Shri Gajanan Shikshan Sanstha's
SHRI SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING
SHEGAON – 444203, DIST. BULDHANA (MAHARASHTRA STATE), INDIA
"Recognized by A.I.C.T.E., New Delhi" Affiliated to Sant Gadge Baba Amravati University, Amravati
"Approved by the D.T.E., M.S. Mumbai"

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CRITERION I - CURRICULAR ASPECTS

Key Indicator: 1.3. Curriculum Enrichment

Metric No	Assessment Indicators	Evidences
1.3.2	Number of courses that include experiential learning through project work/field work/internship during the year	List of Courses Syllabus of the courses

Shri Sant Gajanan Maharaj College of Engineering SHEGAON 444 203

PRINCIPAL
Shri Sant Gajanan Maharaj
College of Engineering,Shegaon.

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a. B. E. Semester wise scheme

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER: THIRD

			Teaching Scheme					Examination Scheme								
			Hours per Week					Theory					Practical Max Marks			
Sr No	Subject Code	Subject Name	Lecture	Tutorial	P/D	Total Hours/Week	Credit	Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	External	Internal	Total	Min Passing Marks
Theory																
1	3KS01	Mathematics-III	3	1		4	4	3	80	20	100	40				
2	3KS02	Discrete Structure & Graph Theory	3			3	3	3	80	20	100	40				
3	3KS03	Object Oriented Programming	3			3	3	3	80	20	100	40				
4	3KS04	Data Structures	3			3	3	3	80	20	100	40				
5	3KS05	Analog & Digital Electronics	3			3	3	3	80	20	100	40				
6	4ES06	Environmental Studies *	2			2	0									
Practicals																
7	3KS06	Object Oriented Programming (Java) Lab			2	2	1						25	25	50	25
8	3KS07	Data Structures Lab			2	2	1						25	25	50	25
9	3KS08	Analog & Digital Electronics Lab			2	2	1						25	25	50	25
10	3KS09	C Skill-Lab I (#)			2	2	1						25	25	50	25
		Total	17	1	8	26	20				500				200	
														Total	700	

* As per the Ordinance No. 42 of 2005
# C Skill Lab I - based on technology like -**Python/Django** etc. to be decided by Individual Dept. of respective College

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FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER: FOURTH

			Teaching Scheme					Examination Scheme								
			Hours per Week					Theory					Practical			
													Max Marks			
Sr No	Subject Code	Subject Name	Lecture	Tutorial	P/D	Total Hours/Week	Credit	Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	External	Internal	Total	Min Passing Marks
Theory																
1	4KS01	Artificial Intelligence	3			3	3	3	80	20	100	40				
2	4KS02	Data Communication & Networking	3			3	3	3	80	20	100	40				
3	4KS03	Operating System	3			3	3	3	80	20	100	40				
4	4KS04	Microprocessor & Assembly Lang. Prog.	3			3	3	3	80	20	100	40				
5	4KS05	Theory of Computation	3	1		4	4	3	80	20	100	40				
6	4ES06	Environmental Studies *	2			2	2	3	80	20	100	40				
Practicals																
7	4KS06	Data Communication & Networking Lab			2	2	1						25	25	50	25
8	4KS07	Operating System Lab			2	2	1						25	25	50	25
9	4KS08	Microprocessor & Assembly Lang. Prog. Lab			2	2	1						25	25	50	25
10	4KS09	C Skill-Lab II (#)			2	2	1						25	25	50	25
		Total	17	1	8	26	22				600				200	
														Total	800	

* As per the Ordinance No. 42 of 2005

C Skill Lab II - based on technology like -**PHP, Web Technology, Raspberry Pi/Ardino**, etc. to be decided by Individual Dept. of respective College

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BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER: FIFTH

			Teaching Scheme					Examination Scheme								
			Hours/Week					Theory					Practical			
													Max Marks			
Sr No	Subject Code	Subject Name	Lecture	Tutorial	P/D	Total Hours/ Week	Credit	Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	External	Internal	Total	Min Passing Marks
Theory																
1	5KS01	Database Management Systems	4			4	4	3	80	20	100	40				
2	5KS02	Compiler Design	3			3	3	3	80	20	100	40				
3	5KS03	Computer Architecture & Organization	3			3	3	3	80	20	100	40				
4	5KS04	Professional Elective-I (#)	3			3	3	3	80	20	100	40				
5	5KS05	Open Elective - I ($)	3			3	3	3	80	20	100	40				
Practicals																
6	5KS06	Database Management Systems Lab (@)			2	2	1						25	25	50	25
7	5KS07	Compiler Design Lab			2	2	1						25	25	50	25
8	5KS08	Emerging Technology Lab# I			2	2	1						25	25	50	25
9	5KS09	C Skill Lab III (*)			2	2	1						25	25	50	25
		Total	16	0	8	24	20				500				200	
														Total	700	

Track	# Professional Elective-I
AI	Cognitive Technologies
DS	Data Science and Statistics
IoT	Internet of Things
Cy. Security	Introduction to Cyber Security

$ Open Elective - I
Fundamentals of Finance & Accounting
Principles of Marketing for Engineering
Entrepreneurship

@ Practicals using MongoDB,MySQL

FOSS Tools & Technology for Practicals

Track	Emerging Technology Lab# I
AI	IBM Watson, Microsoft Cognitive Toolkit , TensorFlow, Apache SystemML, Caffe, OpenNN, Torch, Neuroph
DS	R, Python, Cassandra, Apache Hadoop
IoT	Arduino, DeviceHive, Kaa, Home Assistant
CS	Kali Linux, OpenVPN, NMAP, Metasploit Framework

* C Skill Lab III - based on technology like - **Angular & React, Express, Node.js** etc. to be decided by Individual Dept. of respective College

An Orientation Program of 15 hours duration /MOOC on Indian Constitution to be offered to the students during the Vth Semester

Open Elective I to be opted from the courses offered by other engineering technology boards of the university /Massive Open learning Courses (MOOC) such as SWAYAM pertaining to the profession

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BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER: SIXTH

			Teaching Scheme					Examination Scheme								
			Hours per Week					Theory					Practical			
													Max Marks			
Sr No	Subject Code	Subject Name	Lecture	Tutorial	P/D	Total Hours/Week	Credit	Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	External	Internal	Total	Min Passing Marks
Theory																
1	6KS01	Security Policy & Governance	3			3	3	3	80	20	100	40				
2	6KS02	Design & Analysis of Algorithm	4			4	4	3	80	20	100	40				
3	6KS03	Software Engineering	3			3	3	3	80	20	100	40				
4	6KS04	Professional Elective-II (#)	3			3	3	3	80	20	100	40				
5	6KS05	Open Elective - II ($)	3			3	3	3	80	20	100	40				
Practicals																
6	6KS06	Design & Analysis of Algorithm Lab			2	2	1						25	25	50	25
7	6KS07	Software Engineering Lab		v	2	2	1						25	25	50	25
8	6KS08	Emerging Technology Lab# II			2	2	1						25	25	50	25
9	6KS09	C Skill Lab IV (*)			2	2	1						25	25	50	25
		Total	16		8	24	20				500				200	
														Total	700	

Track	# Professional Elective-II
AI	Natural Language Processing
DS	Big Data Analytics
IoT	Sensors & Actuators
Cy.Security	Cryptography

$ Open Elective - II
Computational Biology
Cyber Law & Ethics
Intellectual Property Right

FOSS Tools & Technology for Practicals

Track	Emerging Technology Lab# II
AI	Natural Language Toolkit (NLTK),SpaCy, PyTorch-NLP, Natural, Retext, TextBlob
DS	KNIME, Spark, Neo4J, MongoDB, Hive, Storm,
IoT	Devicehub, Zetta, Node-RED, Flutter, M2MLabs Mainspring
CS	VeraCrypt, ModSecurity, AdBlocker, CheckShortURL, SPAMfighter, SpamBully

* C Skill Lab IV - based on technology like - **DevOp to be decided by Individual Dept. of respective College**

An Orientation Program of 15 hours duration /MOOC on Indian Constitution to be offered to the students during the Vth Semester

Open Elective II to be opted from the courses offered by other engineering technology boards of the university /Massive Open learning Courses (MOOC) such as SWAYAM pertaining to the profession

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BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER: SEVENTH

			Teaching Scheme					Examination Scheme								
			Hours per Week			Total Hours/Week	Credit	Theory					Practical			
													Max Marks			
Sr No	Subject Code	Subject Name	Lecture	Tutorial	P/D			Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	External	Internal	Total	Min Passing Marks
Theory																
1	7KS01	Social Science & Engineering Economics	3			3	3	3	80	20	100	40				
2	7KS02	Computer Graphics	3			3	3	3	80	20	100	40				
3	7KS03	Cloud Computing	4			4	4	3	80	20	100	40				
4	7KS04	Professional Elective-III (#)	3			3	3	3	80	20	100	40				
5	7KS05	Professional Elective-IV ($)	3			3	3	3	80	20	100	40				
Practicals																
6	7KS06	Computer Graphics Lab			2	2	1						25	25	50	25
7	7KS07	Emerging Technology Lab# III			2	2	1						25	25	50	25
8	7KS08	Emerging Technology Lab# IV			2	2	1						25	25	50	25
9	7KS09	Project & Seminar			8	8	4							50	50	25
		Total	16		14	30	23				500				200	
														Total	700	

Track	# Professional Elective-III
AI	Robotics
DS	Data Warehousing & Mining
IoT	Embedded Systems
Cy.Security	Digital Forensics

Emerging Technology Lab# III
ROS, YARP, MRPT, Gazebo, OROCOS.
RapidMiner, Weka, Scrapy, Pandas
ThingsBoard, Kinoma, SiteWhere
Security Onion, LastPass,KeePAss

Emerging Technology Lab# V
Ethereum,BigchainDB, Corda
OpenCV, SimpleCV, Keras, Caffe
OpenEaagles, Repast, OpenSimulator

← FOSS Tools & Technology for Practicals ↑

$ Professional Elective-IV	Blockchain Fundamentals	Image Processing	Optimization Techniques

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BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER: EIGHTH

			Teaching Scheme					Examination Scheme								
			Hours per Week					Theory					Practical			
													Max Marks			
Sr No	Subject Code	Subject Name	Lecture	Tutorial	P/D	Total Hours/Week	Credit	Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	External	Internal	Total	Min Passing Marks
Theory																
1	8KS01	Object Oriented Analysis & Design	3			3	3	3	80	20	100	40				
2	8KS02	Professional Ethics & Management	3			3	3	3	80	20	100	40				
3	8KS03	Professional Elective-V (#)	3			3	3	3	80	20	100	40				
4	8KS04	Professional Elective-VI ($)	3			3	3	3	80	20	100	40				
Practicals																
5	8KS05	Emerging Technology Lab# V			2	2	1						25	25	50	25
6	8KS06	Emerging Technology Lab# VI			2	2	1						25	25	50	25
7	8KS07	Project & Seminar			12	12	6						75	75	150	75
		Total	12		16	28	20				400				250	
														Total	650	

Track	# Professional Elective-V	Emerging Technology Lab# IV	Emerging Technology Lab# VI
AI	Virtual & Augmented Reality	Google's ARCore, AR.js, ARToolKit, DroidAR, Brio, Adobe Aero	Hyperledger, HydraChain, MultiChain, Elements
DS	Machine Learning and AI	R Studio, Orange, D3.js, Ggplot2, Jupyter Notebooks	Google Colab, GPUImage, Cuda, Aforge/Accord.NET
IoT	Wireless Sensor Networks	DSA,Thinger,RIOT, OpenRemote,Anjay	OR-Tools, Locust.io, httperf, Apache JMeter, Siege
Cy.Security	System & Software Security	Wireshark, Burp Suit, Nessus	FOSS Tools & Technology for Practicals

$ Professional Elective-VI	Distributed Ledger Technology	Multimedia Computing	Modeling & Simulation

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BRANCH: COMPUTER SCIENCE & ENGINEERING

Baskets for Open Electives & Professional Electives

Open Elective - I	Open Elective - II
Fundamentals of Finance & Accounting	Computational Biology
Principles of Marketing for Engineering	Cyber Law & Ethics
Entrepreneurship	Intellectual Property Right

Track	Professional Elective-IV	Professional Elective-VI
	Blockchain Fundamentals	Distributed Ledger Technology
	Image Processing	Multimedia Computing
	Statistics using R	Modeling & Simulation

Track	Professional Elective-I	Professional Elective-II
AI	Cognitive Technologies	Natural Language Processing
DS	Data Science	Big Data Analytics
IoT	Internet of Things	Sensors & Actuators
Cyber Security	Introduction to Cyber Security	Cyptography

Track	Professional Elective-III	Professional Elective-V
AI	Robotics	Virtual & Augmented Reality
DS	Data Warehousing & Mining	Machine Learning and AI
IoT	Embedded Systems	Wireless Sensor Networks
Cyber Security	Digital Forensics	System & Software Security

Specialization option can be supported by Professional Electives I, II, III, IV, V & VI can also be opted through SWAYAM which needs to be mentored by Faculty.

C Skill Lab I - IV covers the technology essentials for ***Full Stack Developer*** Skill set

Wherever possible students should be encouraged to opt for Virtual Labs apart from the normal Physical Labs for all the subjects specifically from Professional electives baskets. (Various Virtual Labs were floated by Ministry of HRD http://www.vlab.co.in/)

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BRANCH: COMPUTER SCIENCE & ENGINEERING

Tentative FOSS Tools & Technology for Practicals
(Free and open-source software)

Track	Emerging Technology Lab#1	Emerging Technology Lab#2
AI	IBM Watson, Microsoft Cognitive Toolkit , TensorFlow, Apache SystemML, Caffe, OpenNN, Torch, Neuroph	Natural Language Toolkit (NLTK),SpaCy, PyTorch-NLP, Natural, Retext, TextBlob
DS	R, Python, Cassandra, Apache Hadoop,	KNIME, Spark, Neo4J, MongoDB, Hive, Storm,
IoT	Arduino, DeviceHive, Kaa, Home Assistant	Devicehub, Zetta, Node-RED, Flutter, M2MLabs Mainspring
Cyber Security	Kali Linux, OpenVPN, NMAP, Metasploit Framework	VeraCrypt, ModSecurity, AdBlocker, CheckShortURL, SPAMfighter, SpamBully

Track	Emerging Technology Lab#3	Emerging Technology Lab#4
AI	ROS, YARP, MRPT, Gazebo, OROCOS.	Google's ARCore, AR.js, ARToolKit, DroidAR, Holokit. Mixare, Brio, Adobe Aero
DS	RapidMiner, Weka, Scrapy, Pandas	R Studio, Orange, D3.js, Ggplot2, Jupyter Notebooks
IoT	ThingsBoard, Kinoma, SiteWhere	DSA,Thinger,RIOT, OpenRemote,Anjay
Cyber Security	Security Onion, LastPass,KeePAss	Wireshark, Burp Suit, Nessus

Track	Emerging Technology Lab# V	Emerging Technology Lab# VI
Block Chain	Ethereum,BigchainDB, Corda	Hyperledger, HydraChain, MultiChain, Elements
Image Processing	OpenCV, SimpleCV, Keras, Caffe	Google Colab, GPUImage, Cuda, AForge.NET/Accord.NET
Optimization	OpenEaagles, Repast, OpenSimulator	OR-Tools, Locust.io, httperf, Apache JMeter, Siege

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b. B. E. Syllabus

3KS02 Discrete Structure and Graph Theory

Course Prerequisite: Basic knowledge of Mathematics

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Discrete Structure and Graph Theory by being able to do each of the following:

1. Use mathematically correct terminology and notation.
2. Construct correct direct and indirect proofs.
3. Use division into cases in a proof.
4. Apply logical reasoning to solve a variety of problems.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to

1. Analyze and express logic sentence in terms of predicates, quantifiers, and logical connectives.
2. Derive the solution for a given problem using deductive logic and prove the solution based on logical inference.
3. Classify algebraic structure for a given mathematical problem.
4. Perform combinatorial analysis to solve counting problems.
5. Develop the given problem as graph net works and solve with techniques of graph theory

Unit I: Foundations: Logic and Proofs **Hours: 7**
Propositions, Truth Tables, Compound Propositions, Logical Operators, Logic and Bit Operations; Logical Equivalences, De Morgan's Laws, Predicates, Quantifiers: Restricted Domains, Precedence, Logical Equivalences; Rules of Inference for Propositional Logic, Use to Build Arguments, Resolution, Combination for Propositions and Quantified Statements; Proofs Terminology, Methods, Direct Proofs, Proof by Contraposition and Contradiction;

Unit II: Sets, Functions and Relations **Hours: 7**
Introduction, Venn Diagrams, Subsets, Size of a Set, Power Sets, Cartesian Products, Set Notation with Quantifiers, Truth Sets and Quantifiers, Set Operations; Inverse Functions, Compositions and Graphs of Functions, Important Functions, Partial Functions; Sequences, Recurrence Relations, Special Integer Sequences, Summations; Countable Sets, An Uncountable Set; Functions as Relations, Relations on a Set, Properties of Relations, Combining Relations; n-ary Relations, Operations on n- ary Relations; Representing Relations Using Matrices; Closures, Transitive Closures

Unit III: Number Theory and Induction **Hours: 6**
Division, The Division Algorithm, Modular Arithmetic, Arithmetic Modulo m; Primes, Trial Division, Conjectures and Open Problems About Primes, GCD and LCM, The Euclidean Algorithm, gcds as Linear Combinations; Linear Congruences, The Chinese Remainder Theorem, Fermat's Little Theorem, Pseudoprimes, Primitive Roots and Discrete Logarithms, Applications: Hashing Functions, Mathematical Induction and Examples of Proofs, Mistaken Proofs, Guidelines for Proofs; Strong Induction, Examples of Proofs.

Unit IV: Algebraic Structures **Hours: 7**
Algebraic Systems: Examples and General Properties; Semigroups and Monoids: Homomorphism of Semigroups and Monoids, Subsemigroups and Submonoids; Groups: Definitions, Subgroups and Homomorphisms, Cosets and Lagrange's Theorem, Normal Subgroups, algebraic Systems with Two Binary Operations.

Unit V: Counting **Hours: 7**
Basic Counting Principles, Complex Counting Problems, Subtraction and Division Rule, The Pigeonhole Principle, The Generalized Pigeonhole Principle, Applications; Permutations, Combinations, Generating Permutations, Generating Combinations.

Unit VI: Graphs **Hours: 6**
Graph Models; Basic Terminology, Special Simple Graphs, Bipartite Graphs, Matchings, Applications of Special Types of Graphs, New Graphs from Old; Graph Representation, Adjacency and Incidence Matrices, Isomorphism of Graphs, Determining Isomorphism; Paths, Connectedness in Undirected Graphs and Directed Graphs, Paths and Isomorphism, Counting Paths Between Vertices; Euler Paths and Circuits, Hamilton Paths and Circuits, Applications of Hamilton Circuits; Planar Graphs: Euler's Formula, Kuratowski's Theorem; Graph Coloring: Introduction, Applications of Graph Colorings.

Text Book:
Kenneth H. Rosen: Discrete Mathematics and Its Applications, 7th Edition, McGraw-Hill.

Reference Books:

1. J. P. Tremblay and R. Manohar: Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw-Hill Edition, McGraw-Hill.
2. Norman L. Biggs: Discrete Mathematics, 2nd Edition, Oxford University Press.
3. Seymour Lipschutz and Marc Lars Lipson: Schaum's Outline of Theory and Problems of Discrete Mathematics, 3rd Edition, Schaum's Outlines Series, McGraw-Hill.
4. C. L. Liu and D. P. Mohapatra: Elements of Discrete Mathematics: A Computer Oriented Approach, 3rd Edition, Tata McGraw-Hill, McGraw-Hill.

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SHEGAON – 444203, DIST. BULDANA (MAHARASHTRA STATE), INDIA
"Recognized by A.I.C.T.E., New Delhi" Affiliated to Sant Gadge Baba Amravati University, Amravati
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3KS03 Object Oriented Programming

Course Prerequisite: Computer Programming

Course Objectives:

1. To explore the principles of Object Oriented Programming (OOP) such as data abstraction, encapsulation, inheritance and polymorphism.
2. To use the object-oriented paradigm in program design.
3. To Provide programming insight using OOP constructs.
4. To lay a foundation for advanced programming

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Apply Object Oriented approach to design software.
2. Implement programs using classes and objects.
3. Specify the forms of inheritance and use them in programs.
4. Analyze polymorphic behaviour of objects.
5. Design and develop GUI programs.
6. Develop Applets for web applications

Unit I: Introduction to Object Oriented Programming **Hours:7**
Introduction, Need of OOP, Principles of Object-Oriented Languages, Procedural Language Vs OOP, Application of OOP, Java Virtual Machine, Java features, Program Structures. Java Programming Constructs: Variables, Primitive data types, Identifier, Literals, Operators, Expressions, Precedence Rules and Associativity, Primitive Type Conversion and Casting, ,Flow of Control.

Unit II: Classes and Objects **Hours:7**
Classes, Objects, Creating Objects, Methods, Constructors, Cleaning up Unused Objects, Class Variable and Methods, this keyword, Arrays, Command Line Arguments.

Unit III: Inheritance, Interfaces and Packages **Hours:6**
Inheritance: Inheritance vs. Aggregation, Method Overriding, super keyword, final keyword, Abstract class. Interfaces: Defining interfaces, Implementing interfaces, Accessing interface variables, Extending interfaces. Packages: Packages, java.lang package, Enum type.

Unit IV: Exception handling and Input/Output **Hours:7**
Exception: Introduction, Exception handling Techniques, User-defind exception, Exception Encapsulation and Enrichment. Input/Output: The java.io.file Class, Reading and Writing data, Randomly Accessing a file, Reading and Writing Files using I/O Package.

Unit V: Applets **Hours:7**
Introduction, Applet Class, Applet structure, Applet Life cycle, Common Methods used in displaying the output, paint (), update () and repaint (), More about applet tag, getDocumentBase() and getCodeBase () methods, Applet Context Interface, Audio clip, Graphic Class, Color, Font, Font Metrics.

Unit VI: Unit Title:Event Handling **Hours:6**
Introduction, Event delegation Model, java.awt.event Description, Sources of events, Event Listeners, Adapter classes, Inner Classes. Abstract Window Toolkit: Introduction, Components and Containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Textfield and Textarea, Container Class, Layouts, Menu, Scrollbar.

Text Books:

1. SachinMalhotra and SaurabhChoudhary: Programming in Java, Oxford University Press 2010.
2. Herbert Schildt: Java Complete References (McGraw Hill)

Reference Books:

1. H.M.Dietel and P.J.Dietel, "Java How to Program" Pearson Education/PHI, Sixth Edition.
2. E. Balagurusamy: Programming with Java (McGraw Hill)
3. Dr. R. NageswaraRao: Core Java An Integrated Approach (Dreamtech)
4. Khalid Mughal: A Programmer's Guide to Java Certification, 3rdEdition (Pearson)
5. Sharnam Shah and Vaishali Shah: Core Java for Beginners,(SPD),2010.

3KS04/3KE04 Data Structures

Course Prerequisite: Fundamentals of programming Language & Logic Building Skills

Course Objectives:

1. To understand the linear and nonlinear data Structures and its memory representations.
2. To perform different operations on data structures such as insertion, deletion, searching and traversing.
3. To understand various data searching and sorting methods with its complexity.
4. To introduce various techniques for representation of the data in the real world.

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Apply various linear and nonlinear data structures
2. Demonstrate operations like insertion, deletion, searching and traversing on various data structures
3. Examine the usage of various structures in approaching the problem solution.
4. Choose appropriate data structure for specified problem domain

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Unit I: Introduction to Data Structures **Hours: 7**
Introduction to Data structures, Data Structure Operations, Algorithmic Notation, Complexity of algorithms. String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms.

Unit II: Array & Record Structure **Hours: 7**
Linear arrays : Memory Representation of arrays, traversing linear arrays, insertion & deletion operations, Bubble sort, Linear search and Binary search algorithms. Multi dimensional arrays, Pointer arrays. Record structures and Matrices.

Unit III: Linked lists **Hours: 6**
Linked lists: Memory Representation of Linked List, traversing a linked list, searching a linked list. Memory allocation & garbage collection. Insertion & deletion operations on linked lists. Header linked lists, Two- way linked lists.

Unit IV: Stack & Queue **Hours: 7**
Stacks: Sequential Memory Representation of Stack, Arithmetic expressions: Polish notation. Quick sort, Recursion, Tower of Hanoi.
Queues: Sequential Memory Representation of Queue, DeQueue, Priority queues.

Unit V: Trees **Hours: 7**
Introduction to Trees, Binary trees, Memory Representation of Binary Tree, Traversing binary trees, Header nodes, Binary Search Tree, Heap and heapsort, Path length & Huffman's algorithm.

Unit VI: Graphs & Sorting Algorithms **Hours: 6**
Introduction to Graphs, Memory representation of graphs, Warshalls' algorithm, operations on Graphs, Breadth First Search, Depth First Search
Sorting : Insertion Sort, Selection Sort, Radix sort, Merge Sort.

Text Book:
1. Seymour Lipschutz: Data Structures , Schaum's Outline Series, McGraw-Hill, International Editions.
2. Trembley, Sorenson: An Introduction to Data Structures with Applications, McGraw Hill.

Reference Books:
1. Ellis Horowitz, SartajSahni: Fundamentals of Data Structures, CBSPublications.
2. Data Structure Using C, Balagurusamy.
3. Standish: Data Structures in Java, Pearson Education.

3KS05 Analog & Digital Electronics

Course Prerequisite: Basic Physics.

Course Objectives:
1. To get the introductory knowledge of PN Junction Diode, Bipolar Junction Transistor, Field Effect Transistor.
2. To understand number systems and conversion between different number systems.
3. To get basics knowledge about digital ICs and digital systems.
4. To study the design of combinational circuits and sequential circuits

Course Outcomes(Expected Outcome): At the end of course students will able to
1. Explain basic concepts of semiconductor devices and its application.
2. Compare different Number System and basics of conversion of number systems.
3. Realize different minimization technique to obtain minimized expression.
4. Design Combinational Circuits.
5. Design and Develop Sequential Circuits.

Unit I: PN Junction Diode and Bipolar Junction Transistor **Hours: 7**
PN-Junction Diode, Characteristics and Parameters, BJT operation, BJT Voltages and Currents, BJT Amplification: Current and Voltage, BJT Switching, Common-Base Characteristics, Common-Emitter Characteristics, Common- Collector Characteristics

Unit II: Field Effect Transistors **Hours: 7**
Junction Field Effect Transistors, n-Channel and p-Channel JFET, JFET Characteristics, JFET Parameters, FET Amplifications and Switching, MOSFETs: Enhancement MOSFET, Depletion_Enhancement MOSFET, Comparison of p-channel and n-channel FETs, Introduction to CMOS.

Unit III: Number System **Hours: 6**
Binary Number System, Signed and unsigned Number, Octal Number System, Hexadecimal Number System, Conversions between Number Systems, r's and (r-1)'s Complements Representation, Subtraction using 1's and 2's Complements, BCD, Gray Code, Excess 3 Code and Alpha numeric codes.

Unit IV: Minimization Techniques **Hours: 7**
Logic Gates, Boolean Algebra, Logic Operation, Axioms and Laws of Boolean Algebra, Reducing Boolean Expression, Boolean Functions and their representation, SOP Form, POS Form, Karnaugh Map (up to 5 variable), Limitation of Karnaugh Map, Quine- McCluskey Minimization Technique (up to 5 variable).

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Unit V: Combinational Circuits **Hours: 7**

Introduction, Design Procedure, Adders, Subtractors, Binary Parallel Adder, 4 Bit Parallel Subtractor, Look-ahead-carry Adder, BCD adder, BCD Subtractor, Multiplexer, De-multiplexer, Decoder, Encoder, Comparator, Parity bit Generator/Checkers, Boolean Expression Implementation using these ICs.

Unit VI: Sequential Circuits **Hours: 6**

Flip-flops: S-R, J-K, Master slave J-K, D-type, T-type, Flip flop Excitation Table, Conversion of Flip Flops, Registers: SISO, SIPO, PISO, PIPO, Universal Shift Register. Counters: Asynchronous and Synchronous counter, Up/Down counter, MOD-N counter, Ring counter, Johnson counter.

Text Book:

1. David A. Bell: "Electronic Devices and Circuits", 5e , Oxford University Press.
2. Jain R.P. "Modern Digital Electronics", 3e, TMH.

Reference Books:

1. Millman&Halkies: "Electronic Devices & Circuits", 2e, McGraw Hill.
2. Sedra& Smith: "Microelectronics Circuits", 5e, Oxford University Press.
3. Anand Kumar: "Switching Theory and Logic Design", 3e, PHI Learning Private Limited
4. Wakerly, "Digital Design: Principles and Practices", 3 e, Pearson Education, 2004.

3KS06 Object Oriented Programming Lab

Course Prerequisite: Basic Computer Programming

Course Objectives: Design, implement, test, and debug simple programs in an object-oriented programming language.

1. To develop the knowledge of object-oriented paradigm in the Java programming language.
2. To evaluate classical problems using java programming.
3. To develop software development skills using java programming for real world applications.

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Design, implement, test, and debug simple programs in an object-oriented programming language.
2. Interpret the basics of object-oriented design and the concepts of encapsulation, abstraction, inheritance, and polymorphism
3. Build applications in Java by applying concepts like interfaces, packages and exception handling.
4. Make use of Java concepts like API, Applets, AWT.

List of Experiments:

This is a sample list of Experiments; minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Introduction to Object Oriented Programming and installation of JDK. Write a program to print a message "Hello World..."
2. Develop a program to explain use of Operators in java.
3. Develop a Program to study and implement Looping Statements belonging to Java.
4. Develop a Program to study and implement Selection Statements belonging to Java.
5. Develop a program to study and implement some Pyramid.
6. Develop a program to demonstrate the concept of Class, Method and Object.
7. Develop a program to study and implement the concept of Method Overloading.
8. Develop a program to study and implement concept of Constructor in Java.
9. Develop a program to study and implement concept of Constructor Overloading in Java.
10. Develop a program to study and implement the Array in Java.
11. Develop a Program on various ways to accept data through keyboard(Command Line Argument)
12. Develop a program to study and implement the concept of Inheritance.
13. Develop a program to study and implement the concept of Method Overriding.
14. Develop a program to study and implement the Abstract Class.
15. Develop a program to study and implement the concept of Interface in Java.
16. Develop a program to study and implement Exception Handling Mechanism in Java.
17. Develop a program to study and implement Java I/O.
18. Develop a program to study and implement simple Applet in java.
19. Develop a program on Applet to demonstrate Graphics, Font and Color class.
20. Develop a Program on passing parameters to applets
21. Develop a Program to create GUI application without event handling using AWT controls
22. Develop a Program to create GUI application with event handling using AWT controls
23. Develop a program on Multithreading
24. Develop a Program to create GUI application with event handling using Swing controls
25. Mini Project based on content of the syllabus. (Group of 2-3 students)

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3KS07 Data Structure Lab

Course Prerequisite: Basics of programming Language & Logic Building Skills

Course Objectives:

1. To understand the linear and nonlinear data Structures and its memory representations.
2. To perform different operations on data structures such as insertion, deletion, searching and traversing.
3. To understand various data searching and sorting methods with its complexity.
4. To introduce various techniques for representation of the data in the real world.

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Apply various linear and nonlinear data structure.
2. Demonstrate operations like insertion, deletion, searching and traversing on various data structures
3. Examine the usage of various structures in approaching the problem solution.
4. Choose appropriate data structure for specified problem domain

List of Experiments:

This is a sample list of Experiments; minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Write a program to find out largest number from the array and also find it's location.
2. Write a program to traverse an array and find the sum and average of data elements from an array.
3. Write a Program to a) insert an element in an array b)delete an element from an array.
4. To study and execute the Linear search method
5. To study and execute the Binary Search method
6. To study and execute the Pattern matching Algorithms(Slow and Fast)
7. To study and execute Bubble sort method.
8. To study and implement various operations on singly linked list
   (a) Traversing the linked list.
   (b) Insert a node at the front of the linked list.
   (c) Delete a last node of the linked list.
   (d) Searching a Linked list.
9. To study and implement following operations on the doubly linked list.
   (a) Insert a node at the front of the linked list.
   (b) Insert a node at the end of the linked list.
   (c) Delete a last node of the linked list.
   (d) Delete a node before specified position.
10. To study and implement following operations on the circular linked list.
    (a) Insert a node at the end of the linked list.
    (b) Insert a node before specified position.
    (c) Delete a first node of the linked list.
    (d) Delete a node after specified position.
11. Understand the stack structure and execute the push, pop operation on it.
12. Understand the Queue structure and execute the insertion, deletion operation on it.
13. Formulate and demonstrate Transforming Infix Expressions to Postfix Expression using Stack.
14. Formulate and demonstrate the Evaluation of Postfix Expression using Stack.
15. To study and execute Quick sort method.
16. Understand the Tree structure and implement the Pre-order, In-order, post-order traversing operations on it.
17. Understand the concept of Recursion and write a program to calculate factorial of a number using Recursion.
18. Understand the Heap sort and implement it on given data.
19. Understand the Insertion sort and implement it on given data.
20. Understand the Selection sort and implement it on given data.
21. To study and execute Merge sort method.
22. To study and execute Radix sort method.
23. Write a Program to implement the concept of BFS algorithm.
24. Write a Program to implement the concept of DFS algorithm.
25. To study and execute Josephus problem.

3KS08 Analog & Digital Electronics Lab

Course Prerequisite: Students should have the knowledge of Basic Physics.

Course Objectives:

1. To impart the concepts of analog and digital electronics practically.
2. To provide students basic experimental experiences in the operation of semiconductor device and Digital ICs.
3. To learn the operation of various logic gates and their implementation using digital IC's.
4. To learn the realization of various combinational and sequential circuits.

Course Outcomes(Expected Outcome): After successfully completing the lab, the students will be able to

1. Apply practically the concepts of analog and digital electronics.
2. Explain the operation and characteristics of semiconductor devices.
3. Illustrate the operation of various logic gates and their implementation using digital IC's.
4. Design and implement various combinational logic circuits.
5. Design and implement various sequential logic circuits

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List of Experiments:

This is a sample list of Experiments; minimum 10 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. To study V-I characteristics of a PN Junction diode in Forward and Reverse bias.
2. To Sketch and Study the input and output characteristics of transistor connected in Common Emitter (CE) configuration..
3. To Sketch and Study the input and output characteristics of transistor connected in Common Base (CB) configuration
4. To Sketch and Study the input and output characteristics of transistor connected in Common Collector (CC) configuration.
5. To plot static characteristics of FET & calculate its parameters g_m, r_d and μ.
6. To implement Logic gates using TTL ICs (7400, 7402, 7404, 7408, 7410, 7411, 7420, 7427, 7432, 7486).
7. Study and verify the truth table of half adder and full adder using logic gates.
8. Study and verify the truth table of half subtractor and full subtractor using logic gates
9. To compare two 4 bits number and verify the output using 4-bit comparator IC 7485.
10. Implementation of 4×1 multiplexer using logic gates.
11. Implementation and verification of Demultiplexer and Encoder using logic gates.
12. Implementation of 4bit parallel adder using 7483 IC.
13. Design and verify the 4 bit synchronous counter.
14. Design and verify the 4 bit asynchronous counter.
15. Verification of truth table of SR, JK, T and D Flip Flops.

List of Experiment beyond syllabus:

1. Design and Implementation of Op-amp as an inverting amplifier.
2. Design and Implementation of Op-amp as a non-inverting amplifier.
3. To design and find frequency of Astablemultivibrator using IC 555.

3KS09 C-Skill-Lab I

Course Prerequisite: Basic knowledge of any Programming Language

Course Objectives:

1. To be able to program design with functions using Python.
2. To understand data and information processing techniques.
3. To understand to Design a program to solve the problems.
4. To be able to access database using python programming.
5. To be able to design web applications using python programming.

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
2. Interpret different Decision Making statements, Functions, Object oriented programming in Python
3. Summarize different File handling operations
4. Explain how to design GUI Applications in Python and evaluate different database operations
5. Develop applications using Django framework or Flask

List of Experiments:

This is a sample list of Experiments, minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Write python program to store data in list and then try to print them.
2. Write python program to print list of numbers using range and for loop
3. Write python program to store strings in list and then print them.
4. Write python program in which an function is defined and calling that function prints Hello World.
5. Write a python script to print the current date in the following format "Sun May 29 02:26:23 IST 2017"
6. Write a program to create, append, and remove lists in python.
7. Write a program to create, concatenate and print a string and accessing sub-string from a given string.
8. Write a program to demonstrate working with tuples in python.
9. Write a program to demonstrate working with dictionaries in python.
10. Write a python program to find largest of three numbers.
11. Write python program in which an function(with single string parameter) is defined and calling that function prints the string parameters given to function.
12. Write python program in which an class is define, then create object of that class and call simple print function define in class.
13. Write a Python script that prints prime numbers less than 20.
14. Write a python program to find factorial of a number using Recursion.
15. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
16. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.
17. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
18. Write a Python class to convert an integer to a roman numeral.
19. Write a Python class to implement pow(x, n)
20. Write a Python class to reverse a string word by word.
21. Accessing and working with databases using Python.
22. Create data frame from .csv files and operations on it.

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4KS01 Artificial Intelligence

Course Prerequisite: Basic concepts of Data Structures, Algorithms, Programming

Course Objectives:
1. To present an overview of Artificial Intelligence (AI) principles and approaches.
2. To understand the historical evolution of Artificial Intelligence.
3. To learn various searching techniques and identify to address a particular problem).

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to
1. Explain concepts of Artificial Intelligence and different types of intelligent agents and their architecture.
2. Formulate problems as state space search problem & efficiently solve them.
3. Summarize the various searching techniques, constraint satisfaction problem and example problems - game playing techniques.
4. Apply AI techniques in applications which involve perception, reasoning and learning.
5. Compare the importance of knowledge, types of knowledge, issues related to knowledge acquisition and representation.

Unit I: Introduction to AI **Hours: 7**
Introduction : What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Risks and Benefits of AI,
Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents

Unit II: Problem Solving Through AI **Hours: 7**
Introduction, Representation the AI Problems, Production System, Algorithm of Problem Solving, Examples of AI Problems, Nature of AI Problems

Unit III: Uninformed Search Strategies **Hours: 6**
Problem-Solving Agents, Example Problems, Search Algorithms, **Uninformed Search Strategies**: Breadth-First Search, Uniform-Cost Search, Depth First Search, Bidirectional Search, Depth Limited Search, Iterative Deepening Depth-First Search

Unit IV: Informed Search Strategies **Hours: 7**
Basic Concept of Heuristic Search and Knowledge, Designing of Heuristic Function, **Heuristic Search Strategies:** Generate-And-Test, Best-First Search, Problem Reduction, Hill Climbing, Constraint Satisfaction, Means-Ends-Analysis

Unit V: Adversarial Search & Games **Hours: 7**
Game Theory, Optimal Decisions in Games, Mini-Max Search, Alpha Beta Pruning, Additional Refinements, Monte Carlo Tree Search, Stochastic Games, Partially Observable Games, Limitations of Game Search Algorithms

Unit VI: Introduction to Knowledge **Hours: 6**
Introduction, Types of Knowledge, Knowledge Representation, Knowledge Storage, Knowledge Acquisition, Knowledge Organization and Management, Basic Concepts of Knowledge Engineering

Text Books:
1. Artificial Intelligence: A Modern Approach by Stuart Russell & Peter Norvig (Pearson - 4th Ed.)
2. Artificial Intelligence by Ela Kumar (IK International Publishing House Pvt. Ltd.)

Reference Books:
1. Artificial Intelligence by Elaine Rich and Kevin Knight (Tata McGraw Hill - 3rd Ed.)
2. A First Course in Artificial Intelligence by Deepak Khemani (Tata McGraw Hill - 1st Ed.)
3. Artificial Intelligence and Expert Systems by Patterson (PHI)
4. Introduction to Artificial Intelligence by RajendraAkerkar (PHI Learning Pvt. Ltd.)

4KS02 Data Communication and Networking

Course Prerequisite: Computer and Data Communication Requirements

Course Objectives:
1. To understand the building blocks of digital communication system.
2. To prepare mathematical background for communication signal analysis.
3. To understand and analyze the signal flow in a digital communication system
4. To analyze error performance of a digital communication system in presence of noise and other interferences.
5. To evaluate the errors using various error detection & correction techniques.
6. To understand network based protocols in data communication and networking.

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to
1. Describe data communication Components, Networks, Protocols and various topology based network architecture
2. Design and Test different encoding and modulating techniques to change digital –to- digital conversion, analog-to-digital conversion, digital to analog conversion, analog to analog conversion,
3. Explain the various multiplexing methods and evaluate the different error detection & correction techniques.
4. Illustrate and realize the data link control and data link protocols.
5. Describe and demonstrate the various Local area networks and the IEEE standards.

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Unit I: Introduction to Data Communication **Hours: 7**

Introduction: Data Communication, Components, Networks, Network types: Local Area Network,Wide Area Network, Switching, The Internet, Accessing the Internet, Standards and Administration: Internet Standards, Internet Administration, Network Models:TCP/IP Protocol Suite, TheOSI Model, Transmission media: Introduction, Guided media & Unguided media-Wireless. Switching: Introduction, Circuit Switched Networks, Packet Switching.

Unit II: Data link Layer **Hours: 6**

Data Link Layer: Introduction, Nodes & Links, Services , Two categories of link, Two sub-layers, Error detection and correction: Introduction, Block Coding, Cyclic codes, Checksum, Forward Error Correction, Data link control: DLC services, Data-Link Layer Protocol, HDLC, Point-To-Point Protocol, Media Access Control (MAC): Random Access, Controlled Access, Channelization.

Unit III: Network Layer **Hours: 7**

Introduction to Network layer Network Layer Services: Packetizing, Routing and Forwarding, Other Services Packet Switching: Datagram Approach: Connectionless Service, Virtual-Circuit Approach: Connection-Oriented Service , Network Layer performance: Delay, Throughput, Packet Loss, Congestion Control, IPV4 Address: Address Space, Classful Addressing, Classless Addressing, Dynamic Host Configuration Protocol (DHCP), Network Address Resolution (NAT), Forwarding of IP packets: Forwarding Based on Destination Address, Forwarding Based on Label, Routers as Packet Switches

Unit IV: Network Layer Protocol **Hours: 7**

Network Layer Protocols: Internet Protocol (IP),Datagram Format, Fragmentation, Security of IPv4 Datagrams,ICMPV4: Messages, Debugging Tools, ICMP Checksum,Mobile IP: Addressing, Agents, Three Phases, Inefficiency in Mobile IP,Routing algorithms: Distance Vector routing, Link State Routing, IPV6 Addressing: Representation, Address Space, Address Space Allocation, Auto configuration, Renumbering, Transition from IPV4 to IPV6: Strategies, Use of IP Addresses

Unit V: Transport Layer **Hours: 6**

Introduction to Transport layer: Introduction, Transport-Layer Services, Connectionless and Connection-Oriented Protocols, Transport-Layer Protocols: Simple Protocol, Stop-and-Wait Protocol, Go-Back-N Protocol (GBN), Selective-Repeat Protocol, Bidirectional Protocols: Piggybacking,User Datagram Protocols: User Datagram, UDP Services, UDP Applications,Transmission Control Protocol: TCP Services, TCP Features , Segment, A TCP Connection, State Transition Diagram, Windows in TCP, Flow Control, Error Control, TCP Congestion Control, TCP Timers, Options, SCTP: SCTP Services, SCTP Features

Unit VI: Application layer **Hours: 7**

Introduction to Application layer:Providing Services, Application-Layer Paradigms, Client-Server Programming: Application Programming Interface, Using Services of the Transport Layer, Iterative Communication Using UDP, Iterative Communication Using TCP, Concurrent Communication,World wide web and HTTP: World Wide Web, Hyper-Text Transfer Protocol (HTTP) FTP: Two Connections, Control Connection, Data Connection, Security for FTP,Electronic Mail:Architecture, Web-Based Mail, E-Mail Security,Domain Name System (DNS):Name Space, DNS in the Internet, Resolution, Caching, Resource Records, DNS Messages, Registrars, Security of DNS, Network Management: Introduction. Configuration Management, Fault Management, Performance Management, Security Management, Accounting Management,SNMP: Managers and Agents, Management Components, ASN.1: Language Basics, Data Types, Encoding.

Text Book:

Behrouz A. Forouzan: Data Communication and Networking, (5/e) (TMH

Reference Books:

1. William Stallings: Data & Computer Communications, 6/e, Pearson Education
2. William L. Schweber : Data Communication, McGraw Hill
3. J.Freey : Computer Communication & Networks, AEW Press
4. D. Corner: Computer Networks & Internet, Pearson Education.

4KS03 Operating System

Course Prerequisite: Discrete Structures, Data Structure, Any programming Language

Course Objectives:

1. To make students aware of the kernel and shell structure of the operating systems.
2. To make students aware of the purpose, structure and functions of operating systems
3. To equip students with understanding of the various scheduling algorithms in OS.
4. To make students aware of understanding of memory management in different OS.

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Explain memory management issues like external fragmentation, internal fragmentation.
2. Illustrate multithreading and its significance.
3. List various protection and security mechanisms of OS.
4. Analyze and solve the scheduling algorithms.
5. Analyze the deadlock situation and resolve it.
6. Compare various types of operating systems

Unit I: Introduction to OS **Hours: 7**

Introduction: Operating System definition, OS Evolution, Components and Services, Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Interprocess Communication, Threads Overview, Multithreading Models, Threading Issues, Java Threads

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Unit II: Process Scheduling **Hours: 7**
Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR, Priority, Multilevel Queue, Multilevel Feedback Queue Scheduling

Unit III: Process Synchronization **Hours: 6**
Process Synchronization Basics: The Critical-Section Problem, Synchronization Hardware, Semaphores, Monitors, Deadlocks: Definition & Characterization, Deadlocks Prevention, Avoidance, Detection and Recovery from Deadlock

Unit IV: Memory Management **Hours: 7**
Memory Management Background, Swapping, Contiguous Memory Allocation Schemes, Paging, Segmentation, Virtual Memory Management: Background, Demand paging scheme, Process Creation, Page Replacement Policies, Allocation of Frames, Thrashing

Unit V: Unit Title: File System **Hours: 7**
File-System Interface; Directory Structure, File-System Mounting, File Sharing &Protection, File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management. File Recovery

Unit VI: Unit Title: I/O System **Hours: 6**
I/O Systems : Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O to Hardware Operations , Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure.

Text Book: Avi Silberschatz, P. B. Galvin, G. Gagne: "Operating System Concepts" (9/e) John-Wiley & Sons.

Reference Books:
1. A.S. Tanenbaum "Modern Operating Systems" Pearson Education.
2. William Stallings "Operating Systems" Prentice-Hall.
3. D. M. Dhamdhere "Operating Systems" Tata McGraw-Hill.
4. P. Balkrishna Prasad: "Operating Systems" Scitech Publications (I) Pvt.

4KS04 Microprocessor & Assembly Language Programming

Course Prerequisite: Computer Programming and Computer Fundamentals

Course Objectives:
1. To explore 8086 microprocessor and its architecture.
2. To introduce interfacing techniques of 8086 microprocessor.
3. To introduce basics of Internet of Things

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to
1. Describe 8086 microprocessor and its architecture; also understand instruction processing during the fetch-decode-execute cycle.
2. Design and Test assembly language programs using 8086 microprocessor instruction set.
3. Demonstrate the implementation of standard programming constructs, including control structures and functions, in assembly language.
4. Illustrate and realize the Interfacing of memory & various I/O devices with 8086 microprocessor.
5. Explain the basic concepts of Internet of Things

Unit I: 8086 Architecture **Hours: 7**
8086 architecture and pin configuration, Software model of 8086 microprocessor. Memory addresses space and data organization. Data types. Segment registers, memory segmentation. IP & Data registers, Pointer, Index registers. Memory addresses generation.

Unit II: 8086 Instruction Set **Hours: 7**
8086 Instruction set overview, addressing modes. 8086 instruction formats. 8086 programming: Integer instructions and computations: Data transfer instructions, Arithmetic instructions and their use in 8086 programming.

Unit III: 8086 Instruction Set **Hours: 6**
8086 programming: logical instructions. Shift and rotate instructions and their use in 8086 programming. 8086 flag register and Flag control instructions, compare instruction, control flow and jump instructions, Loops & loop handling instructions. 8086 programming using these instructions.

Unit IV: Subroutines& Macros **Hours: 7**
The 8086 stack segment and stack related instructions. 8086 I/O Address space. Subroutines and related instructions, Parameter passing, Concept of Macros, Status saving on stack. Concept of recursion at assembly program level. 8086 Programming using subroutines, recursion and macros.

Unit V: 8086 Interrupt **Hours: 7**
8086 Interrupts types, priority and instructions. Interrupt vector table, External hardware-interrupt interface signals & interrupts sequence. Software interrupts. Non-maskable interrupts. 8086 microprocessor interrupt programming.

Unit VI: Internet of Things (IoT) **Hours: 6**
Internet of things: An overview, IoT conceptual framework, IoT Architectural View, Technology behind IoT, Sources of IoT, M2M communication, Examples of IoT.

Text Book:
1. A. K. Ray & K. M. Bhurchandi: Advanced Microprocessors & Peripherals, Third Edition (TMH).

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2. Raj Kamal: Internet of Things, Architecture and Design Principals, McGraw Hill Education (India) Private Limited

Reference Books:
1. W. A. Triebel& Avatar Singh: The 8088/8086 Microprocessors (4e) (PHI /Pearson Education)
2. Liu & Gibson: The 8088/8086 Microprocessor Architecture Programming and Interface (6/e) (PHI)

4KS05 Theory of Computation

Course Prerequisite: Discrete Mathematics, Data Structures

Course Objectives:
1. To understand different automata theory and its operation.
2. To understand mathematical expressions for the formal languages
3. To study computing machines and comparing different types of computational models
4. To understand the fundamentals of problem decidability and Un-Decidability

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to
1. To construct finite state machines to solve problems in computing.
2. To write regular expressions for the formal languages.
3. To construct and apply well defined rules for parsing techniques in compiler
4. To construct and analyze Push Down, Turing Machine for formal languages
5. To express the understanding of the Chomsky Hierarchy.
6. To express the understanding of the decidability and un-decidability problems.

Unit I: Finite State Machines **Hours: 8**
Alphabet, String, Formal and Natural Language, Operations, Definition and Design DFA (Deterministic Finite Automata), NFA (Non Deterministic Finite Automata), Equivalence of NFA and DFA: Conversion of NFA into DFA, Conversion of NFA with epsilon moves to NFA, Minimization Of DFA, Definition and Construction of Moore and Mealy Machines, Inter-conversion between Moore and Mealy Machines.
Minimization of Finite Automata. (Construction of Minimum Automaton)

Unit II: Regular Expression and Regular Grammar **Hours: 8**
Definition and Identities of Regular Expressions, Construction of Regular Expression of the given Language, Construction of Language from the RE, Conversion of FA to RE using Arden's Theorem, Inter-conversion RE to FA, Pumping Lemma for RL, Closure properties of RLs(proofs not required), Regular grammar, Equivalence of RG (RLG and LLG) and FA.

Unit III: Context Free Grammar and Languages **Hours: 8**
Introduction, Formal Definition of Grammar, Notations, Derivation Process: Leftmost Derivation, Rightmost Derivation, Derivation Trees, Construction of Context-Free Grammars and Languages, Pumping Lemma for CFL, Simplification of CFG, Normal Forms (CNF and GNF), Chomsky Hierarchy.

Unit IV: Pushdown Automata **Hours: 8**
Introduction and Definition of PDA, Construction of PDA, Acceptance of CFL, Equivalence of CFL and PDA: Inter-conversion , Introduction of DCFL and DPDA, Enumeration of properties of CFL, Context Sensitive Language, Linear Bounded Automata.

Unit V: Turing Machines **Hours: 8**
Formal definition of a Turing Machine, Design of TM, Computable Functions, Church's hypothesis, Counter machine, Variants of Turing Machines: Multi-tape Turing machines, Universal Turing Machine.

Unit VI: Decidability and Un-Decidability **Hours: 8**
Decidability of Problems, Halting Problem of TM, Un-Decidability: Recursive enumerable language, Properties of recursive & non-recursive enumerable languages, Post Correspondence Problem, Introduction to Recursive Function Theory

Text Book:
1. Hopcraft H.E. & Ullman J: Introduction to Automata Theory, Languages and Computation
2. Peter Linz: An Introduction to Formal Languages and Automata

Reference Books:
1. Rajesh K. Shukla: Theory of Computation, CENGAGE Learning, 2009.
2. K V N Sunitha and N Kalyani: Formal Languages and Automata Theory, McGraw Hill,2010
3. Lewis H.P. and Papadimition C.H.: Elements of Theory of Computation
4. Mishra &Chandrashekharan: Theory of Computation
5. C.K.Nagpal: Formal Languages and Automata Theory, Oxford University Press, 2011.
6. VivekKulkarni : Theory of Computation, OUP India, 2013

4KS06 Data Communication & Networking Lab

Course Prerequisite: Computer and Data Communication Requirements

Course Objectives:
1. To understand the working principle of various communication protocols
2. To understand and analyze the signal flow in a digital communication system.
3. To analyze error performance of a digital communication system in presence of noise and other interferences.
4. To evaluate the errors using various error detection & correction techniques.
5. To understand network based protocols in data communication and networking.

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Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Analyze performance of various communication protocols
2. Implement Configure various network protocols.
3. Compare IP Address classes of networks

List of Experiments:

This is a sample list of Experiments; minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. To study various LAN topologies and their creation using network devices, cables and computers. .
2. To connect the computers in Local Area Network.
3. Familiarization with Networking Components and devices: LAN Adapters, Hubs, Switches, Routers etc.
4. Write a program of bit stuffing used by Data Link Layer
5. Write a program to implement CRC(Cyclic Redundancy Check)
6. Write a program to implement Checksum
7. Write a program to implement Sliding window
8. Configure Internet connection and use IP-Config, PING / Tracer and Net stat utilities to debug the network issues.
9. Configuration of TCP/IP Protocols in Windows and Linux.
10. Transfer files between systems in LAN using FTP Configuration, install Print server in a LAN and share the printer in a network.
11. Write a C Program to determine if the IP Address is in Class A, B, C, D, or E
12. Write a C Program to translate Dotted Decimal IP Address into 32 Bit Address.
13. Configure Host IP, Subnet Mask and Default Gateway in a System in LAN (TCP/IP Configuration)

4KS07 Operating System Lab

Course Prerequisite: Basic computer programming

Course Objectives:

1. To make students aware of the kernel and shell structure of the operating systems.
2. To make students aware of the purpose, structure and functions of operating systems
3. To equip students with understanding of the various scheduling algorithms in OS.
4. To make students aware of understanding of memory management in different OS.

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Explain memory management issues like external fragmentation, internal fragmentation.
2. Illustrate multithreading and its significance.
3. List various protection and security mechanisms of OS.
4. Analyze and solve the scheduling algorithms.
5. Analyze the deadlock situation and resolve it.
6. Compare various types of operating systems

List of Experiments:

This is a sample list of Experiments, minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. To study Linux Operating System along with its installation.
2. To Study and Execute basic file commands and process related open source Ubuntu commands
   a. Commands to view all executing, block and suspended process.
   b. Command to check and change the priority of process CPU utilization for executing processes.
   c. Commands to check for child process, sub-processes, process tree, abort & end process and all other basics commands related to processes
3. Write a program for multithreading using C.
4. To simulate First Come First Serve & Shortest Job First process scheduling algorithm
5. To simulate Shortest Job First process scheduling algorithm
6. To simulate Preemptive Shortest Job First process scheduling algorithm
7. To implement Round Robin Process scheduling Algorithm
8. To implement Priority Based Process scheduling Algorithm
9. To implement and analyze multi-level queue scheduling algorithm
10. To implement the following file allocation strategies.
11. To simulate paging technique of memory management.
12. To implement the FIFO page replacement policy
13. To implement the LRU page replacement policy
14. To implement the optimal page replacement policy
15. To simulate producer-consumer problem using semaphores.
16. To implement Dining-Philosophers problem to deal with concurrency control mechanism.
17. To implement contiguous memory allocation strategies to detect fragmentation using: First Fit, Best Fit and Worst Fit.
18. To implement FCFS Disk Scheduling algorithm
19. To implement SCAN Disk Scheduling algorithm
20. To implement C-SCAN Disk Scheduling algorithm
21. To simulate Bankers algorithm for deadlock avoidance
22. To implement following memory management techniques
    Implement MVT and MFT where memory block size is 100 for 5 processes. Enter no. of blocks for each process and calculate internal fragmentation.
23. To simulate LFU page replacement algorithms

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24. To simulate the Single level directory file organization techniques.
25. To Simulate bankers algorithm for Dead Lock Avoidance (Banker's Algorithm)

4KS08 Microprocessor & Assembly Lang. Prog Lab

Course Prerequisite: Computer Programming, Number System

Course Objectives: In this lab student will learn about' Microprocessor and Interfacing' in regards to digital computer, microprocessor architecture, programming with 8086 microprocessor and different peripherals.

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Analyze the internal workings of the microprocessor
2. Design and develop programs in Assembly Language Programming
3. Describe 8086 microprocessor and its architecture; also understand instruction processing during the fetch-decode-execute cycle.
4. Design and Test assembly language programs using 8086 microprocessor instruction set.
5. Demonstrate the implementation of standard programming constructs, including control structures and functions, in assembly language
6. Illustrate and realize the Interfacing of memory & various I/O devices with 8086 microprocessor

List of Experiments:

This is a sample list of Experiments; minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Installation and Introduction of TASM Assembler.
2. Write a program for addition of two 8-bits numbers and two 16-bits numbers.
3. Write a program for subtraction of two 8-bits numbers and two 16-bits numbers.
4. Write a program for multiplication of two 8-bits numbers.
5. Write a program for division of two 8-bits numbers
6. Write a program to check whether a given number is even or odd.
7. Write a program to demonstrate Logical Group and Shift Rotate Instructions.
8. Write a program to check whether a given number is positive or negative.
9. Write a program to find greatest of two 8-bits signed &unsigned numbers.
10. Block Transfer Program
11. Write a program to find Factorial of a number using loop instruction.
12. Write a program to find cube of a given number using Subroutine.
13. Write a program to find square of a given number using Subroutine.
14. Write a program to find square of a given number using Macro.
15. Write a program to find whether the string is palindrome or not.
16. To convert BCD Number Program
17. Write a program to perform Reverse of the String
18. Write a program to transfer 10-bytes from one memory bank to another memory bank.
19. Program for sorting an array for 8086 microprocessor.
20. To write an assembly language program to arrange the given numbers in descending order.
21. Program for searching for a number/character in a string for 8086 microprocessor.

4KS09 C-Skill-Lab II

Course Prerequisite: Basic knowledge of scripting language, Programming language. Basic understanding of Electronic concepts.

Course Objectives: To develop an ability to design and implement static and dynamic website and to develop embedded systems with the help of Raspberry Pi/Ardino.

Course Outcomes(Expected Outcome): On completion of the course, a student will be able to

1. Develop client server program and web applications
2. Make use of project-based experience for web application development.
3. Create embedded systems using Raspberry Pi/Ardino

List of Experiments:

This is a sample list of Experiments, minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Introduction to PHP and configure it to work with Apache Web Server.
2. Design web pages for your college containing a description of the courses, departments, faculties, library etc, use href, list tags.
3. Create your class timetable using table tag.
4. Create user Student feedback form (use textbox, text area , checkbox, radio button, select box etc.)
5. Create your resume using HTML tags also experiment with colors, text , link , size and also other tags you studied.
6. Design a web page of your home town with an attractive background color, text color, an Image, font etc. (use internal CSS).
7. Develop a JavaScript to display today's date.
8. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
9. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).

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10. Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
11. Write a PHP program to display a digital clock which displays the current time of the server.
12. Write the PHP programs to do the following: a. Implement simple calculator operations. b. Find the transpose of a matrix.
13. Write a PHP program to sort the student records which are stored in the database using selection sort.
14. Study and Install IDE of Arduino and different types of Arduino.
15. Write program using Arduino IDE for Blink LED.
16. Write Program for RGB LED using Arduino.
17. Study the Temperature sensor and write a Program for monitor temperature using Arduino.
18. Study and Implement RFID, NFC using Arduino. • Study and implement MQTT protocol using Arduino.
19. Study and Configure Raspberry Pi.
20. WAP for LED blink using Raspberry Pi.
21. Study and Implement Zigbee Protocol using Arduino / Raspberry Pi.
22. Create Smart Plugs with Arduino and Raspberry Pi.
23. Interfacing digital sensors with raspberry pi.
24. Creating a webpage to control I-O devices, Reading data from sensor and passing to web page.
25. Implement a program to access Analog sensor via wifi with HTML Web server.

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[12] Implement programs to find the shortest path in a given graph using Dijkstra's algorithm.
[13] Implement programs factorial knapsack problem.
[14] Develop a program to implement Strassen's matrix multiplication algorithm.
[15] Implement programs to implement LCS problems using Dynamic Programming.
[16] Develop a program to implement matrix chain multiplication problems using dynamic programming.
[17] Explain Breadth-First Search and Implement BFS to print all the nodes reachable from a given starting node in a digraph.
[18] Develop a program to Print all the nodes reachable from a given starting node in a digraph using Depth First Search.
[19] Study an algorithm Tower of Hanoi where the aim is to move the entire stack to another rod for n=3 and understand the concept of recursion.
[20] Implement C programs N Queen's problem using Back Tracking.

List of Experiments beyond Syllabus: (Maximum 05)

[1] Implement the Work Function Algorithm and the Greedy Algorithm for the k-Server problem on graph metrics.
[2] Design and Implement Boyer Moore Algorithm for Pattern Searching.
[3] Design and Implement Topological Sort of a graph using departure time of vertex.
[4] Implement programs to find an s-t cut of minimum capacity. Minimum Cut Problem s 2 3 4 5 6 7 t 15 5 30 15 10 8 15 9 6 10 15 4 4 A Capacity = 10 + 8 + 10 = 28
[5] Implement programs to s-t flow of maximum value. Maximum Flow Problem 10 9 9 14 4 10 4 8 9 1 0 0 0 14 capacity flow s 2 3 4 5 6 7 t 15 5 30 15 10 8 15 9 6 10 15 4 4 0 Value = 28

Text Books:
[1] Dave and Dave: "Design and Analysis of Algorithms" Pearson Education.

Reference Books:
[1] Aho,Hopcroft & Ullman "The Design & Analysis of Computer Algorithms", Addison-Wesley
[2] G. Brassard, P.Bratley: "Fundamentals of Algorithmics" , PHI
[3] Horowitz & Sahani: " Fundamental Algorithms" , Galgotia.
[4] Cormen, T.H, Lierson & Rivest: " Introduction to Algorithms", Mc Graw-Hill.

6KS07 SOFTWARE ENGINEERING LAB.

Course Prerequisite: A Scripting Language, IDEs (Integrated Development Environment), Databases, Software Development Life Cycle (SDLC)

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Software Engineering by being able to do each of the following:
1. Impart state-of-the-art knowledge on Software Engineering and UML in an interactive manner
2. Present case studies to demonstrate the practical applications of different concepts
3. Provide a scope to the students where they can solve small, real-life problems
4. All the while it is intended to present Software Engineering as an interesting subject to the students where learning and fun can go alongside.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to
1. Understand basic Software engineering methods and practices, and their appropriate application.
2. Describe software process models such as the waterfall and evolutionary models.
3. Discuss role of project management including planning, scheduling and, risk management.
4. Explain data models, object models, context models and behavioral models.
5. Understand of different software architectural styles and Process frame work.

List of experiments: This is the sample list of Experiments; minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

[1] Identifying the Requirements from Problem Statements
Requirements, Characteristics of Requirements, Categorization of Requirements, Functional Requirements, Identifying Functional Requirements
[2] Estimation of Project Metrics
Project Estimation Techniques, COCOMO, Basic COCOMO Model, Intermediate COCOMO Model, Complete COCOMO Model, Advantages of COCOMO, Drawbacks of COCOMO, Halstead's Complexity Metrics
[3] Modeling UML Use Case Diagrams and Capturing Use Case Scenarios
Use case diagrams |,Actor , Use Case , Subject , Graphical Representation , Association between Actors and Use Cases , Use Case Relationships , Include Relationship , Extend Relationship , Generalization Relationship ,Identifying Actors , Identifying Use cases , Guidelines for drawing Use Case diagrams
[4] E-R Modeling from the Problem Statements
Entity Relationship Model , Entity Set and Relationship Set , Attributes of Entity , Keys , Weak Entity , Entity Generalization and Specialization ,Mapping Cardinalities , ER Diagram , Graphical Notations for ER Diagram , Importance of ER modeling
[5] Identifying Domain Classes from the Problem Statements
Domain Class , Traditional Techniques for Identification of Classes ,Grammatical Approach Using Nouns , Advantages , Disadvantages ,Using Generalization ,Using Subclasses , Steps to Identify Domain Classes from Problem Statement , Advanced Concepts

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Unit V: Design & Geographical Indication Hours: 07
Design: meaning and concept of novel and original - Procedure for registration, effect of registration and term of protection. Geographical indication: meaning, and difference between GI and trademarks - Procedure for registration, effect of registration and term of protection.

Unit VI: IPR: Current Contour Hours: 06
India`s New National IP Policy, 2016 – Govt. of India step towards promoting IPR – Govt. Schemes in IPR – Career Opportunities in IP - IPR in current scenario with case studies.

Text Books:
[1] K. V. Nithyananda (2019), "Intellectual Property Rights: Protection and Management", IN: Cengage Learning India Private Limited.
[2] P. Neeraj and D. Khusdeep (2014), "Intellectual Property Rights", PHI learning Private Limited.

Reference Books:
[1] Deborah E. Bouchoux, "Intellectual Property for Paralegals – The law of Trademarks, Copyrights, Patents & Trade secrets", 4th Edition, Cengage learning, 2012.
[2] N. S. Gopalakrishnan and T. G. Agitha, "Principles of Intellectual Property", Eastern Book Company, Lucknow, 2009.
[3] M. M. S. Karki, "Intellectual Property Rights: Basic Concepts", Atlantic Publishers, 2009.
[4] Ganguli Prabuddha, "Intellectual Property Rights--Unleashing the Knowledge Economy", Tata McGrawHill, 2001.
[5] V. K. Ahuja, "Law relating to Intellectual Property Rights". India, IN: Lexis Nexis, 2017.
[6] P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi, 2010.
[7] Ajit Parulekar and Sarita D' Souza, Indian Patents Law – Legal & Business Implications; Macmillan India ltd, 2006.
[8] B. L. Wadehra. Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications; Universal law Publishing Pvt. Ltd., India 2000.
[9] Ganguli Prabuddha, "Gearing up for Patents… The Indian Scenario", Universities Press, 1998.

6KS06 DESIGN AND ANALYSIS OF ALGORITHMS – LAB [P-2, C-1]

Course Prerequisite: Any programming language, Discrete Mathematics and Data Structures

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Design and Analysis of Algorithms by being able to do each of the following:
1. To understand asymptotic analysis of algorithms.
2. To apply algorithmic strategies while solving problems.
3. Ability to analyze time and space complexity.
4. Demonstrate a familiarity with major algorithms.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to
1. Carry out the analysis of various Algorithms for mainly Time complexity.
2. Apply design principles and concepts to algorithm design.
3. Understand different algorithmic design strategies.
4. Analyze the efficiency of algorithms using time complexity.
5. Apply the standard sorting algorithms.

List of Experiments: This is the sample list of Experiments; minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

List of Experiments based on Syllabus: (Maximum 20)

[1] Implement C programs to perform recursive calls using the following searching algorithms.
   1. Linear Search when the list is given.
   2. Binary Search when the given list is not sorted.

[2] Study and analyze to sort an array of integers using merge sort.
[3] Implement and analyze to sort an array of integers using quicksort.
[4] Write a program to implement the Closest Pair of Points problem using the divide and conquer strategy.
[5] Study and Implement the Divide and Conquer strategy using the Merge sort Algorithm and determine the complexity of an algorithm. DATA- {23, 12, 3, 5, 89, 1, 24}
[6] Write a C program for Implementing (n X n) matrix multiplication using the Strassen matrix multiplication algorithm.
[7] Explain the knapsack algorithm to find an optimal solution of getting maximum profit and implement using the program.
[8] Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm and implement using C.
[9] Implement programs to find minimum cost spanning trees from a given graph using Prim's algorithm.
[10]Implement Prim's algorithm to find the Minimum Cost Spanning Tree of an undirected graph using the program.
[11] Develop a program to implement Floyd's algorithm which will produce the shortest distance between all vertex pairs of a weighted graph.

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Unit VI: Hours:7
Human Rights Perspectives Cyber Crimes: Introduction, Ideological Aspects, Fundamental Rights and Civil Liberties, Various Issues and Challenges. Cyber Crimes : Precaution and Prevention: Introduction, Awareness and Law Reforms, Improving Criminal Justice Administration, Increasing International Cooperation, Curricular Endeavours and Checking Kids' Net Addiction, Role of Guardians, Mobile Pornography: No Nearer Solution in Sight, Self-regulation in Cyber Space.

Text Book:

[1] Dr Pramod Kr.Singh, "Laws on Cyber Crimes [Along with IT Act and Relevant Rules]" Book Enclave Jaipur India.

Reference Books:

[1] Craig B, "Cyber Law: The Law of the Internet and Information Technology". Pearson Education.
[2] Pawan Duggal, "Cyber Laws" Universal Law Publishing.
[3] K.Kumar," Cyber Laws: Intellectual property & E Commerce, Security", First Edition, Dominant Publisher, 2011.
[4] Rodney D. Ryder, "Guide to Cyber Laws", Second Edition, Wadhwa And Company, New Delhi, 2007.
[5] Vakul Sharma, "Handbook of Cyber Laws" Macmillan India Ltd, Second Edition, PHI, 2003.
[6] Justice Yatindra Singh, "Cyber Laws", Universal Law Publishing, First Edition, New Delhi, 2003.
[7] Sharma, S.R., "Dimensions of Cyber Crime", Annual Publications Pvt. Ltd., First Edition, 2004.
[8] Augastine, Paul T., "Cyber Crimes and Legal Issues", Crecent Publishing Corporation, 2007.

6KS05 INTELLECTUAL PROPERTY RIGHTS [L-3,T-0,C-3]

Course Prerequisite: Basic knowledge of Communication skills, Soft skills, Presentation and Ethics.

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Intellectual Property Rights in the following:
1. This course is intended to impart awareness on Intellectual Property Rights (IPR) and various regulatory issues related to IPR
2. To make familiarizing students with the shades of Intellectual Property Rights (IPR) so as to help them integrate the IPR process in their project and research activities.
3. To make the students familiar with basics of IPR and their implications in Project research, development and commercialization.
4. To impart awareness on intellectual property rights and various regulatory issues related to IPR.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to
1. Demonstrate a breadth of knowledge in Intellectual property.
2. Assess fundamental aspects of Intellectual Property Rights.
3. Discuss Patents, Searching, filling and drafting of Patents
4. Discuss the basic principles of geographical indication, industrial designs, and copyright.
5. Explain of Trade Mark and Trade Secret.
6. Investigate current trends in IPR and Government initiatives in fostering IPR.

Unit I: Overview of Intellectual Property Rights Hours: 06
Discovery, Invention, Creativity, Innovation, History & Significance of Intellectual Property Rights (IPR), Overview of IPR - Patent, Copyright, Trade Mark, Trade Secret, Geographical Indication, Industrial Design & Integrated Circuit, Non-patentable criteria.

Unit II: Patents Hours: 08
Patents: Patents- Patentability Criteria, Types of Patents-Process, Product & Utility Models, Software Patenting and protection, Overview of Patent Search-Types of Searching, Public & Private Searching Databases, Basics of Patent Filing & Drafting, Indian Patents Law Patents - Elements of Patentability: Novelty, Non Obviousness (Inventive Steps), Industrial Application - Non - Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentee, Assignment and license , Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties - Patent office and Appellate Board.

Unit III: Copyrights Hours: 06
Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artistic works; cinematograph films and sound recordings - Registration Procedure, Term of protection, Ownership of copyright, Assignment and licence of copyright - Infringement, Remedies & Penalties – Related Rights - Distinction between related rights and copyrights.

Unit IV: Trademarks Hours: 07
Concept of Trademarks - Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) - Non Registrable Trademarks - Registration of Trademarks - Rights of holder and assignment and licensing of marks - Infringement, Remedies & Penalties - Trademarks registry and appellate board.

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Unit VI: Gene Detection and Genome Annotation Hours:6
Detection of Functional RNA Molecules using Decision Trees, Algorithms for Gene Detection in Prokaryotes, Features used in Eukaryotic Gene Detection, Predicting Eukaryotic Gene Signals, Predicting Exon/Intron Structure, Beyond the Prediction of Individual Genes.

Text Books:

[1] Understanding Bioinformatics , Marketa Zvelbil and Jeremy O. Baum, Garland Sceincem Taylor & Francis Group, LLC
[2] Bioinformatics: Principles and Applications, Bal, H. P. (2005), Tata McGraw-Hill.

Reference Books:

[1] Bioinformatics Algorithms – Design and Implementation in Python, Miguel Rocha & Pedro Ferreira, Academic Press, Elsevier Inc.
[2] Bioinformatics Algorithms: An Active Learning Approach, Edition 2, Volume 1. Phillip Compeau & Pavel Pevzner.
[3] Bioinformatics computing, Bergeron, B. P. (2003), Prentice Hall Professional.
[4] Bioinformatics Technologies, Chen, Y. P. P. (Ed.). (2005). Springer.
[5] Bioinformatics for dummies, Claverie, J. M., & Notredame, C. (2011), John Wiley & Sons.
[6] Fundamental Concepts of Bioinformatics, Dan. E. Krane, & Raymer, M. L. (2003), Pearson Education International.

6KSO5 CYBER LAWS & ETHICS [L-3,T-0,C-3]

Course Prerequisite: Basic Knowledge of Internet

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Cyber Laws & Ethics by being able to do each of the following:
1. Understand Cyber Space, Cyber Crime, Cyber Laws, Information Technology, Internet, Internet Services
2. Know Legal Aspects of Regulation concerned with Cyber Space, Technology and Forms of Cyber Crimes
3. Understand Computer Crimes and Cyber Crimes, Cyber Crime in Global and Indian Response.
4. Understand Criminal Liability, Cyber Crime implications and challenges.
5. Learn Precaution & Prevention of Cyber Crimes, Human Rights perspective of Cyber Crime

Course Outcomes (Expected Outcome): On completion of this course, the students should be able to:
1. Understand Cyber Space, Cyber Crime, Information Technology, Internet & Services.
2. List and discuss various forms of Cyber Crimes
3. Explain Computer and Cyber Crimes
4. Understand Cyber Crime at Global and Indian Perspective.
5. Describe the ways of precaution and prevention of Cyber Crime as well as Human Rights.

Unit I: Hours:6
Information Technology & Cyber Crimes: Introduction, Glimpses, Definition and Scope, Nature and Extent, Know no Boundaries, Rapid Transmission and Accuracy, Diversity and Span of Victimization, Cyber World, Inadequacy of Law, Influence of Teenagers Information Technology: Definition & Perspective, Growth & Future, Various Facets & Dimensions. Regulatory Perspective on Technology: Impact of Information and Technology, Regulation of Cyber Space, Legal Aspects of Regulation.

Unit II: Hours:6
Technology & Forms of Cyber Crimes: Influence of Technology on Criminality, Forms of Cyber Crimes.
Computer Crimes & Cyber Crimes: A Criminological Analysis Computer Crimes and Cyber Crimes: Terminological Aspects, Opportunities to Cyber Criminals, Motives of Offenders, Problems Affecting Prosecution, Cyber Crimes: Challenges of Prevention and Control, Need and Prospects (~f Criminological Research.

Unit III: Hours:6
Cyber Crimes 'and Global Response: Global Perspective, Country wise Legal Response, Country wise Analysis. Cyber Crimes and Indian Response: Introduction, The Indian Information Technology Act 2000,
Preamble & Coverage, Nature of Offences and Penalties, Miscellaneous and Subsidiary Provisions Certain Shortcomings, Future Prospects and Needs.

Unit IV: Hours:6
Mens Rea & Criminal Liability: Introduction, Historical Perspectives, Mens Rea in Indian Criminal Law, Mens Rea in English Criminal Law, Abetment of Offence, Criminal Liability and Role of Mens Rea in Indian Information Technology Act, 2000 Investigation in Cyber Crimes: Implications and Challenges: : Introduction, Procedural Aspects, Issues, Complications and Challenges Concerning Cyber Crimes, Problems and Precautionary measures for Investigation.

Unit V: Hours:7
Cyber Crimes : Discovery and Appreciation of Evidences: Introduction, Law of Evidence, Evidences in Cyber Crimes : Challenges and Implications, Computer Generated Evidence and their Admissibility, Judicial Interpretation of Computer related Evidence Prevention of Cyber Crimes :National and International Endeavours: Introduction, International Services on Discovery and Recovery of Electronic and Internet Evidence, International Organisation on Computer Evidence (IOCE), OECD Initiatives, Efforts of G-7 and G-8 Groups, Endeavours of Council of Europe, Measures of United Nations, Efforts of WTO, Measures of World Intellectual Property Organisation (WIPO),Interpol and its Measures, Efforts in India, Need of International Assistance and Appropriate Amendments.

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Unit IV: Hours:6
Digital Certificates and Public Key Infrastructure (PKI): Introduction, Digital Certificates, Private Key Management, The PKIX Model, Public Key Cryptography Standards (PKCS), XML,PKI and Security, Creating Digital Certificate.

Unit V: Hours:6
Internet Security Protocols: Introduction, Concepts, Secure Socket Layer(SSL), Transport Layer Security(TLS), Secure Hypertext Transport Protocol(SHTTP), Time Stamping Protocol(TSP), Secure Electronic Transaction(SET), SSL Versus SET, 3-D Secure Protocol, Electronic Money, Email Security, Wireless Application Protocol(WAP)Security, Security in GSM, Security in 3G.

Unit VI: Hours:6
User Authentication and Kerberos: Introduction, Authentication Basics, Passwords, Authentication Tokens, Certificate-based-Authentication, Biometric Authentication, Kerberos, Key Distribution Center(KDC), Security Handshake Pitfalls, Single Sign On (SSO) Approaches.

Text Book:
[1] Atul Kahate, " Cryptography and Network Security", McGraw Hill, Second Edition.

Reference Books:
[1] William Stallings, "Cryptography and Network Security, Principles and Practice", PHI Fourth Edition.
[2] Behrouz A. Forouzan and Debdeep Mukhopadhyay, "Cryptography and Network Security", McGraw Hill, Second Edition.
[3] Matt Bishop, "Computer Security Arts and Science", Pearson Education.
[4] Douglas R Stinson, "Cryptography, Theory and Practice" CRC Press.
[5] Keith M Martin, "Everyday Cryptography, Fundamental Principles and Applications", Oxford University Press, Second Edition.

6KSO5 COMPUTATIONAL BIOLOGY [L-3, T-0, C-3]

Course Pre-requisite:

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Computational Biology by being able to do each of the following:
1. To familiarize the students with most basic and useful algorithms for sequence analysis
2. To aware the students with basic file formats
3. To transform the basic molecular data for interpreting their patterns for various analysis
4. To compare genomes of different species, gene finding, and gene regulation

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to
1. Understand what types of biological questions can be investigated using computers, and what limitations computational methods impose on the understanding of biology.
2. Describe the properties of DNA, RNA, and proteins, the relationships among these molecules.
3. Analyze how to convert a biological question into a computational problem that can be solved using computers.
4. Explain general approaches for solving computational problems, and will be able to apply these approaches to new problems you encounter.
5. Understand how implement the algorithms by writing computer programs.

Unit I: Cellular and Molecular Biology Fundamentals Hours: 6
The structure of DNA & RNA, Gene Structure and control, Tree of Life and evolution, Primary & Secondary Structure of Protein, Implications for Bioinformatics Protein fold to form compact structures. Dealing with Databases: Structure of databases, Types of databases, Data Quality.

Unit II: Sequence Alignments Hours: 6
Principles of sequence alignments, scoring alignments, substitution matrices, Inserting gaps, Types of Alignments, Searching Databases, Searching with Nucleic Acid or protein sequences, Protein Sequences Motifs or Patterns, Searching using Motifs and patterns, Patterns & protein function.

Unit III: Pairwise Sequence Alignments & Database Searching Hours:6
Substitution Matrices and scoring, Dynamic Programming Algorithms, Indexing Techniques & Algorithmic approximations, Alignments score significance, aligning complete genome sequences

Unit IV: Patterns Profiles and Multiple Alignments Hours:6
Profile & sequence logos, Profile Hidden Markov Models, Aligning Profiles, Multiple Sequence Alignment by Gradual Sequence Addition, Sequence Pattern Discovery.

Unit V: Revealing Genome Features Hours:6
Preliminary examination of Genome Sequence, Gene Predictions, Splice site Detection, Prediction of Promoter Regions, Confirming Predictions, Genome Annotation, Large Genome Comparisons.

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Unit I: Hours: 7
Introduction: Sensors and Actuators, Technologies related to Sensors: Data Logger, Metal Detector, Photoelectric Sensor, Global Positioning System, Wireless Sensor Network, Sonar, Echo Sounding, Level Sensor, Biosensor, Blood Glucose Monitoring, Load Cell

Unit II: Hours: 7
Application of Sensors: On-board Automobile Sensors, Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing, Medical Diagnostic Sensors, Sensors for Environmental Monitoring

Unit III: Hours: 7
Varied Types of Actuators: Pneumatic Actuator, Hydraulic Cylinder, Linear Actuator, Plasma Actuator, Rotary Actuator

Unit IV: Hours: 7
Actuators: Technologies and Devices- Pneumatic Motor, Pneumatic Cylinder, Hydraulic Press, Jackscrew, Hoist (Device), Electroactive Polymers, Roller Screw, MEMS Magnetic Actuator.

Unit V: Hours: 7
Remote Sensing: An Overview- Water Remote Sensing, Remote Sensing, Lidar, ERDAS Imagine, TerrSet, Remote Sensing (Archaeology)

Unit VI: Hours: 7
Rader and its application: Radar, Radar Imaging, Radar Navigation

Text Books:
[1] Princeton Brown, "Sensors and Actuators: Technology and Applications", Library Press, 2017.
[2] D. Patranabis, "SENSORS AND TRANSDUCERS", Second Edition, PHI Learning Private Limited, 2003.

Reference Books:
[1] D.A. Hall and C.E.Millar, "Sensors and Actuators", CRC Press, 1999.
[2] Nathan Ida, "Sensors, Actuators, and their Interfaces: A multidisciplinary introduction (Materials, Circuits and Devices)", Large Print, 2011.

6KSO4 CRYPTOGRAPHY [L-3,T-0,C-3]

Course Prerequisite: Discrete Structure & Graph Theory, Data Communication and Networking, Introduction to Cyber security

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Cryptography by being able to do each of the following:
1. Understand Security Concepts.
2. Know about various encryption techniques.
3. Understand the concept of public key cryptography.
4. Study about message authentication and hash functions.
5. Impart knowledge on Network security, Internet Security Protocols.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to
1. Classify the symmetric encryption techniques
2. Illustrate various public key cryptographic techniques
3. Evaluate the authentication and hash algorithms.
4. Discuss authentication applications
5. Summarize the intrusion detection and its solutions to overcome the attacks.
6. Understand basic concepts of system level security

Unit I: Hours: 6
Attacks on Computers and Computer Security: Introduction, Need for Security, Security Approaches, Principles of Security, Types of Attacks. Cryptography: Concepts and Techniques Introduction, Plain Text and Cipher Text, Substitution and Transposition Techniques, Encryption and Decryption, Symmetric and Asymmetric Key Cryptography, Stenography, Key Range and Key Size, Possible Types of Attacks

Unit II: Hours: 6
Symmetric Key Algorithms and AES: Introduction, Algorithm Types and Modes, An Overview of Symmetric Key Cryptography, Data Encryption Standard(DES), International Data Encryption Algorithm(IDEA), RC4, RC5, Blowfish, Advanced Encryption Standard(AES).

Unit III: Hours:6
Asymmetric Key Algorithms, Digital Signatures and RSA: Introduction, History and Overview of Asymmetric Key Cryptography, The RSA Algorithm, Symmetric and Asymmetric Cryptography, Digital Signatures, Knapsack and

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Unit I: Big Data Analytics and Lifecycle Hours: 6
Big Data Analytics: Big Data Overview, State of the Practice in Analytics, Key Roles for the New Big Data Ecosystem, Examples of Big Data Analytics, Data Analytics Lifecycle: Overview, Phase 1: Discovery, Phase 2: Data Preparation, Phase 3: Model Planning, Phase 4: Model Building, Phase 5: Communicate Results, Phase 6: Operationalize, Case Study: Global Innovation Network and Analysis (GINA).

Unit II: Review of Basic Data Analytics Methods, Clustering and Association Rules Hours: 7
Exploratory Data Analysis, Statistical Methods for Evaluation: Hypothesis Testing, Difference of Means, Wilcoxon Rank-Sum Test, Type I and II Errors, ANOVA, Overview of Clustering, K-means: Use Cases, Overview, Number of Clusters, Diagnostics, Additional Algorithms, Overview, Apriori Algorithm, Evaluation of Candidate Rules, Applications of Association Rules, An Example: Transactions in a Grocery Store, The Groceries Dataset, Frequent Itemset Generation, Rule Generation and Visualization, Validation and Testing, Diagnostics.

Unit III: Regression and Classification Hours: 7
Linear Regression: Use Cases, Model Description, Diagnostics, Logistic Regression: Use Cases, Model Description, Diagnostics, Reasons to Choose and Cautions, Additional Regression Models, Decision Trees: Overview of a Decision Tree, The General Algorithm, Decision Tree Algorithms, Evaluating a Decision Tree, Decision Trees, Naïve Bayes: Bayes' Theorem, Naïve Bayes Classifier, Smoothing, Diagnostics, Naïve Bayes, Diagnostics of Classifiers, Additional Classification Methods.

Unit IV: Time Series Analysis and Text Analysis Hours: 6
Overview of Time Series Analysis: Box-Jenkins Methodology, ARIMA Model: Autocorrelation Function (ACF), Autoregressive Models, Moving Average Models, ARMA and ARIMA Models, Building and Evaluating an ARIMA Model, Reasons to Choose and Cautions, Additional Methods, Text Analysis Steps, A Text Analysis Example, Collecting Raw Text, Representing Text, Term Frequency—Inverse Document Frequency (TFIDF), Categorizing Documents by Topics, Determining Sentiments, Gaining Insights.

Unit V: Tool and Techniques: MapReduce & Hadoop Hours: 7
Big Data Tool and Techniques: Big Data Storage, High-Performance Architecture, HDFS, MapReduce and YARN, Big Data Application Ecosystem, Zookeeper, HBase, Hive, Pig, Mahout, Developing Big Data Applications: Parallelism, Myth, Application Development Framework, MapReduce Programming Model, Simple Example, More on MapReduce, Other Frameworks, The Execution Model, Analytics for Unstructured Data: Use Cases, MapReduce, Apache Hadoop, The Hadoop Ecosystem: Pig, Hive, HBase, Mahout, NoSQL.

Unit VI: Database Analytics, NoSQL and Graph Analytics Hours: 7
SQL Essentials, In-Database Text Analysis, Advanced SQL, NoSQL Data Management: What is NoSQL, Schema-less Models, Key-Value Stores, Document Stores, Tabular Stores, Object Data Stores, Graph Database, Communicating and Operationalizing an Analytics Project, Creating the Final Deliverables, Graph Analytics: Model, Triples, Graphs and Network Organization, Graph Analytics and Use Cases, Graph Analysis Algorithms, Technical Complexity, Features of Graph Analytic Platform, Data Visualization Basics.

Text Books:
[1] EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", 2015, John Wiley & Sons, Inc., ISBN: 978-1-118-87613-8.
[2] David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", First Edition, 2013, Morgan Kaufmann/Elsevier Publishers, ISBN: 978-0-12-417319-4.

Reference Books:
[1] Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", First Edition, 2014, Wiley Publishers, ISBN: 978-1-118-89271-8.
[2] Mohammad Guller, "Big Data Analytics with Spark A Practitioner's Guide to Using Spark for Large-Scale Data Processing, Machine Learning, and Graph Analytics, and High-Velocity Data Stream Processing", First Edition, 2015, Apress Publisher, ISBN-13 (pbk): 978-1-4842-0965-3.
[3] Arshdeep Bahga & Vijay Madisetti, "Big Data Science & Analytics: A Hands-On Approach", First Edition, 2019, ISBN: 978-1-949978-00-1.

6KS04 SENSORS AND ACTUATORS [L-3, T-0, C-3]

Course Prerequisite: Internet of Things, Micro-technology

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Sensors and Actuators by being able to do each of the following:
1. To understand the fundamentals of sensors and actuators
2. An exposure to sensors and its importance in the real world
3. To understand functional safety in machinery and emergency stop applications

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to
1. Fabricate some of those sensors
2. Simulate sensors and characterize before fabricating it
3. Design application with sensors and actuators for real world

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Course Outcomes (Expected Outcome): On completion of the course, student will be able to–
1. Understand how to tag a given text with basic Language features
2. Design an innovative application using NLP components
3. Implement a rule-based system to tackle morphology/syntax of a language
4. Design a tag set to be used for statistical processing for real-time applications
5. Compare and contrast the use of different statistical approaches for different types of NLP applications.

Unit I: Overview and Morphology Hours: 6
Introduction, Models and Algorithms, Regular Expressions Basic Regular Expression Patterns, Finite State Automata, Morphology, Inflectional Morphology, Derivational Morphology, Finite-State Morphological Parsing

Unit II: Word Level Analysis Hours: 6
Role of language models. Simple N-gram models. Estimating parameters and smoothing. Evaluating language models. Part Of Speech Tagging and Sequence Labeling Lexical syntax. Hidden Markov Models. Maximum Entropy models.

Unit III: Syntactic Analysis Hours: 6
Context-Free Grammars, Grammar rules for English, Treebanks, and Normal Forms for grammar, Dependency Grammar, Syntactic Parsing, Ambiguity, Probabilistic CFG, and Probabilistic Lexicalized CFGs.

Unit IV: Semantic Analysis Hours: 6
Representing Meaning, Meaning Structure of Languages, First Order Predicate Calculus, Syntax-Driven Semantic Analysis, Semantic Attachments, Syntax-Driven Analyzer, Robust Analysis, Relations among Lexemes and their Senses, Word Sense Disambiguation

Unit V: Learning to Classify Text: Hours: 6
Supervised classification, further examples of supervised classification, Evaluation, Decision Trees, Naïve Bayes classifiers, Modelling Linguistic Patterns.

Unit VI: Extraction Information from Text: Hours: 6
Information Extraction, Chunking, Developing and Evaluating Chunks, Recursion in Linguistic Structure, Named Entity Recognition, Relation Extraction.

Text Books:
[1] Daniel Jurafsky, James H. Martin - Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
[2] Steven Bird, Ewan Klein and Edward Loper - Natural Language Processing with Python, First Edition, OReilly Media, 2009.
[3] Christopher D.Manning and Hinrich Schuetze - Foundations of Statistical Natural Language Processing, MIT press, 1999.

Reference Books:
[1] Breck Baldwin, Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
[2] Richard M Reese, Natural Language Processing with Java, OReilly Media, 2015.
[3] Nitin Indurkhya and Fred J. Damerau, Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
[4] Roland R.Hausser - Foundations of Computational Linguistics: Human Computer Communication in Natural Language, Paperback, MIT press,2011
[5] Tanveer Siddiqui, U.S. Tiwary, Natural Language Processing and Information Retrieval, Oxford University Press, 2008
[6] Daniel Jurafsky and James H. Martin - Speech and Language Processing, 2nd
[7] Edition , Prentice Hall,2008.
[8] Charu C.Aggarwal - Machine Learning for Text, Springer,2018 edition

6KS04 BIG DATA ANALYTICS [L-3, T-0, C-3]

Course Prerequisite: Knowledge of basic computer science principles and skills, Basic knowledge of Linear Algebra and Probability Theory, Basic knowledge of Data Base Management Systems

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Big Data Analytics by being able to do each of the following:
1. To know the fundamental concepts of big data and analytics.
2. To explore tools and practices for working with big data.
3. To know about the research that requires the integration of large amounts of data.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to
1. Work with big data tools and its analysis techniques.
2. Analyze data by utilizing clustering and classification algorithms.
3. Learn and apply different algorithms and recommendation systems for large volumes of data.

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6KS03 SOFTWARE ENGINEERING [L-3, T-0, C-3]

Course Prerequisite: Fundamentals of Programming Languages.

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Software Engineering by being able to do each of the following:
1. To learn and understand the principles of Software Engineering
2. To be acquainted with methods of capturing, specifying, visualizing and analyzing software requirements.
3. To apply Design and Testing principles to S/W project development.
4. To understand project management through life cycle of the project.
5. To understand software quality attributes.
6. To understand of the role of project management including planning, scheduling, risk management.

Course Outcomes (Expected Outcome): On completion of the course, student will be able to–
1. Decide on a process model for a developing a software project
2. Classify software applications and identify unique features of various domains
3. Design test cases of a software system.
4. Understand basics of Project management.
5. Plan, schedule and execute a project considering the risk management.
6. Apply quality attributes in software development life cycle.
7. Understand quality control and to ensure good quality software.

Unit I: Introduction to Software Engineering, Software Process Models Hours: 6
Evolving role of Software, Software crises & myths, Software engineering, Software process & process models, Linear sequential, prototyping ,RAD ,Evolutionary Product & Process, Project management concepts, People, Product, Process, Project W5HH principles, critical practice

Unit II: Project Management: Process, Metrics, And Estimations & Risks Hours:6
Measures, Metrics & Indicators. Metrics in process & project domains-software measurement, Metrics for software quality, small organization. Software projects Planning: Scope, resources, estimation, decomposition technique, Tools. Software risks: identification, risk projection, refinement & RMMM plan

Unit III: Project Scheduling & Quality Management Hours: 6
Project Scheduling: Concepts. Peoples Efforts. Task set, Task network. Scheduling. EV analysis, Project Plan. Software quality concepts. SQ Assurance, Software reviews, technical reviews, software reliability, ISO 900 L, SQA Plan. SCM process. Version control. SCM standard.

Unit IV: Requirement Engineering & System Engineering Hours:6
System engineering: Hierarchy, Business Process & Product engineering: Overviews. Requirement engineering, System modeling. Requirement analysis. Analysis principles. Software prototyping. Specification. Design Process. Design Principles & Concepts. Effective modular design. Design model & documentation.

Unit V: Software architecture & User interface design Hours: 6
Software architecture, Data Design, Architectural styles, Requirement mapping. Transform & Transaction mappings. User interface design: Golden Rule. UTD, Task analysis & modeling, ID activities, Tools, design evaluation. Component level design: Structure programming, Comparison of design notation.

Unit VI: Software Testing Hours: 6
Software testing fundamentals; test case design, White box testing. Basis path, control structure-, Black box-Testing, & for specialized environments. Strategic approach to S/W testing. Unit testing, integration testing, validation testing, and system testing. Debugging. Technical metrics for software.

Text Book: Pressman Roger. S: Software Engineering, A Practitioner's Approach, TMH.

Reference Books:
[1] Somerville: Software Engineering (Addison-Wesley) (5/e)
[2] Fairly R: Software Engineering (McGraw Hill)
[3] Davis A: Principles of Software Development (McGraw Hill)
[4] Shooman, M.L: Software Engineering (McGraw-Hill)

6KS04 NATURAL LANGUAGE PROCESSING [L-3, T-0, C-3]

Course Prerequisite: Fundamentals of Artificial Intelligence.

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Natural Language Processing by being able to do each of the following:
1. To learn the fundamentals of natural language processing
2. To understand the use of CFG and PCFG in NLP
3. To understand the role of semantics of sentences and pragmatics
4. To gain knowledge in Information Extraction.

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Unit IV: Hours:6
Information Security Policy: Policy, Enterprise Information Security Policy, Issue-Specific Security Policy, System-Specific Security Policy, Guidelines for Effective Policy Development and Implementation.
Unit V: Hours:6
Risk Management: Assessing Risk: Introduction to the Management of Risk in Information Security, The Risk Management Process.
Unit VI: Hours:6
Risk Management: Treating Risk: Introduction to Risk Treatment, Managing Risk, Alternative Risk Management Methodologies.
Text Book: Michael E. Whitman, Herbert J. Mofford, "Management of Information Security" Sixth Edition, Cengage Learning, 2016.

Reference Books:
[1] Robert F Smallwood, "Information Governance for Business Documents and Records" Wiley 2014
[2] Michael E. Whitman and Herbert J. Mofford, "Principles of Information Security" Sixth Edition, Cengage Learning, 2018
[3] Krag Brotby, "Information Security Governance: A Practical Development and Implementation Approach" 2009 by John Wiley & Sons.
[4] Brijendra Singh, "Network Security and Management" Second Edition, PHI.
[5] Alan Calder and Steve Watkins, "IT Governance an international guide to data security and ISO27001/ISO27002" 2015, Kogan Page Limited.
[6] Evan Wheeler, "Security Risk Management, Building an Information Security Risk Management Program from the Ground Up" 2011, Syngress publications.
[7] Mike Chapple, James Michael Stewart and Darril Gibson, "CISSP® Certified Information Systems Security Professional Official Study Guide" Eighth Edition, 2018, John Wiley & Sons.

6KS02 DESIGN AND ANALYSIS OF ALGORITHMS [L-4, T-0, C-4]

Course Prerequisite: Any programming language, Discrete Mathematics and Data Structures.

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Design and Analysis of Algorithms by being able to do each of the following:
1. To understand asymptotic analysis of algorithms.
2. To apply algorithmic strategies while solving problems.
3. Ability to analyze time and space complexity.
4. Demonstrate a familiarity with major algorithms.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to
1. Carry out the analysis of various Algorithms for mainly Time complexity.
2. Apply design principles and concepts to algorithm design.
3. Understand different algorithmic design strategies.
4. Analyze the efficiency of algorithms using time complexity.
5. Apply the standard sorting algorithms.

Unit I: Iterative Algorithm Design Issue: Hours: 8
Introduction, Use of Loops, Efficiency of Algorithms, Estimating & Specifying Execution Times, Order Notations, Algorithm Strategies, Design using Recursion
Unit II: Divide And Conquer Hours: 8
Introduction, Multiplication Algorithm and its analysis, Introduction to Triangulation, Covex Hulls, Drawbacks of D & C & Timing Analysis.
Unit III: Greedy Methods Hours: 8
Introduction, Knapsack Problem, Job sequencing with deadlines, Minimum Spanning Trees, Prim's Algorithms, Kruskal's Algorithm, Dijkstras Shortest Path Algorithm.
Unit IV: Dynamic Programming Hours: 8
Introduction, Multistage Graphs, Traveling Salesman, Matrix multiplication, Longest Common Sub-Sequences, Optimal Polygon Triangulation, Single Source Shortest Paths.
Unit V: Backtracking Hours: 8
Combinational Search, Search & Traversal, Backtracking Strategy, Backtracking Framework, and Some typical State Spaces.
Unit VI: Efficiency of Algorithm Hours: 8
Polynomial Time & Non Polynomial Time Algorithms, Worst and Average case Behavior, Time Analysis of Algorithm, Efficiency of Recursion, Complexity, Examples of Complexity Calculation for Various Sorting algorithms. Time-Space Trade off and Time-Space Trade off in algorithm research.

Text Book: Dave and Dave: "Design and Analysis of Algorithms" Pearson Education.

Reference Books:
[1] Aho,Hopcroft & Ullman "The Design & Analysis of Computer Algorithms", Addison-Wesley
[2] G. Brassard, P.Bratley: "Fundamentals of Algorithmics" , PHI
[3] Horowitz & Sahani: " Fundamental Algorithms" , Galgotia.
[4] Cormen, T.H, Lierson & Rivest: " Introduction to Algorithms", Mc Graw-Hill.

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Decision Trees
[26] To learn and perform Fitting Classification Trees
[27] To learn and perform Fitting Regression Trees
[28] To learn and implement Bagging and Random Forests
[29] To learn and perform Boosting
Support Vector Machines
[30] To learn and perform Support Vector Classifier
[31] To learn and perform Support Vector Machine
[32] To learn and perform ROC Curves
[33] To learn and perform SVM with Multiple Classes
[34] To use Gene Expression Data
Clustering
[35] To implement K-Means Clustering
[36] To implement Hierarchical Clustering
NCI60 Data Example
[37] To implement PCA on the NCI60 Data
To Cluster the Observations of the NCI60 Data

List of Experiments beyond Syllabus: (Maximum 05)

1. To implement the Association Rules
2. To implement the kernel method to increase data separation
3. Develop a data model and deploy it as R HTTP Services or by export
4. Develop a data model and present it to end user with proper presentations
5. Carry out your assigned task and present it to other data scientist with proper presentations

Text Books:
1. Cathy O'Neil and Rachel Schutt: Doing Data Science, First Edition, 2014, O'reilly Publications, ISBN: 978-1-449-35865-5
2. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani: An Introduction to Statistical Learning with Applications in R, First Edition, 2013, Springer-Verlag New York, ISBN: 978-1- 4614-7137-0

Reference Book:
Nina Zumel, John Mount: Practical Data Science with R, First Edition, 2014, Manning Publications Co., ISBN: 9781617291562.

B.E. (COMPUTER SCIENCE & ENGINEERING) SEM. VI

6KS01 SECURITY POLICY & GOVERNANCE [L-3, T-0, C-3]

Course Prerequisite: Data Communication and Networking,

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Security Policy & Governance by being able to do each of the following:
1. Understand the legal and regulatory environment and its relationship to Information Security.
2. Understand Information Security Concepts.
3. Understand the role of Information Security governance and planning within the organizational context.
4. Understand how to develop, implement and maintain various types of Information Security policies.
5. Understand risk management and its role in the organization.
6. Understand how to identify risk control classification categories

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to
1. List and discuss the key characteristics of Information Security, Leadership and Management
2. Differentiate between Law and Ethics
3. Describe why ethical codes of conduct are important to Information Security
4. Discuss the importance, benefits and desired outcomes of Information Security Governance
5. Discuss the process of developing, implementing and maintaining various types of Information Security Policies.
6. Define Risk Management and its role in the organization.

Unit I: Hours:6
Introduction to the Management of Information Security: Introduction to Security, Key Concepts of Information Security: Threats and Attacks, Management and Leadership, Principles of Information Security Management.
Unit II: Hours:6
Compliance: Law and Ethics: Introduction to Law and Ethics, Ethics in information Security, Professional Organizations and Their Codes of Conduct, Information Security and Law Organizational Liability and the

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5KS08 EMERGING TECHNOLOGY LAB I

5KS08 Emerging Technology Lab 1 is based on 5KS04 Professional Elective-I. Tentative FOSS Tools & Technology for Practical's are as follows:

AI : IBM Watson, Microsoft Cognitive Toolkit , TensorFlow, Apache SystemML, Caffe, OpenNN, Torch, Neuroph
DS :R, Python, Cassandra, Apache Hadoop,
IoT : Arduino, DeviceHive, Kaa, Home Assistant
Cyber Security: Kali Linux, OpenVPN, NMAP, Metasploit Framework

5KS08 DATA SCIENCE AND STATISTICS – LAB [P-2, C-1]

Course Prerequisite: Basic knowledge of Mathematics.

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Data Science and Statistics by being able to do each of the following:

- Demonstrate knowledge of statistical data analysis techniques utilized in business decision making.
- Apply principles of Data Science to the analysis of business problems.
- Apply the learned concepts for the skillful data management.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to

1. Demonstrate proficiency with statistical analysis of data.
2. Build skills in transformation and merging of data for use in analytic tools.
3. Perform linear and multiple linear regression analysis.
4. Develop the ability to build and assess data-based models.
5. Evaluate outcomes and make decisions based on data.

List of Experiments: This is the sample list of Experiments; minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

List of Experiments based on Syllabus:

Introduction to R:
[1] To learn and implement the Basic Commands and Graphics in R
[2] To perform Indexing and Loading Data

Linear Regression:
[3] To learn different Libraries in R and To perform Simple Linear Regression and Multiple Linear Regression
[4] To learn Interaction Terms and to perform Non-linear Transformations of the Predictors
[5] To learn and evaluate Qualitative Predictors
[6] To learn to Write Functions

Logistic Regression, LDA, QDA, and KNN
[7] To perform Logistic Regression
[8] To perform Linear Discriminant Analysis
[9] To perform Quadratic Discriminant Analysis
[10] To implement K-Nearest Neighbors technique
[11] To use Caravan Insurance Data for LR, LDA, QDA, and KNN
Cross-Validation and the Bootstrap
[12] To learn and perform The Validation Set Approach
[13] To learn and perform Leave-One-Out Cross-Validation
[14] To learn and perform k-Fold Cross-Validation
[15] To learn and perform The Bootstrap
Subset Selection Methods
[16] To learn and perform Best Subset Selection
[17] To learn and perform Forward and Backward Stepwise Selection
[18] To learn to Choose Among Models Using the Validation Set Approach and Cross-Validation
Ridge Regression and the Lasso
[19] To learn and perform Ridge Regression
[20] To learn and perform The Lasso

PCR and PLS Regression
[21] To learn and perform Principal Components Regression
[22] To learn and perform Partial Least Squares

Non-linear Modeling
[23] To learn and perform Polynomial Regression and Step Functions
[24] To learn and perform Splines
[25] To learn and perform GAMs

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Reference Books:

1. Doug Brown, John Levine, and Tony Mason, "Lex & Yacc", O'Reilly & Associates, Inc., Second Edition.
2. Andrew Appel, "Modern Compiler Implementation in C", Cambridge University press.
3. K C. Louden "Compiler Construction - Principles and Practice" India Edition, CENGAGE.
4. Dick Grune, Kees van Reeuwijk, Henri E. Bal, Ceriel J.H. Jacobs and Koen Langendoen, "Modern Compiler Design", Second Edition, John Wiley & Sons Publication.
5. Keith Cooper and Linda Torczon, "Engineering: A Compiler", Second Edition, Morgan Kaufmann Publication.

5KS09 C-Skill Lab – III [P-2, C-1]

Course Prerequisite: Basic knowledge of Web Development, HTML, CSS, JavaScript and IDE.

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of C-Skill Lab - III by being able to do each of the following:

- To develop an ability to set up a local JS Library/Framework development Environment.
- To be able to install and implement different JS Libraries and Frameworks
- To be able to develop single-page/multi-page static and dynamic Web Applications.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to

1. Explain the various tools, packages and modules required for Web Development.
2. Discuss the workings of web server, cookies, routes, etc.
3. Develop a mobile application using JS Framework.
4. Design GUI using JS framework and/or Libraries.
5. Create applications using Angular, React, Node and Express.

List of Experiments: This is the sample list of Experiments; minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

List of Experiments based on Syllabus: (Maximum 20)

1. Introduction to the Node.js and its installation to print Hello World
2. To study built-in modules and implement the user defined built-in modules in the Node.js
3. To study HTTP module and implement Node.js as a web server
4. To study and implement Node.js File system module to read, write, create, update, delete and rename the file
5. To study the URL module of the Node.js and write a program that opens the requested file and returns the content of the file to the client. If anything goes wrong, throw a 404 error.
6. To convert the output "Hello World!" into upper-case letters by installing the "upper-case" package of NPM.
7. To study event handling in Node.js and demonstrate it using event module and EventEmitter object.
8. To study and implement the Formidable module of Node.js to upload the file on the server.
9. To study and implement the Nodemailer module of Node.js to send emails from your server.
10. To install MySQL and its driver and create connection with it using Node.js.
11. To demonstrate the creation database and table in MySQL using Node.js
12. To demonstrate the insertion of single and multiple records in the MySQL using "INSERT" statement and Node.js
13. To demonstrate the display of records from the MySQL database using "SELECT" statement and display it using Node.js
14. To demonstrate the display the records based on condition from the MySQL database using "WHERE" statement using Node.js
15. To demonstrate deletion of records from database using "DELETE" statement and Node.js
16. To demonstrate updating existing records in a table by using the "UPDATE" statement and Node.js
17. To demonstrate combining rows from two or more tables, based on a related column between them, by using a JOIN statement using Node.js

List of Experiments beyond Syllabus: (Maximum 05)

1. Create an Email sender app using Node.js
2. Create an Basic User database: Site in which User can Sign up/Login and can see other User's Profile Information.
3. Create a User model covering Registration, Email verification(send an email), login (with remember me, display user details and allow to save/update user details(DOB, Location, Hobbies etc or anything)
4. A random number generator web application.

Text Books:

1. Simon Holmes: Getting Mean with Mongo, Express, Angular, and Node, 2nd Edition, Manning.
2. Alex Banks and Eve Porcello: Learning React: Functional Web Development with React and Redux, O'Reilly .

Reference Books:

1. ShyamSeshadri: Angular Up and Running, O'Reilly
2. Akshat Paul and Abhishek Nalwaya: React Native for Mobile development, Apress.
3. Jos Dirksen: Learn Three.js, 3rd Edition, Packt Publishing.

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Reference Books: (may be 5 to 6)

1. Kevin Roebuck, "Storing and Managing Big Data - NoSQL, HADOOP and More", Emereopty Limited, ISBN: 1743045743, 9781743045749
2. Kristina Chodorow, Michael Dirolf, "MangoDB: The Definitive Guide" ,O Reilly Publications, ISBN: 978-1-449-34468-9.
3. Adam Fowler, "NoSQL For Dummies", John Wiley & Sons, ISBN-1118905628
4. C J Date, "An Introduction to Database Systems", Addison-Wesley, ISBN: 0201144719.

5KS07 COMPILER DESIGN – Lab [P-2, C-1]

Course Prerequisite: Basic knowledge of C Programming, Data Structures, Theory of Computation.

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Compiler Design by being able to do each of the following:

- Know the basic components of a Compiler.
- To implement Lexical Analyzer using Lex tool and Syntax Analyzer using Yaac Tool.
- To implement various parsing methods.
- To implement code optimization techniques .

Course Outcomes (Expected Outcome):

On completion of the course, the students will be able to

1. Identify the fundamentals of compiler and its phases.
2. Use the powerful compiler generation tools such as Lex and Yacc.
3. Write a lexical scanner, either from scratch or using Lex.
4. Develop program for solving parser problems.
5. Examine the various optimization techniques.

List of Experiments: This is the sample list of Experiments; minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

List of Experiments based on Syllabus: (Maximum 20)

1. Design a lexical analyzer for given language and the lexical analyzer should ignore redundant spaces, tabs and new lines. It should also ignore comments. Although the syntax specification states that identifiers can be arbitrarily long, you may restrict the length to some reasonable value. Simulate the same in C language.
2. Write a C program to identify whether a given line is a comment or not.
3. Implement a C program to check parenthesis of regular expression is balanced or not.
4. Implement a C program to construct NFA from regular expression.
5. Implement a C program to simulate Deterministic Finite Automation (DFA) for a string which ending with 'a', 'a*b+', 'abb'.
6. Write a C program to construct of DFA from NFA.
7. Implement a Lex program to verify the parenthesis of a given expression is balanced.
8. Implement a Lex program to recognize the token like Digit, Identifier & Delimiter.
9. Implement the Lexical Analyzer using JLex, flex or other lexical analyzer generating tools.
10. Implement a Lex program to a valid arithmetic expression and to recognize the identifier and operators present.
11. Implement a Lex program to count words, characters, lines, vowels and consonants from given input.
12. Implement a Lex program to check given number is positive negative or zero.
13. Implement a Lex program to generate string which is ending with zeros.
14. Implement LEX and Yacc tool to implement desk calculator.
15. Write a C program for constructing of SLR parsing.
16. Write a C program for constructing of LL (1) parsing.
17. Write a C program for constructing of LALR parsing.
18. Write a C program for constructing recursive descent parsing.
19. Write a C program to implement Program semantic rules to calculate the expression that takes an expression with digits, + and * and computes the value.
20. Write a C program for Tokenizing the file which reads a source code in C/C++ from an unformatted file and extract various types of tokens from it
21. Write functions to find FIRST and FOLLOW of all the variables / given grammar.
22. Implement a Shift Reduce Parser for the following productions.
23. E → E+E / E*E / a / b
24. Implement a symbol table containing functions create(), modify(), search(), display() and delete().
25. Implement three address Code for the input a=b*c.
26. Implement Recursive Decent Parser for the productions.

List of Experiments beyond Syllabus: (Maximum 05)

1. Convert the BNF rules into Yacc form and write code to generate Abstract Syntax Tree.
2. Write a C program to generate machine code from abstract syntax tree generated by the parser.
3. Write a Lex program to find out total number of vowels, and consonants from the given input string.
4. Implementation of Finite State machines DFA, NFAs .
5. Computation of Leading & Trailing Sets.

Text Book: Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman Compilers: "Principles, Techniques and Tools", Pearson Education, Second Edition.

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Practical 3: To Study and implement DML Commands-I
- SQL queries : Write and execute different SQL queries
- Execute Simple queries using SELECT, FROM, WHERE clauses,
- In Where clause use different predicates involving OR,AND, NOT
- Rename operation
- Tuple Variables
- Write SQL for various String operations (%,_,*)
- Match beginning with
- Match ending with
- Substring
- Match exactly n characters
- Match at least n characters
- Sort the output of the query using Order by
- Write SQL using Having

Practical 4 : To Study and implement DML Commands-II Write SQL queries and perform
- Set membership operations
- In, not in
- Some
- All
- Exists and not exists, Test for emptyness using exists, not exists
- Test for absence of duplicates.
- Nested queries

Practical 5. Study and implement aggregation functions.
- Write different queries using following Aggregate functions
- Min (minimum 3 SQL queries)
- Max (minimum 3 SQL queries)
- Avg (minimum 3 SQL queries)
- Sum (minimum 3 SQL queries)
- Count (minimum 3 SQL queries)

Practical 6: Write SQL to create Views and Indexes.
Practical 7: Write SQL to perform the modifications to the database
Practical 8 : PL /SQL
Practical 9 : Database Access Using Cursors
Write a trigger to find the names and cities of customers who have more than xyz in any account.
Practical 10 : Triggers
- Write a trigger for dealing with the overdrafts (set the account balance to zero, and creating a loan in the amount of the overdraft. Keep account number as loan number in the loan table)
- Write a trigger for dealing with blank cities (set the city field to null when it is blank)

Practical 11: Procedures, functions
- Write atleast 2 functions, and demonstrate its use
- Write atleast 2 procedures, and demonstrate its use

Practical 12 : Web Programming with PL/SQL. (Contents beyond Syllabus)
HTTP, A Simple Example, Printing HTML Tables., Passing Parameters, Processing HTML Forms., Multi-Valued Parameters.
Practical 13: Develop a JDBC Applications, Retrieve the information by connecting to the database using a host language (JAVA, C, C++) (Contents Beyond Syllabus)
Practical 14: Web Programming with Java Servlets. (Connecting to the database) (Contents beyond Syllabus)
A Simple Servlet., HTTP Servlet API Basics.,HTML Form Processing in Servlets.
Practical 15: PHP : Develop a simple application to access the database using PHP (Contents beyond Syllabus)
Study of Open Source NoSQL Databases
Based on the concepts covered in text create a Mini Project:

Suggested Topics:
i. Bank database (Given in Korth book)
ii. University Database (Given in Korth book)
iii. Airline Flight Information System.
iv. Library Database Application.
v. University Student Database.
vi. Video Chain Database.
vii. Banking Database.
viii. BiBTeX Database.
ix. Music Store Database.
x. Online Auctions Database.
xi. A Web Survey Management System.

Text Book: Korth, Sudarshan, Silberschatz, Database System Concept, Mc-Graw Hill Mysql Reference Manual (for Mysql database)

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Unit IV: **Hours: 6**
Ethical and Legal Foundation: Initial Ethical and Legal issues facing a New Firm, Drafting a Founders Agreement, Avoiding Legal Disputes, Business Licenses and Permits, Choosing a Form of Business Organization.
Assessing A New Venture's Financial Strength and Viability: Introduction to Financial Management, Financial Statements and Forecasts, Pro forma Financial Statements.

Unit V: **Hours: 6**
New Venture Team: Creating a New-Venture Team, Rounding out the Team: The Role of Professional Advisers.
Getting Financing or Funding: The Importance of Getting Financing or Funding, Sources of Equity Funding, Sources of DEBT Financing, Creative Sources of Financing and Funding.

Unit VI: **Hours:6**
Unique Marketing Issues: Selecting a Market and Establishing a Position, Key Marketing issues for New Ventures, The 4Ps of Marketing for New Ventures.
The Importance of Intellectual Property: The Importance of Intellectual Property, Patents, Trademarks, Copyrights, Trade Secrets, Conducting an Intellectual Property Audit.

Text Book: Bruce R. Barringer, R. Duane Ireland, "Entrepreneurship Successfully Launching New Ventures", Pearson Education, Third Edition.

Reference Books:
1. Ram Chandran, "Entrepreneurial Development", Tata McGraw Hill, New Delhi
2. Khanka, S S. "Entrepreneurial Development", S Chand & Company Ltd. New Delhi
3. Badhai, B "Entrepreneurship for Engineers", Dhanpat Rai & Co. (p) Ltd.
4. Gupta and Srinivasan, "Entrepreneurial Development", S Chand & Sons, New Delhi.
5. Arya Kumar, Entrepreneurship, Pearson, Delhi
6. Poornima MCH, Entrepreneurship Development –Small Business Enterprises, Pearson, Delhi
7. Sangeetha Sharma, Entrepreneurship Development, PHI Learning
8. Kanishka Bedi, Management and Entrepreneurship, Oxford University Press, Delhi

5KS06 DATABASE MANAGEMENT SYSTEMS LAB [P-2, C-1]

Course Prerequisite: Basic concept of programming, Basic concepts of data structures
Course Objectives:
- To study the ER model which provides a high level view of the issues in database design, to capture the semantics of realistic applications within the constraints of a data model.
- To study the primary data model (relational model) for commercial data processing applications.
- To study the standard structured query language and retrieve the information from the database in various ways.
- To study the integrity and security constraints of the database by enforcing constraints.

Course Outcomes (Expected Outcome) On completion of the course, the students will be able to
1. Design ER model for any kind of application.
2. Design and develop database.
3. Apply normalization.
4. Query the database.
5. Apply various integrity constraints
6. Build indices, views
7. Implement triggers, assertions

List of Experiments: This is the sample list of Experiments; minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

Practical 1: To Study a Database Modeling Tool.
Study of Data Modeling Tools:
- Take a description of the enterprise, create its corresponding ER Diagram and build a database model using any modeling tool. The following basic features of the modeling should be covered while building the model:
- Logical / Physical Modeling
- Adding an entity / its attributes, relationships (all kinds of relationships viz., parent-child, foreign key references, one to many, many to many etc)
- Forward / reverse engineering
- Details of forward engineering / schema generation
- Steps to generate the schema

Practical 2: To Study and implement DDL Commands
Implement the model created in Practical 1, in any of the DBMS like Oracle, MySQL, or Microsoft SQL Server database software.
- Creating the proper tables
- Insert the data into it.
- Study Dropping and Altering the Tables. Study the cascaded deletes.

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Course Outcomes (Expected Outcome): On completion of the course, the students will be able to

1. Define bookkeeping and accounting
2. Explain the general purposes and functions of accounting
3. Explain the differences between management and financial accounting
4. Describe the main elements of financial accounting information – assets, liabilities, revenue and expenses
5. Identify the main financial statements and their purposes.

Unit I: The basics of Accounting I **Hours: 7**
The Assets, Liabilities and Balance Sheets, Procedure for creating a Balance Sheet, Different forms of Balance Sheet, Basic concepts of Accounting

Unit II: The basics of Accounting II **Hours: 7**
The Profit & Loss Account, Cash Flow Statement, Creating Profit & Loss Account, Creating Cash Flow Statement, Book Keeping Basic terminology, Debt & Credit Convention

Unit III: Interpretation of Accounts **Hours: 8**
Accounting Rules, Reports, Assets, Liabilities, Shareholders' Equity, P&L Statement,

Unit IV: Introduction to Financial Management **Hours:6**
What is Finance, Forms of Business Organization, Stock Price & Shareholder Value, Intrinsic Value, Stock Price, Business trends and ethics, Conflicts management.

Unit V: Financial Markets and Institutions **Hours: 7**
Financial Markets, Capital Allocation, Financial Institutions, Stock Market, Market for Common Stock, Stock Market Returns, Stock Market Efficiency

Unit VI: Financial Statements & Analysis **Hours: 7**
Financial Statements & Reports, Stockholders' Equity, Free Cash Flow, Income Taxes, Analysis of Financial Statements: Ratio Analysis, Liquidity Ratios, Asset & Debt Management Ratio, Profitability Ratio, Trend Analysis

Text Books:

1. Accounts Demystified, 5th Edition, Anthony Rice, Pearson – Prentice Hall
2. Fundamentals of Financial Management, 6th Edition, E. F. Brigham, J.F. Houston, Cengage Learning.

Reference Books:

1. Engineering Economics: Financial Decision Making for Engineering, N. M. Fraser, E. M. Jewkes, 5th Edition, Pearson Publication.
2. Financial Fundamentals for Engineers, Richard Hill & George Slot, Butterworth-Heinemann, Elsevier.
3. Financial Accounting, Jerry Weygandt, Paul Kimmel, Donald Kieso, 9th Edition, Wiley
4. Financial Accounting: Tools for Business Decision Making, Jerry Weygandt, Paul Kimmel, Donald Kieso, 6th Edition, Wiley Plus.

5KS05 ENTREPRENEURSHIP [L-3,T-0,C-3]

Course Prerequisite:

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Entrepreneurship by being able to do each of the following:

- Understand basic concepts in the area of entrepreneurship
- Understand the role and importance of entrepreneurship for economic development
- Develop personal creativity and entrepreneurial initiative,
- Adopt the key steps in the elaboration of business idea

Course Outcomes (Expected Outcome): On completion of this course, the students should be able to:

1. Analyse the business environment in order to identify business opportunities,
2. Identify the elements of success of entrepreneurial ventures,
3. Evaluate the effectiveness of different entrepreneurial strategies,
4. Specify the basic performance indicators of entrepreneurial activity,
5. Explain the importance of marketing and management in small businesses venture,
6. Interpret their own business plan.

Unit I: **Hours:6**
Introduction to Entrepreneurship: Introduction, Common Myths About Entrepreneurs, Types of Start- Up Firms, Changing Demographics of Entrepreneurs, Entrepreneurship Importance.
Recognizing Opportunities and Generating Ideas: Identifying and Recognizing Opportunities, Finding Gaps in the Marketplace, Techniques for Generating Ideas, Encouraging and Protecting New Ideas.

Unit II: **Hours:6**
Feasibility Analysis: Product/Service Feasibility Analysis, Industry/Target Market Feasibility Analysis, Organizational Feasibility Analysis and Financial Feasibility Analysis.
Writing A Business Plan: The Business Plan, Outline of the Business Plan, Presenting the Business Plan to Investors.

Unit III: **Hours:6**
Industry and Competitor Analysis: Industry Analysis, Industry Trends, The Five Competitive Forces Model, The Value of the Five Forces Model, Industry Types and the Opportunities, Competitor Analysis, Identifying Competitors, Sources of Competitive Intelligence, Completing a Competitive Analysis Grid. Developing an Effective Business Model: Business Models, Components of an Effective Business Model.

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Text Books:
1. Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81- 265-21791,2013
2. Joseph Migga Kizza, "A Guide to Computer Network Security", Springer 2009.

Reference Books:
1. V.K. Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India.
2. Nina Godbole, "Information Systems Security", Wiley India, New Delhi
3. Kennetch J. Knapp, "Cyber Security & Global Information Assurance", Information Science Publishing.
4. James Graham, Richard Howard, Ryan Olson, "Cyber Security Essentials" CRC Press.
5. Jeetendra Pande, "Introduction to Cyber Security" Uttarakhand Open University, 2017

5KS05 PRINCIPLES OF MARKETING FOR ENGINEERING [L-3, T-0, C-3]

Course Pre-requisite: Basic knowledge of Computers.

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Principles of Marketing for Engineering by being able to do each of the following:
- To provide students with the knowledge about business advantages of the digital marketing and its importance for marketing success;
- To develop a digital marketing plan; to make SWOT analysis;
- To define a target group; to introduced to various digital channels, their advantages and ways of integration;
- To integrate different digital media and create marketing content to manage a digital marketing performance efficiently.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to
1. Identify the importance of the digital marketing for marketing success,
2. Manage customer relationships across all digital channels and build better customer relationships,
3. Create a digital marketing plan, starting from the SWOT analysis and defining a target group,
4. Identify digital channels, their advantages and limitations, to perceiving ways of their integration taking into consideration the available budget

Unit I: Introduction to e-Marketing: **Hours: 7**
Introduction, Wired-up world, B2C, B2B, C2B and C2C Model, Objectives: Sell, Serve, Speak, Save, Sizzle, Introduction to e-strategy.
Unit II: Remix and e-Models **Hours: 7**
Introduction to Remix: Product, Price, Place, Promotion, People, Process. Introduction to e-Models, e-Marketplace, Digital Communication market, Web & Social Network Models, Customer buying models, Loyalty models
Unit III: e-Customers **Hours: 7**
Introduction to e-Customers, Motivations, Expectations, Fears & Phobias, Online Buying Process, information processing, relationship & royalty, Communities & social networks, Customer profiles
Unit IV: e-Tools & Site Design **Hours:7**
Introduction to e-Tools, Technology development & customer impact, Interactive digital TV, Digital Radio, Mobile Devices, Interactive self-service kiosks, Convergence, Integrated Campaigns, Web-site design, Integrated design, online value proposition, Dynamic & aesthetics design
Unit V: Traffic Building **Hours: 7**
Search Engine Marketing, Online PR & Partnerships, Interactive Advertising, e-mail & viral marketing, Online traffic building, Control, Resourcing
Unit VI: e-CRM & e-Business **Hours: 7**
Introduction to e-CRM, Database marketing, e-CRM, Profiling, Personalization, Introduction to e-Business, e-Business Architecture & framework, e-business security.

Text Book: E-Marketing excellence: Planning & Optimizing your Digital Marketing, Dave Chaffey & P R Smith, 3rd Edition, Butterworth-Heinemann, Elsevier.

Reference Books:
1. Marketing 4.0: Moving from Traditional to Digital, Philip Kotler, H. Kartajaya, I. Setiawan, Wiley.
2. Business Marketing and Management Principles for IT and Engineering, D. N. Chorafas, CRC Press.
3. Marketing Management, Philip Kotler, Kevin Keller, 12th Edition, Pearson Prentice Hall.
4. Marketing Insights from A to Z, Philip Kotler, John Wiley & Sons..

5KS05 Open Elect. I (i) FUNDAMENTALS OF FINANCE & ACCOUNTING [L-3, T-0, C-3]

Course Prerequisite: Basic Knowledge of Mathematics
Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Fundamentals of Finance & Accounting by being able to do each of the following:
- Know and apply accounting and finance theory
- Critically evaluate financial statement information
- Evaluate and compare different investments

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Unit VI: **Hours: 7**
Case Studies Illustrating IoT Design, Introduction, Home Automation: Smart Lighting, Home Intrusion detection, Cities: Smart parking, Environment: Weather Monitoring System, Weather reporting Bot, Air pollution monitoring, Forest fire detection, Agriculture: Smart Irrigation, Productivity Applications: IoT printer.

Text Book: Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, ISBN:0: 0996025510, 13: 978-0996025515.

Reference Books:
1. Fundamentals of Python, K.A.Lambert and B.L.Juneja, Cengage Learning, 2012.
2. David Hanes, IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, Cisco Press, ISBN-13: 978-1-58714-456-1, ISBN-10: 1-58714-456-5, 2017
3. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014

5KS04 INTRODUCTION TO CYBER SECURITY [L-3, T-0,C-3]

Course Prerequisite: Computer Programming, Data Structure, Data Communication & Networking.

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Introduction to Cyber Security by being able to do each of the following:
- Understand basics of Cybercrime and Information Security.
- To familiarize various cyber threats, attacks, Cyber offenses.
- Understand Cybercrime on Mobile and Wireless devices.
- Understand tools and methods used in Cybercrime.
- Understand Access Control and Authentication.
- Understand Intrusion Detection and Prevention.

Course Outcomes (Expected Outcome): After completion of this course, the students should be able to:
1. Know fundamentals of Cybercrimes and Cyber offenses
2. Realize the Cyber threats, attacks and Vulnerabilities.
3. Explore the industry practices and tools.
4. Comprehend the Access Control and Authentication Process.
5. Implement Intrusion Detection and Prevention.

Unit I: **Hours:6**
Introduction to Cybercrime: Introduction, Cybercrime, Cybercrime and Information Security, Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era.

Unit II: **Hours: 6**
Cyber offenses: Introduction, Attacks, Social Engineering, Cyberstalking, Cybercafe and Cybercrime, Botnets, Attack Vector, Cloud Computing.

Unit III: **Hours: 6**
Cybercrime: Mobile and Wireless Devices Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Cards Frauds in Mobile and Wireless Computing, Security Challenges posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implementations for Organizations, Organizational Measures for Handling Mobile, Devices Related Security Issues Organizational Security Policies and Measures in Mobile Computing, Laptops.

Unit IV: **Hours: 6**
Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.

Unit V: **Hours:6**
Access Control and Authorization: Definitions, Access Rights, Access Control Systems, Authorization, Types of Authorization Systems, Authorization Principles, Authorization Granularity, Web Access and Authorization.
Authentication: Definition, Multiple Factors and Effectiveness of Authentication, Authentication Elements, Types of Authentication, Authentication Methods.

Unit VI: (Hours: 6) System Intrusion Detection and Prevention: Definition, Intrusion Detection, Intrusion Detection Systems (IDSs), Types of Intrusion Detection Systems, The Changing Nature of IDS Tools, Response to System Intrusion, Challenges to Intrusion Detection Systems, Implementing an Intrusion Detection System, Intrusion Prevention Systems (IPSs), Intrusion Detection Tools
Disaster Management: Introduction, Disaster Prevention, Disaster Response, Disaster Recovery, Make your Business Disaster Ready, Resources for Disaster Planning and Recovery.

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Unit V: Nonlinearity and Tree Based Methods **Hours: 7**
Moving Beyond Linearity: Polynomial Regression, Step Functions, Basis Functions, Regression Splines: Piecewise Polynomials, Constraints and Splines, Representation, Number and Locations of the Knots, Comparison to Polynomial Regression, Smoothing Splines: An Overview and Smoothing
Parameter λ, Local Regression, Generalized Additive Models: Regression Problems and Classification Problems, Tree-Based Methods: Decision, Regression and Classification Trees, Trees Versus Linear Models, Advantages and Disadvantages, Bagging, Random Forests, Boosting

Unit VI: SVM and Unsupervised Learning **Hours: 7**
Maximal Margin Classifier: Hyperplane and Classification, The Maximal Margin Classifier, Construction, The Non-separable Case, Support Vector Classifiers: Overview and Details, Support Vector Machines: Classification with Non-linear Decision Boundaries, SVM, Application, SVMs with More than Two Classes, Relationship to Logistic Regression, Unsupervised Learning: The Challenge of Unsupervised Learning: Principal Components Analysis, Clustering Methods: K-Means Clustering, Hierarchical Clustering, Practical Issues in Clustering.

Text Books:
1. Cathy O'Neil and Rachel Schutt: Doing Data Science, First Edition, 2014, O'reilly Publications, ISBN: 978-1-449-35865-5
2. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani: An Introduction to Statistical Learning with Applications in R, First Edition, 2013, Springer-Verlag New York, ISBN: 978-1- 4614-7137-0.

Reference Book:
Nina Zumel, John Mount: Practical Data Science with R, First Edition, 2014, Manning Publications Co., ISBN: 9781617291562.

5KS04 INTERNET OF THINGS [L-3, T-0, C-3]

Course Prerequisite: Basic knowledge of Internet and Microprocessor & Assembly Language Programming

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Internet of Things by being able to do each of the following:
- To learn and understand fundamental of IoT
- To study the design methodology and different IoT platform
- To understand usefulness of IoT for society
- To design and implement application of IoT using various sensor

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to:

1. Understand the basics of IoT
2. Understand design methodology and platforms involved in IoT
3. Apply the knowledge to interface various sensors with IoT development
4. Design and Implement IoT system for real time application

Unit I: **Hours: 6**
Introduction to Internet of Things, Definition & Characteristics of IoT, Physical Design of IoT Logical Design of IoT, IoT Enabled Technologies like Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels & Deployment Templates, Domain Specific IoTs: Home, Cities, Environment, Energy systems, Logistics, Agriculture, Health & Lifestyle.

Unit II: **Hours: 7**
IOT & M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT, Software defined networks, network function virtualization, IoT Systems Management, Simple Network Management Protocol (SNMP) ,Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IoT Systems Management with NETCONF-YANG, NETOPEER.

Unit III: **Hours: 7**

IoT Platforms Design Methodology, Case Study on IoT System for Weather Monitoring, Motivation for Using Python, IoT Systems - Logical Design using Python ,Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling l, Date/Time Operations, Classes, Python Packages of Interest for IoT

Unit IV: (Hours: 7) IoT Physical Devices & Endpoints, Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces serial, SPI, I2C, Programming Raspberry Pi with Python, Controlling LED with Raspberry Pi, Interfacing an LED and switch with Raspberry Pi, Interfacing Light Sensor with Raspberry Pi Other IoT Devices, pcDuino, BeagleBone Black, Cubieboard.

Unit V: **Hours: 7**

IoT Physical Servers & Cloud Offerings, Introduction to Cloud Storage Models & Communication APIs , WAMP - AutoBahn for IoT , Xively Cloud for IoT , Python Web Application Framework - Django , Designing a RESTful Web API , Amazon Web Services for ,SkyNet IoT Messaging Platform.

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Unit VI: Emerging Areas and Future Application **Hours: 06**
Smarter Cities: Cognitive Computing in Government: How Cities Have Operated, The Characteristics of a Smart City, The Rise of the Open Data Movement Will Fuel Cognitive Cities, The Internet of Everything and Smarter Cities, Understanding the Ownership and Value of Data, Smarter Approaches to Preventative Healthcare, Building a Smarter Transportation Infrastructure, Using Analytics to Close the Workforce Skills Gap, Creating a Cognitive Community Infrastructure, The Next Phase of Cognitive Cities.
Emerging Cognitive Computing Areas: Characteristics of Ideal Markets for Cognitive, Computing Vertical Markets and Industries.
Future Applications for Cognitive Computing: Requirements for the Next Generation, Technical Advancements That Will Change the Future of Cognitive Computing, What the Future Will Look Like, Emerging Innovations.

Text Book:
Judith Hurwitz, Marcia Kaufman and Adrian Bowles, "Cognitive Computing and Big Data Analytics", publication John Wiley & Sons, Inc, 2015.

Reference Books:
1. José Luis Bermúdez, Cognitive Science: An Introduction to the Science of the Mind, publication Cambridge University Press, New York, Second Edition.
2. Jay Friedenberg and Gordon Silverman, Cognitive Science: An Introduction to the Study of Mind, Sage Publications, Inc. London, 2014.
3. Huimin Lu (Editor), Cognitive Internet of Things: Frameworks, Tools and Applications, Springer Nature Switzerland AG 2020.
4. Danish Contractor and Aaditya Telang (Editors), Applications of Cognitive Computing Systems and IBM Watson, 8th IBM Collaborative Academia Research Exchange, publication Springer Nature Singapore Pte Ltd., 2017.
5. S. Bird, E. Klein, E. Loper (2009), Natural Language Processing with Python, O' Reilly Media.

5KS04 DATA SCIENCE AND STATISTICS [L-3, T-0, C-3]

Course Prerequisite: Basic knowledge of Mathematics

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Data Science and Statistics by being able to do each of the following:
- Demonstrate knowledge of statistical data analysis techniques utilized in business decision making.
- Apply principles of Data Science to the analysis of business problems.
- Apply the learned concepts for the skillful data management.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to
1. Demonstrate proficiency with statistical analysis of data.
2. Build skills in transformation and merging of data for use in analytic tools.
3. Perform linear and multiple linear regression analysis.
4. Develop the ability to build and assess data-based models.
5. Evaluate outcomes and make decisions based on data.

Unit I: Data Science and Statistical Learning **Hours: 6**
Introduction: What Is Data Science?, Statistical Inference, Exploratory Data Analysis, and the Data Science Process, Exploratory Data Analysis, Stages of a Data Science Project, The Data Science Process, Why Statistical Learning: f Estimation- Why and How, Tradeoff Between Prediction Accuracy and Model Interpretability, Supervised vs Unsupervised Learning, Regression vs Classification Problems, Accessing Model Accuracy: Measuring the Quality of Fit, The Bias Variance Trade-off, The Classification Setting.

Unit II: Linear Regression **Hours: 7**
Simple Linear Regression: Estimating the Coefficients, Assessing the Accuracy of the Coefficient Estimates, Assessing the Accuracy of the Model, Multiple Linear Regression: Estimating the Regression Coefficients, Other Considerations in the Regression Model: Qualitative Predictors, Extensions of the Linear Model, Potential Problems, The Marketing Plan, Comparison of Linear Regression with K-Nearest Neighbors.

Unit III: Classification and Cross Validation **Hours: 7**
Classification: An Overview of Classification, Why not Linear Regression?, Logical Regression: The Logistic Model, Regression Coefficients, Making Predictions, Multiple Logistic Regression, >2 Response Classes, Linear Discriminant Analysis: Using Bayes' Theorem, LDA for $p = 1$ and $p > 1$, Quadratic Discriminant Analysis, Comparison of Classification Methods, Cross Validation: The Validation Set Approach, Leave-One-Out and k-Fold Cross-Validation, Bias-Variance Trade-Off for k-Fold Cross-Validation, Classification Problems, The Bootstrap

Unit IV: Linear Model Selection and Regularization **Hours: 6**
Subset Selection: Best Subset Selection, Stepwise Selection, Choosing the Optimal Model, Shrinkage Methods: Ridge Regression, The Lasso, Selecting the Tuning Parameter, Dimension Reduction Methods: Principal Components Regression, Partial Least Squares, Considerations in High Dimensions: High-Dimensional Data, What Goes Wrong in High Dimensions?, Regression in High Dimensions, Interpreting Results in High Dimensions

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5KS04 COGNITIVE TECHNOLOGIES (L-3, T-0, C-3)

Course Prerequisite: Basic knowledge of Artificial Intelligence, Programming and Data Structures.

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Cognitive Technologies by being able to do each of the following:

- This course intends to introduce concept of cognitive technologies and important approaches of cognitive technologies.
- Student will learn and analyze key concept of cognitive technologies.
- Students will gain an understanding of innovation concepts, terminology, current and future trends in cognitive technologies.
- Introduces students to IBM Watson platform, an artificially intelligent computer system capable of answering questions posed in natural language, developed in IBM's Deep QA project.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to
1. Describe the Cognitive computing and principles of cognitive systems.
2. Identify role of Natural Language Processing in cognitive system.
3. Outline application of advanced analytics in cognitive computing.
4. Justify role of Cloud and Distributed Computing in Cognitive Computing.
5. Assess the process of building a Cognitive Application.
6. Identify the Emerging Areas and Future Applications of Cognitive Computing.

Unit I: Foundation of Cognitive Computing & Design Principle of Cognitive Systems Hours: 07
The Foundation of Cognitive Computing: Cognitive Computing as a New Generation, The Uses of Cognitive Systems, What Makes a System Cognitive, Gaining Insights from Data, Domains Where Cognitive Computing Is Well Suited, Artificial Intelligence as the Foundation of Cognitive Computing, Understanding Cognition, Two Systems of Judgment and Choice, Understanding Complex Relationships Between Systems, The Elements of a Cognitive System, Infrastructure and Deployment Modalities.
Design Principles for Cognitive Systems: Components of a Cognitive System, Building the Corpus, Bringing Data into the Cognitive System, Machine Learning, Hypotheses Generation and Scoring, Presentation and Visualization Services.

Unit II: NLP and Big Data in Cognitive System Hours: 07
Natural Language Processing in Support of a Cognitive System: The Role of NLP in a Cognitive System, Semantic Web, Applying Natural Language Technologies to Business Problems.
The Relationship Between Big Data and Cognitive Computing: Dealing with Human-Generated Data, Defining Big Data, The Architectural Foundation for Big Data, Analytical Data Warehouses, Hadoop, Data in Motion and Streaming Data, Integration of Big Data with Traditional Data.

Unit III: Knowledge Representation and Advance Analytics in Cognitive Computing Hours: 06
Representing Knowledge in Taxonomies and Ontologies: Representing Knowledge, Developing a Cognitive System, Defining Taxonomies and Ontologies, Explaining How to Represent Knowledge, Models for Knowledge Representation. Applying Advanced Analytics to Cognitive Computing: Advanced Analytics Is on a Path to Cognitive Computing, Key Capabilities in Advanced Analytics, Using Advanced Analytics to Create Value, Impact of Open Source Tools on Advanced Analytics.

Unit IV: Role of Cloud and Distributed Computing in Cognitive Computing Hours: 07
The Role of Cloud and Distributed Computing in Cognitive Computing: Leveraging Distributed Computing for Shared Resources, Why Cloud Services Are Fundamental to Cognitive Computing Systems, Characteristics of Cloud Computing, Cloud Computing Models, Delivery Models of the Cloud, Managing Workloads, Security and Governance, Data Integration and Management in the Cloud.
The Business Implications of Cognitive Computing: Preparing for Change, Advantages of New Disruptive Models, What Does Knowledge Mean to the Business?, The Difference with a Cognitive Systems Approach, Meshing Data Together Differently, Using Business Knowledge to Plan for the Future, Answering Business Questions in New Ways, Building Business Specific Solutions, Making Cognitive Computing a Reality, How a Cognitive Application Can Change a Market.

Unit V: IBM Watson and Process of Building a Cognitive Application Hours: 07

IBM's Watson as a Cognitive System: Watson Defined, Advancing Research with a "Grand Challenge", Preparing Watson for Jeopardy, Preparing Watson for Commercial Applications, The Components of DeepQA Architecture.
The Process of Building a Cognitive Application: The Emerging Cognitive Platform, Defining the Objective, Defining the Domain, Understanding the Intended Users and Defining their Attributes, Defining Questions and Exploring Insights, Creating and Refining the Corpora, Training and Testing.
Building a Cognitive Healthcare Application: Foundations of Cognitive Computing for Healthcare, Constituents in the Healthcare Ecosystem, Learning from Patterns in Healthcare Data, Building on a Foundation of Big Data Analytics, Cognitive Applications across the Healthcare Ecosystem, Starting with a Cognitive Application for Healthcare, Using Cognitive Applications to Improve Health and Wellness, to Enhance the Electronic Medical Record and to Improve Clinical Teaching.

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Unit VI: Code Generation **Hours: 06**
Code Generation: Issues in Design of a Code generator, The Target Language, Address in the target code, Basic blocks and flow graphs. Optimization of Basic Blocks, Peephole Optimization and The Principal sources of Optimization.

Text Book: Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman Compilers: "Principles, Techniques and Tools", Pearson Education Second Edition.

Reference Books:
1. D. M. Dhamdhere, Compiler Construction—Principles and Practice, (2/e), Macmillan India.
2. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman Compilers: "Principles, Techniques and Tools", Pearson Education (Low Price Edition).
3. Andrew Appel, Modern Compiler Implementation in C, Cambridge University press.
4. K C. Louden "Compiler Construction—Principles and Practice" India Edition, CENGAGE.
5. Bennett J.P., "Introduction to Compiling Techniques", 2/e (TMH).

5KS03 COMPUTER ARCHITECTURE & ORGANIZATION (L-3, T-0, C-3)

Course Pre-requisite: Microprocessor & Assembly Language Programming
Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Computer Architecture & Organization by being able to do each of the following:
- To discuss the basic concepts and structure of computers.
- To solve concepts of arithmetic operations.
- To understand addressing modes and memory organization.
- To analyze conceptualize multitasking ability of a computer and pipelining
- To explain IO communication

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to
1. Discuss basic structure of computer.
2. Understand the basic operation of CPU.
3. Compare and select various Memory and I/O devices as per requirement.
4. Solve the concepts of number representation and their operation.
5. Explain the concept of parallel processing and pipelining.

Unit I: Basic Structure of Computer **Hours: 7**
Basic Structure of Computer H/W & S/W: Functional Units, Basic Operational Concepts, Bus structures, Addressing Methods and Machine Program Sequencing: Memory Locations, Addresses, Instruction and instruction sequencing, Addressing Modes. Basic I/O Operations.

Unit II: Memory Unit **Hours: 7**
Basic Concepts, Memory Hierarchy, Semiconductor RAM Memories, Internal Organization of Memory Chips, Static Memories, Dynamic Memories, Read Only Memories, Speed, Size and Cost.

Unit III: Processing Unit **Hours: 8**
Fundamental Concepts, Execution of a Complete Instruction, Hardwired Control, Performance Consideration, Microprogrammed Control, Microinstructions, Microprogram Sequencing.

Unit IV: I/O Organization **Hours:6**
Accessing I/O Devices, Interrupts, Enabling and Disabling Inerrupts, Handling Multiple Devices, DMA,I/O Hardware, Standard I/O Interfaces:SCSI
Unit V: Arithmetic **Hours: 7**
Number Representations, Design of Fast Adders, Signed Addition and Subtraction, Multiplication of Positive Numbers ,Booth Multiplier, Fast Multiplication ,Integer Division, Floating Point Numbers and Operations.

Unit VI: Parallel Organization and Pipelining **Hours: 7**
Parallel Processing, Array Processors, The Structure of General Purpose Multiple Processors, Symmetric, Multiprocessors, Multithreading and Chip Multiprocessors, Clusters, Multicore Organization, Memory Organization in Multiprocessors. Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.

Text Book: Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", Fifth Edition, Tata McGraw-Hill.

Reference Books:
1. William Stallings, "Computer Organization and Architecture: Designing for Performance", Eighth Edition, Pearson.
   John P. Hayes, "Computer Architecture and Organization", McGraw Hill Publication.
2. DA Patterson and JL Hennessy, Computer Organization and Design, Morgan Kaufmann Publisher, 2nd edition
3. A.S. Tanenbaum, "Structured Computer Organization", PHI Publication.

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Unit III: Relational Database Design **Hours: 8**
Integrity Constraints, SQL data types and schemas, Authorization, Triggers, Features of good relational designs,atomic domains and First Normal Form, decomposition using functional dependencies, Functional dependency theory, Algorithms for decomposition, Decomposition using multi-valued dependencies, More Normal Forms, Database Design Process.

Unit IV: Query Processing and Query Optimization **Hours: 8**
Query Processing: Overview, Measures of Query Cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions, Query Optimization: Overview, Transformation of Relational Expressions ,Estimating Statistics of Expression Results, , Choice of Evaluation Plans, Materialized Views.

Unit V: Transaction Management **Hours: 8**
Transaction Concept, Simple transaction model, Storage structure, Transaction Atomicity and Durability, transaction isolation, Serializability, transaction isolation and atomicity, transaction isolation levels, Implementation of Isolation levels, Transactions as SQL statements

Unit VI: Concurrency Control and recovery system **Hours: 8**
Lock-Based Protocols, Deadlock Handling, Multiple Granularities, Timestamp- Based Protocols, Validation-Based Protocols, Multi-version schemes, Recovery system :Failure classification, Storage , Recovery & Atomicity, Recovery algorithm, buffer management, Failure with loss of nonvolatile storage , early lock release and logical undo operations, , Remote Backup Systems

Text Book: Abraham Silberschatz, Henry F. Korth, S. Sudarshan, DATABASE SYSTEM CONCEPTS, Sixth Edition, McGraw Hill

Reference Books:
1. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, McGraw-Hill
2. Shamkant B. Navathe, RamezElmasri, Database Systems, Pearson Higher Education
3. Garcia-Molina, Ullman, Widom: Database System Implementation, Pearson education.
4. S. K. Singh: Database Systems, Concepts, Design and Applications, Pearson Education.
5. G.K. Gupta: Database Management Systems, McGraw Hill.
6. Toledo and Cushman: Database Management Systems, (Schaum's Outlines)

5KS02 COMPILER DESIGN (L-3, T-0, C-3)

Course Pre-requisite: Basic knowledge of Discrete Mathematics, Theory of Computation
Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Compiler Design by being able to do each of the following:

- To learn concepts of programming language translation and phases of compiler design
- To understand the common forms of parsers.
- To study concept of syntax directed definition and translation scheme for the representation of language
- To illustrate the various optimization techniques for designing various optimizing compilers

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to
1. Describe the fundamentals of compiler and various phases of compilers.
2. Design and implement LL and LR parsers
3. Solve the various parsing techniques like SLR, CLR, LALR.
4. Examine the concept of Syntax-Directed Definition and translation.
5. Assess the concept of Intermediate-Code Generation and run-time environment
6. Explain the concept code generation and code optimization.

Unit I: Introduction to Compiler **Hours: 06**
Introduction to Compilers: Language Processor, The Structure of a Compiler. Lexical Analysis: The role of lexical analyzer, Input Buffering, Specification of tokens, Recognition of tokens, The lexical analyzer generator Lex, Finite Automata, From Regular Expressions to Finite Automata, State minimization of DFA.

Unit II: Syntax Analysis **Hours: 07**
Syntax Analysis: The role of the parser, Review of context free grammar for syntax analysis: Parse Tree and Derivation, Ambiguity in Grammar, Elimination of left recursion and left factoring. Top down parsing: recursive descent parsing, predictive parsers, Transition diagrams for predictive parsers, FIRST and FOLLOW, LL (1) Grammars, Construction of predictive parsing tables, Non recursive predictive parsing, Error recovery in predictive parsing.

Unit III: Bottom up parsing **Hours: 07**
Bottom up parsing: Handle pruning, Stack implementation of Shift Reduce Parsing, conflicts during shift reduce parsing Introduction to LR parsing: Simple LR, Items and the LR(0) Automation, The LR-Parsing algorithm, Construction of SLR parsing table, More powerful LR Parsers: canonical LR(1) Items, Constructing LR(1) sets of items and canonical LR(1) parsing tables, Constructing LALR parsing tables, The parser generator Yacc.

Unit IV: Syntax Directed Translation **Hours: 07**
Syntax Directed Translation: Syntax directed definitions, Inherited and synthesized attributes, Evaluation orders of SDD's: Dependency Graphs, S-attributed definitions, L-attributed definition. Application of Syntax-Directed Translation: Construction of syntax trees. Syntax-directed Translation Schemes.

Unit V: Intermediate-Code Generation **Hours: 07**
Intermediate-Code Generation: Variants of Syntax Trees: Directed Acyclic Graphs(DAG), Three Address Code. Run Time Environments: Storage Organization, Static versus Dynamic Storage Organization, Stack Allocation of Space: Activation trees, Activation Records, Calling Sequences, Variable- Length data on stack. Access to Nonlocal Data on the Stack. Heap Manager: The Memory Manager. Introduction to Garbage Collection: Design Goals for Garbage Collectors.

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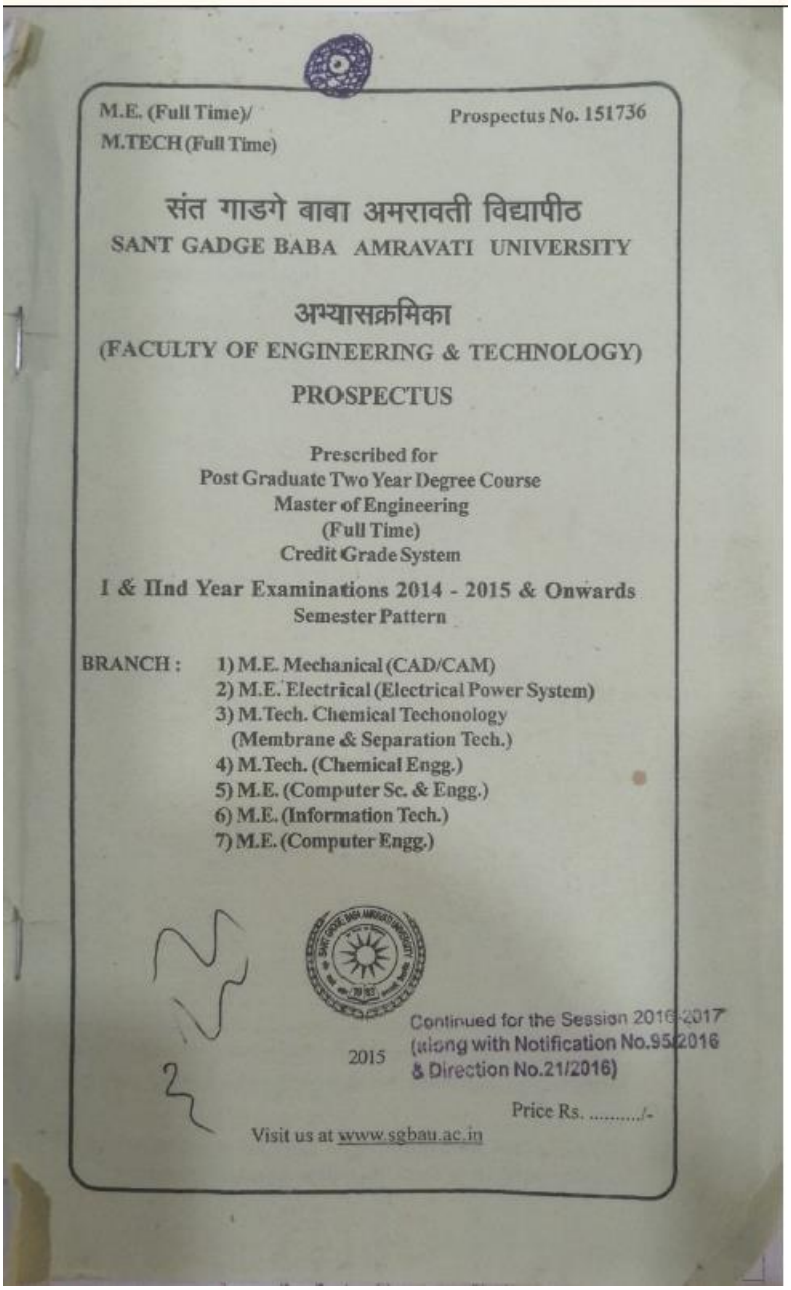
c. M. E. Semester wise Scheme



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M.TECH (Full Time)

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TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULL-TIME)
COMPUTER ENGINEERING
CREDIT GRADE SYSTEM
FIRST SEMESTER

Sr. No.	Subject Code	Subject	Teaching Scheme Hours/Week Lecture	Tutorial	P/D	Total Hours/ Week	Credits	Examination Scheme Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assess-ment	Total	Min. Passing Marks Theory Paper	Min. Passing Marks Subject	Practical Max. Marks External	Max. Marks Internal	Total	Min. Passing Marks
1	1RME1/ 1RMEF1/ 1KMEF1	Advanced Computer Architecture	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	1KMEF2/ 1RMEF2/ 1RME2	Algorithmics	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	1RME3/ 1RMEF3/ 1KMEF3	Operating System Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	1KMEF4	Object-Oriented Systems	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	1RMEF5/ 3RME2	Mobile Computing	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	1KMEF6	Algorithmics -LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	1KMEF7	Operating System Design-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22				500					100	
														TOTAL			600

SECOND SEMESTER

Sr. No.	Subject Code	Subject	Teaching Scheme Hours/Week Lecture	Tutorial	P/D	Total Hours/ Week	Credits	Examination Scheme Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assess-ment	Total	Min. Passing Marks Theory Paper	Min. Passing Marks Subject	Practical Max. Marks External	Max. Marks Internal	Total	Min. Passing Marks
1	2KMEF1	Network Systems Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	2RMEF2/ 2RME2/ 2KMEF2	Advanced Compiling Techniques	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	2KMEF3	Embeded Systems Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	2KMEF4	Elective	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	2KMEF5	Technical Paper Writing	0	1	0	1	1	-	-	-	-	-	-	-	50	50	25
6	2KMEF6	Seminar	0	1	0	1	1	-	-	-	-	-	-	-	50	50	25
7	2KMEF7	Advanced Compiling Techniques-LAB. 2RME4	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
8	2KMEF7	Embeded Systems Design-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			16	2	4	22	20				400					200	
														TOTAL			600

Elective : 1) Human Computer Interfaces 2) Systems Security 3) Image Processing & Computer Vision

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THIRD SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	Internal Marks	Total	Min. Passing Marks
1	3KMEF1	SEMINAR AND DISSERTATION	-	-	6	6	15	100	100	50
			-	-	6	6	15		100	
									TOTAL	100

FOURTH SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	External Marks	Internal Marks	Total	Min. Passing Marks
1	4KMEF1	SEMINAR AND DISSERTATION	-	-	12	12	30	200	100	300	150
		TOTAL	-	-	12	12	30			300	
										TOTAL	100
										GRAND TOTAL	1600

Semester III

Seminar : Seminar to be delivered on work completed during third semester. 50 internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertation guide and subject expert appointed by Principal of the College / Head of University Department. Remaining 50 internal marks will be given by guide based on performance.

Dissertation : Title of the dissertation work to be submitted to the University on or before 15th Sept. (for regular examination) and 15th of February (for supplementary exam.)

Semester IV

Seminar : to be delivered on the complete work of dissertation. 50 internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertation guide and subject expert appointed by Principal of the College / Head of University Department. Remaining 50 internal marks will be given by guide based on performance.

Note : Thesis of dissertation work must be submitted to the University on or before 30th April (for regular exam.) and 30th November (for supplementary exam.). Thesis of Dissertation work be submitted with late fee to the University upto 31 May (for regular exam.) and 31st December (for supplementary exam.). The late fee shall be charged as in case of Examination form.

Notes :
1. Student should fill the examination form in the begining of 3rd semester jointly for 3rd & 4th semester.
2. Single marksheet for 3rd & 4th semester together will be given to the student.

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d. M. E. Syllabus:

SYLLABUS
PRESCRIBED FOR
TWO YEAR P.G. DEGREE COURSE IN
MASTER OF ENGINEERING (FULL TIME)
COMPUTER ENGINEERING
SEMESTER PATTERN
SEMESTER : FIRST

1KMEF1/ 1RMEF1/1RME1
ADVANCED COMPUTER ARCHITECTURE

Unit I: Fundamentals: Technology & Computer usage trends, costs, Performance measurements. Quantitative principles of Computer design. Concepts of memory hierarchy. Instruction set architectures. Memory addressing. Operations in the instruction set. Encoding. Role of compilers. DLX architecture.

Unit II: Pipelining: Basic principles & DLX. Various hazards: Pipelines, data, control hazards. Implementation issues. Multicycle operations. Crosscutting issues. Instruction set design and piplelining. MIPS R4000 pipeline architecture.

Unit III: Advanced pipeline and instruction - level parallelism: concepts & challenges. Data hazards & dynamic scheduling. Dynamic Hardware prediction. Compiler support for ILP. Hardware support for parallelism. Studies of ILP. Power PC620.

Unit IV: Memory- hierarchy design : Basics of caches, Reducing cache miss & hit time. Main memory. Virtual memory. Protections Examples of virtual memory. Issues in the design of memory hierarchies. Alpha APX 21064 Memory hierarchy.

Unit V: Storage Systems: Types of storage devices, Buses & their types, performance I/O performance measures. Reliability, Availability and RAID. Interfacing to an Operating system. Designing an I/O system. Unix file system performance.

Unit VI: Interconnection Networks: Introduction & basic concepts, Computer connection to interconnection network. Interconnection network media. Practical issues. Examples of interconnection networks. Issues for interconnection networks. Internet working. An ATM network of workstations.

Text Book:

Hennessy J.L., Patterson D. A, "Computer Architecture: A Quantitative Approach" 2/e (Harcourt Asia).

Reference Books:

1. Hayes J.P., "Introduction to Computer Architecture", (McGraw Hill)).

2. Tenanbaum A. S., "Computer Organization and Architecture", (PHI).
3. Hwang K., "Advanced Computer Architecture", (McGraw Hill).
4. Hamacher V.C, "Computer Organization", (McGraw Hill).

1KMEF2/ 1RMEF2/1RME2 ALGORITHMICS

Unit I: Introduction: Mathematical Notations, Proof techniques, Elementary algorithmics, Efficiency of algorithms : Examples. Asymptomatic notations: conditional asymptomatic notations. Notation with several parameters. Operations on asymptomatic notations.

Unit II: Algorithm analysis: Analysing control structures. Examples. Average-case analysis. Amortized analysis. Solving recurrences. Review of data structures: Arrays, Stacks, Queries, Records & Pointers, Lists, Graphs, Trees, Associative tables, Heaps.

Unit III: Greedy Algorithms: Some characteristics, Graphs: Minimum spanning trees, shortest paths. The knapsack problem, Scheduling, Divide & Conquer : Introduction - general template, Binary search, sorting, median finding & matrix multiplication. Exponentiation. Cryptograph.

Unit IV: Dynamic programming: Examples, Principle of optimality, Knapsack problem & shortest paths. Chained matrix multiplication, Recursion, Memory function. Graphs: Travarsing trees. Depth-first-search : Directed & undirected graphs : Breadth-first-search. Back tracking. Branch-and-Bound. Minimax principle.

Unit V: Probability algorithms: Introduction, pseudorandom generation. Numerical probabilistic algorithms. Monte Carlo algorithms. Las Vegas algorithms. Parallel algorithms: Basic techniques. Work & efficiency. Examples. Parallel evaluations of expressions. Parallel sorting networks & parallel sorting.

Unit VI: Computational complexity. Introduction. Information-theoretic arguments. Adversary arguments. Linear reduction, Introduction to NP-completeness. Heuristic algorithms. Approximate algorithms. NP-hard approximation problems. Approximation schemes.

Text Book:

G. Brassard, P. Bratley. "Fundamentals of Algorithmics" (PHI).

Reference Books:

1. Horowitz and Sahni, "Fundamentals of Algorithms", (Galgotia).
2. Aho, Ullman, "Analysis & Design of Computer Algorithms", (Addison-Wesley).
3. Donald E. Knuth, "The Art of Computer Programming", Vols. I, II & III, (Addison-Wesley).

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1KMEF3/1RMEF3/1RME3
OPERATING SYSTEM DESIGN

Unit-I: Introduction to OS Internals. Overview of OS and Kernel, Linux and classic UNIX kernels. Kernel Source tree. Process management in Linux: Process descriptor and task structure, process creation, implementation of threads, process termination, process scheduling.

Unit-II: Process Scheduling in Linux: The Linux Scheduling Algorithm, Preemption and Context Switching, Real-Time, Scheduler-Related System Calls, System Calls: Handler, Implementation and Context. Interrupts and Interrupt Handlers.

Unit-III: Kernel Synchronization in Linux: Critical Regions and Race Conditions, Locking, Deadlocks, Contention and Scalability. Kernel Synchronization Methods: Spin Locks, Semaphores, Completion Variables. Preemption Disabling.

Unit-IV: Time Management in Linux: Kernel Notion of Time, Hardware Clocks and Timers, The Timer Interrupt Handler, Delaying Execution. Memory Management in Linux: pages, zones, kmalloc, vmalloc, slab layer allocator, statically allocating on the stack, high memory mapping. Per-CPU Allocations.

Unit-V: The Virtual File System in Linux: common file system interface, file abstraction layer, UNIX file system, VFS, dentry object, Super block object, file object, data structure associated with file systems and with a process. The Block I/O Layer and I/O Scheduler in Linux.

Unit-VI: The Process Address Space, the Memory Descriptor, Memory Areas, Page Tables. The Page Cache and Page Write back: Page Cache, Radix Tree, Buffer Cache. Linux Kernel Modules: Building, installing, Loading and managing. Portability in Linux.

Text Book:
Robert Love, "Linux Kernel Development" Pearson Education, (2/e).

Reference Books:
i. Daniel Bovet, "Understanding the Linux Kernel" O'Reilly Publications 2/e.
ii. Rubini and J. Corbet . "Linux Device Drivers." O'Reilly and Associates, 2001.
iii. Mosberger & Eranian. "IA-64 Linux Kernel: Design & Implementation" PHI.
iv. McKusick & Neil . "The FreeBSD Operating System" Addison-Wesley, 2004.

1KMEF4 OBJECT ORIENTED SYSTEMS

Unit I UML structure; UML building blocks; UML common mechanisms; Architecture. Unified Process (UP): UP axioms; UP structure; UP phases. Requirements workflow. Software requirements – Meta model; Requirements workflow detail; Defining requirements; Finding requirements. Use case modeling; Use case specification; Requirements tracing; Advanced use case modeling; Actor generalization; Use case generalization.

Unit II The analysis workflow; Analysis artifacts – Meta model; Analysis workflow detail; Analysis model - rules of thumb. Objects and classes; UML object notation UML class notation; Scope; Object construction and destruction. Analysis classes, Relationships; link; association; dependency; Inheritance and polymorphism. Generalization; Class inheritance; Polymorphism; Advanced generalization.

Unit III Analysis packages; Packages and namespaces, Nested packages; Package dependencies; Package generalization; Architectural analysis. Use case realization – elements; Interactions; Lifelines; Messages; Interaction diagrams; Sequence diagrams; combined fragments and operators; Communication diagrams. Advanced use case realization; Interaction occurrences; Continuations.

Unit IV Activity diagrams; Activity semantics; Activity partitions; Action nodes; Control nodes; Object nodes; Pins. Connectors; Interruptible activity regions; Exception handling; Expansion nodes; Sending signals and accepting events; Streaming; Advanced object flow features; Multicast and multireceive; Parameter sets; Interaction overview diagrams.

Unit V The design workflow; Design artifacts metamodel; Design workflow detail; Architectural design. Design classes; Anatomy of a design class; Inheritance; Templates; Nested classes. Refining analysis relationships; Design relationships; Aggregation semantics; Composition semantics; One-to-one, Many-to-one and One-to-many associations; Collections; Reified relationships; Interfaces: Provided and required interfaces; Interface realization vs. inheritance; Ports. Component-based development; Component stereotypes; Subsystems; Designing with interfaces.

Unit VI Use case realization-design; Modeling concurrency; Subsystem interactions; Timing diagrams; State machine

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diagrams; States; Transitions; Events. Advanced state machines; Composite states; Submachine states; Submachine communication. The implementation workflow; Implementation artifacts – meta model; Artifacts. Deployment; Architectural implementation; The deployment diagram; Nodes; Artifacts; Deployment.

Text Book:

Jim Arlow, Ila Neustadt "UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design" (2/e), Pearson Education.

Reference Books:

1. Booch, Rumbaugh, Jacobson, "The UML Users Manual", Pearson Education.
2. James Rumbaugh, Jacobson, Booch, "UML Reference Manual', Pearson Education.
3. Jacobson et al., 'The Unified Software Development Process', Pearson Education.
4. Bennett, McRobb, Farmer, "Object-Oriented Systems Analysis and Design Using UML" (TMH)

1KMEF5 MOBILE COMPUTING

Unit I: Characteristics, Fundamentals and Infrastructure of cellular system, Satellite system, Network protocol, Ad Hoc and sensor network, Wireless MAN's, LAN's and PAN's. Mobile Ratio Propagation: Types of Radio waves, Propagation mechanism, Free space propagation, Land propagation, Path loss, Slow fading, Fast fading, Doppler effect, Delay spread, Coherence Bandwidth ,Inter symbol and Co-channel Interferences.

Unit II: Cellular Concept: Cell area, Signal strength and cell parameter, Capacity of a cell, Frequency reuse, Cluster, Co-channel Interference, Cell Splitting, Cell sectoring. Channel allocation: Static allocation verses Dynamic allocation, fixed channel allocation (FCA), Dynamic channel allocation, Hybrid channel allocation (HCA), Allocation in specialized system structure, System Modeling.

Unit III: Mobile communication systems: Cellular system infrastructure, Registration, Handoff parameter and underlying support Roaming support, Multicasting, Security and privacy, Firewall and system security. Exiting wireless system: AMPS, IS-41, GSM, IMT-2000.

Unit IV: Ad hoc And sensor network: Characteristic of MANET, Applications, Routing, Table – driven routing protocol, Source initiated On- demand Routing, Hybrid protocol, Wireless sensor network, Fixed wireless sensor networks.

Unit V: Wireless MANs, LANs and PAN's: Wireless metropolitan area networks (WMANs), Wireless Local Area networks (WLANs), and Wireless Personal Area networks (WPANs), Recent Advances, Introduction, and Ultra –wideband technology.

Unit VI: Multimedia services requirement, Push –to-talk (PTT) technology, Mobility and resources management for Integrated system, Multicast in Wireless networks, Directional and smart antennas, Design issue in sensor networks, Bluetooth network, Low - power design, XML, Threat and security issue..

Text Book:

Agrawal D P and Zeng Q A, "Introduction to Wireless and Mobile Systems", (CENGAGE) (2/e).

Reference Books:

1. Jochen Schiller, "Mobile Communication", (Pearson Education) Second Edition.
2. C.K. Toh, "Ad Hoc Mobile Wireless Networks: Protocols & Systems", (Pearson Edu.)
3. Rajkamal, "Mobile Computing" (Oxford University Press).
4. George A, "Mobile Ad Hoc Networks: From Wireless LANs to 4G Networks" (TMH).

1KMEF6

Algorithmics-Lab: Based on 1KMEF2 Algorithmics.

1KMEF7

Operating System Design Lab: Based on 1KMEF3 Operating System Design.

SEMESTER : SECOND

2KMEF1 NETWORK SYSTEMS DESIGN

Unit I: Network analysis, architecture and design process overview. System and service descriptions, services and performance characteristics. Network supportability. Requirements Analysis: user-, application-, device-, network- and performance requirements.

Unit II: Requirement Analysis: process; gathering and listing requirements, service metrics development, behavior characterization, RMA -, delay-, capacity-, supplemental performance requirements development. Requirement mapping. Specifications development.

Unit III: Flow analysis: Basics, flow identification and development, Flow models, flow prioritization, flow specifications. Network

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architecture: component architectures, reference architecture, architectural models, systems and network architectures.

Unit IV: Addressing and routing architecture: Fundamentals, Addressing mechanisms, Routing mechanisms, Addressing strategies, Routing strategies. Architectural considerations for addressing and routing.

Unit V: Network Management Architecture: Objectives and basics, Defining Network Management, Network Management Mechanisms, Architectural considerations for network management architecture.

Unit VI: Performance Architecture: Objectives and basics, Performance Mechanisms, Architectural considerations for Performance mechanisms. Network layout, Design traceability and Design metrics.

Text Books:

James D. McCabe, "Network Analysis, Architecture, and Design" (2/e) Morgan Kaufmann 2003.

Reference Books:

1. Andrew S. Tenanbaum "Computer Networks", 4th Ed., Pearson Education.
2. James F. Kurose, Keith W. Ross "Computer Networking: A Top-Down Approach" TMH.
3. William Stallings "Data and Computer Communications" 7th Ed., Pearson Education.
4. Priscilla Oppenheimer "Top-Down Network Design" Second Edition, Cisco Press, 200

2KMEF2/2RMEF2/2RME2
ADVANCED COMPILING TECHNIQUES

Unit I: Symbol-Table Structure: Storage Classes, Visibility, and Lifetimes, Symbol Attributes and Symbol-Table Entries, Local Symbol-Table Management, Global Symbol-Table Structure, Storage Binding and Symbolic Registers, Approaches to Generating Loads and Stores.

Unit II: Intermediate Representations: Issues in Designing an Intermediate Language, High-Level, Medium-Level and Low-Level Intermediate Languages, Multi-Level Intermediate Languages, Sample Intermediate Languages: MIR, HIR, and LIR, Representing MIR, HIR and LIR. ICAN Naming of Data Structures, Routines to Manipulate Intermediate Code.

Unit III: Run-Time Support: Data Representations and Instructions, Register Usage, The Local Stack Frame, The Run-Time Stack, Parameter-Passing Disciplines, Procedure Prologues, Epilogues, Calls, and Returns, Code Sharing and Position-Independent Code, Symbolic and Polymorphic Language Support.

Unit IV: Producing Code Generators Automatically: Introduction, need and applications to Automatic production of Code Generators, a Syntax-Directed Technique. Introduction to Semantics-Directed Parsing, Tree Pattern Matching and Dynamic Programming.

Unit V: Control-Flow Analysis: Various Approaches, Depth-First Search, Preorder Traversal, Post order Traversal, Breadth-Firs Search, Dominators and Post dominators, Loops, Strongly Connected Components, Reducibility, Interval Analysis, Control Trees, Structural Analysis.

Unit VI: Data-Flow Analysis: Basic Concepts, Taxonomy of Data-Flow Problems, Solution Methods: Iterative, Lattices of Flow Functions and Control-Tree-Eased. Structural Analysis, Interval Analysis, Du-Chains, Ud-Chains, Webs, SSA Form. Dealing with Arrays, Structures, and Pointers. Automating Construction of Data-Flow Analyzers.

Text Book:
Steven S. Muchnick, "Advanced Compiler Design Implementation" (Hartcourt Asia- Morgan Kaufman).

Reference Books:

1. Aho, Sethi, Ullman, "Compilers: Principles Techniques and Tools" (Pearson).
2. D. M. Dhamdhere, "Compiler Construction" (2/e), Macmillan.
3. Cooper & Torczon, "Engineering a Compiler" Elsevier.
4. K C. Louden, "Compiler Construction: Principles and Practice" Cengage.

2KMEF3 EMBEDDED SYSTEM DESIGN

UNIT I Architecture of Embedded System, Hardware Architecture, Software Architecture, RTOS, Architecture of Kernel ,Features/ Characteristics of RTOS,. Task Scheduling, Signals, Events, Queues, Mail Boxes, Semaphores, Creation of Threads and Inter Thread Communication, Memory Management

UNIT II Detailed study of PIC18 Family Microcontroller Architecture, Pin Description, File Structure, Status Register, PIC data formats, Directives, RISC Architecture in PIC, SFR, PIC18

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"Recognized by A.I.C.T.E., New Delhi" Affiliated to Sant Gadge Baba Amravati University, Amravati
"Approved by the D.T.E., M.S. Mumbai"

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Hardware Connections, PIC 18 Timers, PIC 18 Serial Port, PIC 18 Interrupts. Features of ATMEL, ARM, AVR Microcontrollers.

UNIT III PIC 18 Instruction set, Programming using C / Assembly: Data types, time delays, I/O Programming, Data Conversion, Timer/ Counter, Serial Port, Interrupt programming, ADC,DAC, Sensor Interfacing.

UNIT IV Clock-Driven Scheduling: Notation and Assumptions, Static, Timer Driven Scheduler, General structure of Cyclic Schedules, Cyclic Executives, Improving the Average Response Time of periodic Jobs, Scheduling Sporadic Jobs, Practical Consideration and Generalizations, Algorithms for Constructing Static Schedules, Pros and Cons of Clock-Driven Scheduling.

UNIT V Priority-Driven Scheduling of Periodic Tasks: Static Assumption, Fixed-Priority versus Dynamic-Priority Algorithms, Maximum Schedulable Utilization, Optimality of the RM and DM Algorithms, A Schedulability Test for Fixed-Priority Tasks with Short Response Times, Schedulability Test for Fixed-Priority Tasks with Arbitrary Response Times, Sufficient Schedulability Conditions for the RM and DM Algorithms.

UNIT VI Scheduling Aperiodic and Sporadic Jobs in Priority-Driven Systems: Assumption and Approaches, Deferrable Servers, Sporadic Servers, Constant Utilization, Total Bandwidth, and Weighted Fair Queuing Servers, Scheduling of Sporadic Jobs, Real-time Performance for Jobs with Soft Timing Constraints.

TEXT BOOKS:

1. Dr. K.V. K. K. Prasad "Embedded / Real Time System : Concepts, Design, & Programming" Dreamtech Press Publication
2. Mohammad Ali Mazidi, Rolin D. Mckinly, Danny Causey: "PIC Microcontroller and Embedded system using Assembly and C for PIC18" Pearson Education
3. Jane W.S. Liu : Real Time System, Pearson Education

REFERENCE BOOKS:

1. Raj Kamal, "Embedded Systems Architecture, Programming and Design", Tata McGraw-Hill
2. John B. Beatman, Design with PIC Microntroller, Prentice Hall
3. Barry B. Brey, Applying PIC18 Microntroller, Architecture, Programming and Interfacing using C and Assembly, Prentice Hall.
4. Phillip A. Laplante: Real-Time Systems Design and Analysis, (Wiley InterScience)

2KMEF4 ELECTIVE

(1) HUMAN COMPUTER INTERFACES

UNIT-I: Human factors of interactive software: Goals of system engineering & User-interface design, motivation for human factors, accommodation of human diversity, High level theories, Object-Action interface model, Recognition of the diversity, Eight golden rules of interface design, Preventing errors, Guidelines for data display and data entry, Balance of automation and human control.

UNIT-II: Managing design process, Organizational design to support usability, the three pillars of design, Development methodologies, ethnographic observation, Participatory Design, Scenario Development, Social impact statement for early design review, legal issues, Software tools: specification methods, Interface-Building tools, Evaluation and Critiquing tools.

UNIT-III: Direct manipulation and virtual environments, example of direct manipulation system, Explanations of direct manipulation, OAI model, Visual thinking and icons, direct manipulation programming, home automation, Remote Direct manipulation, Virtual environments.

UNIT-IV: Interaction devices: Keyboards and function keys, Pointing devices, Speech recognition , digitization and generation, Image and Video Displays, Printers. Response time and Display rate: Theoretical foundations, Expectations and attitudes, User Productivity, Variability.

UNIT-V: Multiple window strategies, Individual windows design, multiple window design, Coordination by tightly coupled windows, Image browsing and tightly coupled windows, Personal role management and elastic windows. Computer supported cooperative work: Goals of Cooperation, Asynchronous interaction, Synchronous distributed and face-to-face, applying CSCW to education.

UNIT-VI: Information search and visualization, Database Query and phrase search in textual documents, multimedia documents searches, Information visualization, advanced filtering. Hypermedia and the World Wide Web, Genres and goals and designers, Users and their tasks, Object action interface model for web site design.

Text Book

Ben Shneiderman "Designing the User Interface" (Pearson Education)

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Website- www.ssgmce.ac.in

Reference Books:

1. R. Beale, A.J. Dix, J. E. Finlay, G. D. Abowd "Human Computer Interaction" (Prentice-Hall).
2. Joann Hackos, Janice Redish, "User and Task Analysis for Interface Design"(Wiley).
3. Jeff Raskin, "The Humane Computer Interface" (Pearson Education).
4. Jesse James Garrett, "The Elements of User Experience" (New Riders)

2KMEF4 ELECTIVE

(2) SYSTEMS SECURITY

UNIT-I Introduction: Security, Attacks, Computer criminals, Method of Defense. Cryptography: Substitution ciphers, Transpositions, Symmetric and asymmetric systems, cryptanalysis, data encryption standard, AES Encryption algorithms Public Key Cryptography, RSA Algorithms, Uses of Encryptions.

UNIT-II Program Security: Secure programs, Non-malicious program errors, Computer Viruses and Other malicious code, Targeted malicious code, controls against program threats.

UNIT-III Operating System Security: Protected Objects and methods of protection, Memory address protection, Control of access to general objects, File protection Mechanism, User Authentication: Authentication basics, Password, Biometrics.

UNIT-IV Trusted Operating System, Security Policies, models of Security, Trusted Operating System, Design, Design elements , security features of ordinary and Trusted Operating System, Kernalised design , separation , virtualizations , Layered design , typical OS Flows assurance method , Open Source Evolutions.

UNIT-V Database Security: Security requirements for Database, Reliability and integrity, sensitive data, interface, multilevel database, Proposals for multilevel security: separations, design of multilevel secure databases, Trusted Front-end Practical issues.

UNIT-VI Networks Security: Threats in networks, Network security controls, Firewalls, Intrusion detection systems, Secure E-mail. Administrating Security: Planning, Risk Analysis, Organization, security policies, Physical security.

Text Book:

C.P. Pfleeger and S. L. Pfleeger, "Security in Computing", Pearson Education (LPE)

Reference Books:

1. Stallings, "Cryptography and Network Security:" Pearson Education (LPE)
2. Matt Bishop, "Computer Security: Art and Science", Pearson Education
3. Kaufman, Perlman, Speciner, "Network Security" PHI.
4. Eric Malwald, "Network Security: A Beginner's Guide", TMH

2KMEF4 ELECTIVE

(3) IMAGE PROCESSING & COMPUTER VISION

Unit-I: Introduction to image processing, computer vision. Digitized images: basic concepts, image digitization, sampling, and quantization, digital image properties. Data structures for image analysis: traditional data structures and hierarchical data structures.

Unit-II: Image pre-processing: pixel brightness transformation, geometrical transformation, local pre-processing, image smoothing, edge detection, scaling, parametric edge models, multi-spectral images, adaptive neighborhood pre-processing, image restoration.

Unit-III: Image Segmentation: Thresholding, threshold detection methods, optimal thresholding, Edge-based segmentation, edge image thresholding, edge relaxation, border tracing and detection, Hough transforms, region-based segmentation and matching.

Unit-IV: Shape: Region identification, contour-based shape representation and description, region-based shape representation and description, shape classes. Object recognition: knowledge representation, statistical pattern recognition, syntactic pattern recognition.

Unit-V: Image Understanding: parallel, serial processing and hierarchical control, bottom-up, model-based and combined control strategies, point distribution models, contextual image classification, scene labeling & constraint propagation, semantic region growing.

Unit-VI: Linear discrete image transforms: Fourier, Hadamard, Discrete Cosine and Wavelets. Applications of these transforms. Image data compression: predictive methods, vector quantization, Hierarchical, progressive compression. JPEG & MPEG image compression.

Text Book:

Sonka M, Hlavac H, Boyle R "Image Processing, Analysis, and Machine Vision", (2/e) Brooks/Cole Thomson Learning.

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Fax : 091-7265-252346 Website- www.ssgmce.ac.in

Reference Books:

1. Gonzalez and Woods, "Digital Image Processing" (2/e) Pearson Education.
2. Forsyth, "Computer Vision" Pearson Education.
3. Chanda and Majumdar, "Digital Image Processing and Analysis" PHI.
4. Horn B K P, "Robot Vision" MIT Press, Cambridge, MA.

2KMEF5 Technical Paper Writing: Practice of technical paper writing as per IEEEE or ACM standards.

2KMEF6 Seminar: Based on recent trends in Computer Engineering taken form the Journals like IEEE transactions or ACM transactions.

2 KMEF7 Advanced Compiling Techniques Lab: Based on 2KMEF2 Advanced Compiling Techniques

2KMEF8 Embedded Systems Design Lab: Based on 2KMEF3 Embedded Systems Design.

****

THIRD SEMESTER

3KMEF1 SEMINAR AND DISSERTATION

FOURTH SEMESTER

4KMEF1 SEMINAR AND DISSERTATIONI

****

B.E. Sem-VII,VIII / **B.Arch.** Sem-VII-X **Prospectus No.** 141711

संत गाडगे बाबा अमरावती विद्यापीठ

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(Faculty of Engineering & Technology)

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SANT GADGE BABA AMRAVATI UNIVERSITY

SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

(1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.

(2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc., refer the University Ordinance Booklet the various conditions/provisions pertaining to examination as prescribed in the following Ordinances.

Ordinance No. 1	:	Enrolment of Students.
Ordinance No. 2	:	Admission of Students
Ordinance No. 4	:	National cadet corps
Ordinance No. 6	:	Examinations in General (relevent extracts)
Ordinance No. 18/2001	:	An Ordinance to provide grace marks for passing in a Head of passing and Inprovement of Division (Higher Class) and getting Distinction in the subject and condonation of defficiency of marks in a subject in all the faculties prescribed by the Statute No.18, Ordinance 2001.
Ordinance No. 9	:	Conduct of Examinations (relevent extracts)
Ordinance No. 10	:	Providing for Exemptions and Compartments
Ordinance No. 19	:	Admission of Candidates to Degrees.

Ordinance No. 109	:	Recording of a change of name of a University student in the records of the University.
Ordinance No. 5/2010	:	For improvement of Division/Grade.
Ordinance No.19/2001	:	An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Dineshkumar Joshi
Registrar
Sant Gadge Baba Amravati University

PATTERN OF QUESTION PAPER ON THE UNIT SYSTEM

The pattern of question paper as per unit system will be boradly based on the following pattern.

(1) Syllabus has been divided into units equal to the number of question to be answered in the paper. On each unit there will be a question either a long answer type or a short answer type.

(2) Number of question will be in accordance with the unit prescribed in the syllabi for each paper i.e. there will be one question on each unit.

(3) For every question long answer type or short answer type there will be an alternative choice from the same unit. However, there will be no internal choice in a question.

(4) Division of marks between long answer and short answer type question will be in the ratio of 40 and 60.

(5) Each short answer type question shall Contain 4 to 8 short sub question with no internal choice.

DIRECTION

No. 31/2011 Date : 10-06-2011

Subject :- Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering & Technology.

Whereas faculty of Engineering & Technology in its meeting held on 6th June, 2011 vide Item No.39 accepted and recommended schemes of teaching & examinations of semesters III to VIII/X as per Credit Grade System of various branches in the faculty of Engineering & Technology for its implementation from the session 2011-2012 in phase wise manner,

AND

Whereas the schemes of teaching & examinations of semesters III to VIII/X as per Credit Grade System of various branches in the faculty of Engineering & Technology were accepted by the Hon'ble Vice Chancellor u/s Section 14(7) of M.U.Act, 1994 on behalf on Academic Council on 9th April, 2011,

AND

Whereas these schemes of teaching & examinations of various branches as per Credit Grade System in the faculty of Engineering & Technology are required to be regulated by the Regulation,

AND

Whereas the process of making the Regulation is likely to take some time,

AND

Whereas the schemes of various branches as pere Credit Grade System in the faculty of Engineering & Technology are to be implemented from the academic session 2011-2012,

AND

Whereas syllabi of various branches in the faculty of Enginering & Technology are to be sent for printing,

Now, therefore, I, Dr.Mohan K.Khedkar, Vice-Chancellor of Sant Gadge Baba Amravati University in exercise of powers conferred upon me under sub section (8) of Section 14 of the Maharashtra Universities Act,1994 hereby direct as under :-

1) This Direction shall be called ñSchemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Enginering & Technology, Direction, 2011".
2) This Direction shall come into force from the date of its issuance.
3) Schemes of teaching and examinations of III to VIII/X semesters as per Credit Grade System of the following branches shall be as per respective Appendices appended with this Direction :-

	BRANCH	**Appendix No.**
1)	Civil Engineering	A
2)	Mechanical Enginering	B
3)	Production Engineering	C
4)	Electrical Engineering (Electronics & Power)	D
5)	Electrical and Electronics Engineering	E
6)	Electrical Enginering (Electrical & Power)	F
7)	Electrical Enginering	G
8)	Electronics & Telecommunications Engineering	H
9)	Electronics Engineering	I
10)	Instrumentation Engineering	J
11)	Computer Science & Engineering	K
12)	Computer Engineering	L
13)	Architecture	M
14)	Textile Engineering	N
15)	Chemical Engineering	O
16)	Chemical Technology (Polymer) (Plastic) Technology	P
17)	Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical Technology)	Q
18)	Information Technology	R
19)	Biomedical Engineering	S

sd/-
Dr.Mohan K.Khedkar
Vice Chancellor

****

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH - CIVIL ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH

Appendix - A

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
													EXTERNAL	INTERNAL		
THEORY																
01	7CE01	*Theory of Stuctures-II*	3	1	-	4	4	3	80	20	100	40	-	-	-	-
02	7CE02	*Geotechnical Engineering-II*	3	1	-	4	4	3	80	20	100	40	-	-	-	-
03	7CE03	*Structural Design-II*	4	-	-	4	4	4	80	20	100	40	-	-	-	-
04	7CE04	*Environmental Engineering-I*	4	-	-	4	4	3	80	20	100	40	-	-	-	-
05	7CE05	*Professional Elective-I*	4	-	-	4	4	3	80	20	100	40	-	-	-	-
PRACTICALS / DRAWING / DESIGN																
06	7CE06	*Theory of Stuctures-II - Lab*	-	-	2	2	1	-	-	-	-	-	25	25	50	25
07	7CE07	*Geotechnical Engineering-II - Lab*	-	-	2	2	1	-	-	-	-	-	25	25	50	25
08	7CE08	*Structural Design-II - Lab*	-	-	2	2	1	-	-	-	-	-	25	25	50	25
09	7CE09	*Project & Seminar*	-	-	2	2	4	-	-	-	-	-	-	50	50	25
		Total	18	2	8	28	27				500				200	
															GRAND TOTAL : 700	

Professional Elective-I (i) Advanced Water Treatment (ii) Advanced Geotechnical Engineering (iii) Water Power Engineering (iv) Prestressed Concrete (v) Artificial Neural Network & Fuzzy Logic (vi) Advanced Concrete Technology (vii) Environmental Pollution & Rural Sanitation (viii) Advanced Earthquake Engineernig

SEMESTER : EIGHTH

THEORY																
01	8CE01	*Water Resources Engineering-II*	3	-	-	3	3	3	80	20	100	40	-	-	-	-
02	8CE02	*Environmental Engineering-II*	3	-	-	3	3	3	80	20	100	40	-	-	-	-
03	8CE03	*Project Planning & Management*	3	-	-	3	3	3	80	20	100	40	-	-	-	-
04	8CE04	*Professional Elective-II*	4	-	-	4	4	3	80	20	100	40	-	-	-	-
PRACTICALS / DRAWING / DESIGN																
05	8CE05	*Water Resources Engineering-II-Lab*	-	-	2	2	1	-	-	-	-	-	25	25	50	25
06	8CE06	*Environmental Engineering-II - Lab*	-	-	2	2	1	-	-	-	-	-	25	25	50	25
07	8CE07	*Project & Seminar*	-	-	6	6	12	-	-	-	-	-	75	75	150	75
		Total	13		10	23	27				400				250	
															GRAND TOTAL : 650	

*Professional Elective-II *(i) Advanced Design of Steel Structures (ii) Advanced Waste Water and Industrial Waste Treatment (iii) Finite Element Method (iv) Dam Engineering (v) Advanced Engineering Geology (vi) Matrix Computer Analysis of Structures (vii) Advanced Structural Analysis (viii) Rock Mechanics *(ix) Advanced Design of RCC Structures*
** PAPER 4 HOURS DURATION.*

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH - MECHANICAL ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH

Appendix - B

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hrs.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	7ME01	Machine Design & Drawing-II	3	-	-	3	3	4	80	20	100	40	-	-	-	-
02	7ME02	Energy Conversion-II	3	1	-	4	4	3	80	20	100	40	-	-	-	-
03	7ME03	Industrial Management and Costing	3	1	-	4	4	3	80	20	100	40	-	-	-	-
04	7ME04	Automation Engineering	3	1	-	4	4	3	80	20	100	40	-	-	-	-
05	7ME05	Professional Elective-I	3	1	-	4	4	3	80	20	100	40	-	-	-	-
PRACTICALS / DRAWING / DESIGN																
06	7ME06	Project & Seminar	-	-	2	2	4	-	-	-	-	-	-	50	50	25
07	7ME07	Machine Design & Drawing-II-Lab.	-	-	2	2	1	-	-	-	-	-	25	25	50	25
08	7ME08	Energy Conversion-II-Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
09	7ME09	Automation Engineering-Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
10	7ME10	Professional Elective-I - Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
		Total	15	1	10	29	27				500				250	
															GRAND TOTAL : 750	

Professional Elective-I (1) Non Conventional Energy System (2) Tool Engineering (3) Artificial Intelligence & Expert Systems (4) Mechatronics

SEMESTER : EIGHTH

THEORY																
01	8ME01	Elective-II	3	-	-	3	3	3	80	20	100	40	-	-	-	-
02	8ME02	Elective-III	3	-	-	3	3	3	80	20	100	40	-	-	-	-
03	8ME03	I.C. Engines	3	-	-	3	3	3	80	20	100	40	-	-	-	-
04	8ME04	Opertaions Research Techniques	3	-	-	3	3	3	80	20	100	40	-	-	-	-
PRACTICALS / DRAWING / DESIGN																
05	8ME05	Project & Seminar	-	-	6	6	12	-	-	-	-	-	75	75	150	75
06	8ME06	Professional Elective-III-Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
07	8ME07	I.C. Engines-Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
08	8ME08	Opertaions Research Techniques-Lab	-	-	2	2	2	-	-	-	-	-	25	25	50	25
		Total	12	-	12	24	27				400				300	
															GRAND TOTAL : 700	

Professional Elective-II (1) Automobile Engineering (2) Production Planning & Control (3) Management Information Systems (4) Advanced Manufacturing Systems
Professional Elective-III 1) Refrigeration & Air Conditioning 2) Machine Tool Design 3) Finite Element Methods 4) Robotics

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH - ELECTRICAL ENGINEERING (ELECTRONICS & POWER) - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH

Appendix - C

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
													EXTERNAL	INTERNAL		
THEORY																
01	7EP01	Control System II	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	7EP02	Power System Operation & Control	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	7EP03	Electrical Power - II	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	7EP04	Switchgear & Protection	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	7EP05	Professional Elective - I *	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	7EP06	Project & Seminar	_	_	2	2	4	_	_	_	_	_	0	50	50	25
07	7EP07	Electrical Power - II- Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	7EP08	Switchgear & Protection- Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	20	_	6	26	26				500				150	
															TOTAL	650

* Professional Elective - I 1] Process Control System 2] Computer organisation 3] Computer Methods in Power System Analysis 4] Artificial Intelligence

SEMESTER - EIGHTH

THEORY																
01	8EP01	Power System Stability	3	_	_	3	3	3	80	20	100	40	_	_	_	_
02	8EP02	High Voltage Engineering	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	8EP03	Digital Signal Processing	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	8EP04	Professional Elective - II**	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8EP05	Project & Seminar	_	_	6	6	12	_	_	_	_	_	75	75	150	25
06	8EP06	Digital Signal Processing- Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	14	0	8	22	27				400				200	
															TOTAL	600

** Professional Elective - II 1] Electric Drives & Control 2] Power Quality 3] Embedded Syatems 4] Generalised Machine Theory

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH - ELECTRICAL & ELECTRONICS ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH

Appendix - D

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
													EXTERNAL	INTERNAL		
THEORY																
01	7EX01	Utilisation of Electrical Energy	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	7EX02	Electronic Communication	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	7EX03	Computer Organisation	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	7EX04	Power Electronics - II	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	7EX05	Professional Elective - I *	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	7EX06	Project & Seminar	_	_	2	2	4	_	_	_	_	_	_	50	50	25
07	7EX07	Utilisation of Electrical Energy-Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	7EX08	Computer Organisation-Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	7EX09	Power Electronics - II-Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	20	_	8	28	27				500				200	
															TOTAL	700

* Professional Elective - I 1] Process Control System 2] Power System Simulation 3] High Voltage Engineering 4] Wind Electrical Systems

SEMESTER : EIGHTH

THEORY																
01	8EX01	Power System Operation & Control	3			3	3	3	80	20	100	40				
02	8EX02	Switchgear & Protection	3	_	_	3	3	3	80	20	100	40	_	_	_	_
03	8EX03	Embedded Systems	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	8EX04	Professional Elective - II**	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8EX05	Project & Seminar	_	_	6	6	12	_	_	_	_	_	75	75	150	25
06	8EX06	Embedded Systems-Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	14	_	8	22	27				400				200	
															TOTAL	600

***** Professional Elective - II 1]Power System Management 2] Fuzzy Logic & Control 3] RPC & Facts Controller 4] Power Quality***

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH - ELECTRICAL ENGINEERING (ELECTRICAL & POWER) - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

Appendis - E

SEMESTER - SEVENTH

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	7EL01	Control System II	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	7EL02	Power System Operation & Control	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	7EL03	Electrical Power - II	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	7EL04	Switchgear & Protection	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	7EL05	Professional Elective - I *	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	7EL06	Project & Seminar	_	_	2	2	4	_	_	_	_	_	0	50	50	25
07	7EL07	Electrical Power - II-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	7EL08	Switchgear & Protection-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	20	_	6	26	26				500				150	
															TOTAL	650

**** Professional Elective - I 1] Process Control System 2] Wind Electric Systems 3] Computer Methods in Power System Analysis 4] Artificial Intelligence***

THEORY			Semester : Eighth													
01	8EL01	Power System Stability	3	_	_	3	3	3	80	20	100	40	_	_	_	_
02	8EL02	High Voltage Engineering	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	8EL03	Digital Signal Processing	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	8EL04	Professional Elective - II**	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8EL05	Project & Seminar	_	_	6	6	12	_	_	_	_	_	75	75	150	25
06	8EL06	Digital Signal Processing Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	14	_	8	22	27				400				200	
															TOTAL	600

***** Professional Elective - II 1]Electric Drives & Control 2] Power Quality 3] Power System Management 4] Generalised Machine Theory***

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH : ELECTRICAL ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH

Appendix - F

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	7EE01	Control System II	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	7EE02	Power System Operation & Control	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	7EE03	Electrical Power - II	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	7EE04	Switchgear & Protection	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	7EE05	Professional Elective - I *	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	7EE06	Project & Seminar	_	_	2	2	4	_	_	_	_	_	0	50	50	25
07	7EE07	Electrical Power - II -Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	7EE08	Switchgear & Protection -Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	20	_	6	26	26				500				150	
															TOTAL	650

**** Professional Elective - I 1] Process Control System 2] Wind Electrical Systems 3] Computer Methods in Power System Analysis 4] Artificial Intelligence***

Semester : Eighth

THEORY																
01	8EE01	Power System Stability	3	_	_	3	3	3	80	20	100	40	_	_	_	_
02	8EE02	High Voltage Engineering	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	8EE03	Digital Signal Processing	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	8EE04	Professional Elective - II**	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8EE05	Project & Seminar	_	_	6	6	12	_	_	_	_	_	75	75	150	25
06	8EE06	Digital Signal Processing -Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	14	_	8	22	27				400				200	
															TOTAL	600

***** Professional Elective - II 1] Electric Drives & Control 2] Power Quality 3] Power System Management 4] Generalised Machine Theory***

FIVE YEAR DEGREE COURSE IN BRANCH OF ARCHITECTURE

SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH

Appendix - G

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
1	07AR01	Advance Construction - I	2	_	_	2	2	4	80	20	100	40	_	_	_	_
2	07AR02	Environmental Services - I	3	_	_	3	3	3	80	20	100	40	_	_	_	_
3	07AR03	Professional Practice	3	_	_	3	3	3	80	20	100	40	_	_	_	_
4	07AR04	Urban Planning	2	_	_	2	2	3	80	20	100	40	_	_	_	_
5	07AR05	Architectural Structure - VI	2	1	_	3	3	3	80	20	100	40	_	_	_	_
SESSIONAL / PRACTICAL																
6	07AR06	Architectural Design Studio - VII	_	_	8	8	8	_	_	_	_	_	100	100	200	100
7	07AR07	Advance Construction Studio - I	_	_	4	4	2	_	_	_	_	_	25	25	50	25
8	07AR08	Urban Planning Studio	_	_	4	4	2	_	_	_	_	_	25	25	50	25
		Total	12	1	16	29	25				***500***				***300***	
															TOTAL	***800***

Note: Consider one hour Lecture / Tutorial and P/D is equal to one credit for the subjects of Architectural Design and for all other subjects consider 1hour Lecture & Tutorial = 1credit & 2hour Practical /Design studio. = 1 credit .

Semester : Eighth																
THEORY																
1	08AR01	Architectural Design - VIII	2	_	_	2	2	24	200	_	200	80	_	_	_	_
2	08AR02	Advance Construction - II	2	_	_	2	2	4	80	20	100	40	_	_	_	_
3	08AR03	Environmental Services - II	3	_	_	3	3	3	80	20	100	40	_	_	_	_
4	08AR04	Sustanaible Architecture	3	_	_	3	3	3	80	20	100	40	_	_	_	_
5	08AR05	Landscape Design	2	_	_	2	2	3	80	20	100	40	_	_	_	_
6	08AR06	Professional Elective - I	3	_	_	3	3	3	80	20	100	40	_	_	_	_
SESSIONAL / PRACTICAL																
7	08AR07	Architectural Design Studio - VIII	_	_	6	6	6	_	_	_	_	_	100	100	200	100
8	08AR08	Advance Construction Studio - II	_	_	4	4	2	_	_	_	_	_	25	25	50	25
9	08AR09	Landscape Design Studio	_	_	4	4	2	_	_	_	_	_	25	25	50	25
		TOTAL	15	_	14	29	25				***700***				***300***	
															TOTAL	***1000***

Professional Elective-I 1) Housing 2) Environmental Planning 3) Construction Management

SEMESTER : NINETH

			TEACHING SCHEME						EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
													EXTERNAL	INTERNAL		
SESSIONAL / PRACTICAL																
1	09AR01	Practical Training	_	_	_	_	26	_	_	_	_	_	***150***	***150***	***300***	***150***
		Total	_	_	_	_	26	_	_	_	_	_	_	_	***300***	_
Practical Training shall be for six month in architectural firms approved by the institutions															Total	300
SEMESTER: TENTH																
THEORY																
1	010AR01	Professional Elective – II	2	***1***	_	3	3	3	80	***20***	100	40	-	-	-	-
SESSIONAL / PRACTICAL																
2	010AR02	Architectural Project / Thesis	-	***6***	***12***	18	18	-	-	-	-	-	***200***	***100***	***300***	***150***
3	010AR03	Seminar	-	-	***6***	6	13	-	-	-	-	-	-	***100***	***100***	***50***
		Total	2	***7***	***18***	27	24				100	-	-	-	***400***	-
Professional Elective – II 1) Industrial Architecture 2) Climate Responsive Architecture 3) Vernacular Architecture															Total	500

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH : INFORMATION TECHNOLOGY - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

Appendix - H

SEMESTER - SEVENTH

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	7IT01	Digital Signal Processing	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	7IT02	Object Oriented System Analysis & Design	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	7IT03	Web Technology	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	7IT04	Real Time Embedded Systems	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	7IT05	Professional Elective I*	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	7IT06	Digital Signal Processing-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	7IT07	Web Technology-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	7IT08	Real Time Embedded Systems-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	7IT09	Project & Seminar	_	_	2	2	4	_	_	_	_	_	_	50	50	25
		TOTAL	20	_	8	28	27				500				200	
														TOTAL	700	

Professional Elective I* (i) Distributed DBMS (ii) Modelling & Simulation (iii)Artificial Intelligence & Expert Systems (iv) Multimedia Technologies

Semester :EIGHTH																
THEORY																
01	8IT01	Digital & Wireless Communication	3	_	_	3	3	3	80	20	100	40	_	_	_	_
02	8IT02	Network Administration & Security	3	_	_	3	3	3	80	20	100	40	_	_	_	_
03	8IT03	Software Engineering	3	_	_	3	3	3	80	20	100	40	_	_	_	_
04	8IT04	Professional Elective II*	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8IT05	Network Administration & Security-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
06	8IT06	Software Engineering-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	8IT07	Computer Lab-V (Content Management System)	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	8IT08	Project & Seminar	_	_	6	6	12	_	_	_	_	_	75	75	150	75
		TOTAL	12	_	12	24	27				400				300	
														TOTAL	700	

Professional Elective II* (i) Data Warehousing & Data Mining (ii) Web-Commerce (iii) Cloud Computing (iv) Neural Networks & Fuzzy Logics

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH : BIOMEDICAL ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH

Appendix - I

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	7BM01	Bio Signal Processing	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	7BM02	Artificial Organs and Rehabilitation Engineering	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	7BM03	Medical Expert Systems	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	7BM04	Hospital Engineering & Management	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	7BM05	Professional Elective-I *	4	_	_	4	4	3	80	20	100	40				
PRACTICALS / DRAWING / DESIGN																
06	7BM06	Bio Signal Processing-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	7BM07	Medical Expert Systems-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	7BM08	Hospital Engineering & Management-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	7BM09	Project and Seminar	_	_	2	2	4	_	_	_	_	_	_	50	50	25
		TOTAL	20	_	8	28	27				500				200	
															TOTAL	700

Professional Elective-I * (i) Tissue Engineering
(ii) Bio Informatics

Semester : Eighth

THEORY																
01	8BM01	Professional Ethics & Values	3	_	_	3	3	3	80	20	100	40	_	_	_	_
02	8BM02	Bio Medical Imaging Systems	3	_	_	3	3	3	80	20	100	40	_	_	_	_
03	8BM03	Professional Elective-II*	3	_	_	3	3	3	80	20	100	40	_	_	_	_
04	8BM04	Bio Medical Embedded System Design	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8BM05	Bio Medical Imaging Systems-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
06	8BM06	Bio Medical Embedded System Design-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	8BM07	Project and Seminar	_	_	6	6	12	_	_	_	_	_	75	75	150	75
		TOTAL	13	_	10	23	27				400				250	
															TOTAL	650

Professional Elective - II *i) Bio-Inspired Algorithm ii) Biofluids & Dynamics*

SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
CIVIL ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER SEVEN

7CE01 THEORY OF STRUCTURES – II

SECTION - A

Unit-I: 1. Moment distribution method, application to portal frames with sway. Multibay, multistoried, symmetrical frames subjected to symmetric loads only.
2. Slope deflection method: Application to portal frames with side sway.

Unit-II: 1. Kaniôs method: Continuous beams and single bay single storey portal frames with side sway.
2. Multi- bay, multi storeyed frames subjected to symmetric loads.

Unit-III: 1. Castiglianoôs second theorem, principle of least work, Analysis of redundant frames. (up to two degree redundancy).
2. Analysis of redundant trusses (up to second degree of redundancy), lack of fit, temperature effect.

SECTION - B

Unit-IV : 1. Maxwellôs reciprocal theorem, Bettyôs theorem, Muller - Breslauôs principle, Influence line diagrams for continuous beams, upto two span only.
2. Tension coefficient method & its applications to simple space trusses.

Unit-V: 1. Flexibility method, static redundancy, flexibility coefficients, compatibility condition application to beams.
2. Introduction to plastic analysis of steel structure, shape factor, plastic section modulus, Redistribution of moment, upper and lower bound theorems, collapse loads for beams, single bay, single storey portals.

Unit-VI: Stiffness method, kinematic redundancy, stiffness coefficients, direct stiffness approach, application to continuous beams and single - bay, single - storey portal.

BOOKS RECOMMENDED:

1. Junnarkar, S. B., Mechanics of Structure, Volume I and II
2. Jain and Arya, Theory and Analysis of Structures

3. Reddy. C. S., Basic Structural Analysis, Tata McGraw Hill
4. Wang, C. K., Elementary Analysis of Structures
5. Norris and Wilbur, Elementary Structural Analysis

7CE02 GEOTECHNICAL ENGINEERING – II

SECTION – A

Unit I: Exploratory Programme : Field exploration, objectives and methods of exploration planning of exploration programme soil boring , hand augers, percussion boring, rotary wash boring, collection of sample, split spoon sampler, area ratio, disturbed and undisturbed sample, SPT test, field vane shear test, geophysical methods, electrical resistivity and soil refraction methods. Soil log bore presentation and interpretation exploration data.

Unit II: Bearing Capacity of Shallow foundation :- Different theories: Terzaghiôs skemptonôs, Meyerhofôs, BIS method for bearing capacity , determination bearing capacity of granular soils based on SPT value. concept of raft foundation and floating foundation.
In situ methods of evaluation of bearing capacity, plate load test, static cone penetrometer, pressure meter test contact pressure distribution diagram below the base of footing.

Unit III: Earth pressure at rest, general & local Stages of plastic equilibrium, Rankineôs and coulombôs theory of active and passive earth pressure on retaining wall. Influence of surcharge, water table, wall friction, Rebhannôs and culmannôs simple graphical methods Ground Improvement : methods of soil stabilization use of admixture (lime, cement, flyash) in stabilization) Mechanism of reinforced soil, use of Geo synthetics material as a reinforcement, vibroflotation, sand drain installation and preloading.

SECTION – B

Unit IV: Pile foundation : Classification of piles and their uses, static analysis, formula for determination of pile capacity for driven and bored pile in sandy and in clayey soil , dynamic pile formula Negative skin friction, factor affecting it, piles in groups and their capacity, group efficiency, factors affecting group efficiency, behavior of group of pile in sandy and in clayey soil, pile load test, effect of pile cap. Criteria for spacing and depth of piles. IS design criterion for undereamed Pile in clay and sands

UnitV: Settlement Evaluation of soils settlement : immediate, primary and secondary settlement for footing resting on homogenous isotropic, cohesive and cohesion less soils related to single footing, combined footing, raft foundation etc, standard for requirement of settlement,

total as well as differential settlement, concept of differential settlement, factors and causes for differential settlement, service loads, proportioning of footing for uniform settlement computation of total and differential settlement of a single pile and group of piles in sandy and clayey soil.

Unit VI : 1. Well foundation : Component & their function, sinking of well, types of force system, and their computation, design criteria for various components of wells, tilting and shifting

2. Design of cantilever retaining wall and counterfort retaining Bearing capacity of well as per IS. Cofferdam purpose, various types their suitability

BOOKS RECOMMENDED :

1) Craig : Soil Mechanics.
2) Bowles J.E. : Foundation Design Analysis.
3) Hanson : Theoretical Soil Mechanics.
4) Peck and Hanson : Foundation Engineering.
5) Tomlinson : Foundation Engineering.
6) Leoner : Foundation Engineering.
7) Bramha : Foundation Engineering.
8) Prakash S. : Analysis and Design of Foundation and Retaining Structure.
9) Kasmalkar : Foundation Engineering.
10) Arora K.R. : Foundation Engineering.
11) Venkataramiah : Soil Mechanics and Foundation Engineering.
12) Rao G.V. : Engineering with Geosynthetics.

7CE03 STRUCTURAL DESIGN – II

SECTION-A

(R.C.C. STRUCTURES BY LIMIT STATE METHOD)

Unit-I : 1. Design of interior panel of flat slab by direct design method. (Problem on square panel only)

2. Design of cantilever retaining wall and Counterfort retaining wall.

Unit II : 1. Design of combined footing.

2. Complete design of simple, small structures like Canopies & Parking shed.

SECTION - B
(PRESTRESSED CONCRETE)

Unit-III : 1. Introduction to Prestressed concrete: Materials and their characteristics, types of prestressing, Methods and various prestressing systems, Losses of prestress

2. Analysis of beams for flexure, under working load for Rectangular and flanged sections.

Unit-IV : 1. Basic Design of rectangular sections for flexure by limit state method, Design of one way single span slabs.

2. Design of prestressed concrete circular water tanks by IS code method.

Students may be shown video CD, slides, transparencies, and photograph of actual structures.

BOOKS RECOMMENDED:

1. Jain, A. K., Reinforced Concrete (Limit State Design)
2. Jaikrishna and Jain, Plain and Reinforced Concrete, Volume I and II
3. Sinham S. N., Reinforced Concrete (Limit State Design)
4. Edward G. Nawy ñPrestressed Concrete- A fundamental Approachò, Prentice Hall
5. Lin, T. Y. and Burns N. H., Design of Prestressed Concrete Structures, John Wiley and Sons.
6. Krishna Raju, N.; Prestressed Concrete Structures; TMH; Delhi)
7. Dr. Shah V.L. & Karve S.R.: Limit State Design.

7CE04 ENVIRONMENTAL ENGINEERING–I

SECTION - A

Unit-I : Quantity Estimation of water: Demand of water. Consumption for various purposes. Fire demand, Per capita demand. Factors affecting consumption. Fluctuation in demand. Design period, forecasting population, and design periods for water supply components.

Sources: Surface sources, ground water sources, Infiltration Galleries, Relative merits of sources, assessment & suitability, selection.

Intake works: Intakes, type, location, requirement & features.

Unit-II : Water quality: Impurities in water, their effects and significance water borne diseases, collection of water samples. Water analysis physical, chemical and bacteriological. Water quality standards: I.S. & WHO, Flow diagrams and layouts of different water treatment works.

Unit-III : Aeration: Purpose, type of gravity, aerator & spray aerators. Sedimentation: Plain and with coagulation, different coagulants used, dose of coagulant, Jar test, coagulant, feeding and mixing devices. Flocculation, clarrifloculator. Design criteria for sedimentation tanks, surface loading, simple problems of design of sedimentation tanks.

SECTION - B

Unit-IV : **Filtration :-** Rapid sand and slow sand filters, filter media, Rate of filtration, under drainage system and washing process. Control system, Negative head, operating difficulties, pressure filter; Simple design problems on rapid sand filters modifications of filters. (Dual media, multimedia, upflow, biflow, Diatomaceous earth).

Unit V : **Disinfection** :- Requirement of good disinfectant, methods of disinfection. Chlorination: Methods, prechlorination, post chlorination. Break point chlorination and super chlorination forms of chlorine. Use of bleaching powder - Simple problems. Introduction to tertiary treatments like Softening, Ion Exchange, Reverse Osmosis, Defloridation, Desalination.

Unit-VI : Distribution system: - Types of supply - Continuous, and intermittent, Types of system - Gravity; Pumping and combined gravity and pumping, Layouts of distributions system, Dead end, Grid iron, Circular system and Radial system. Maintenance of distribution system. Equalising storage, Type of storage reservoirs, capacity, Types of conduits, Relative merits, selection, joints, hydraulic design. Pipe laying and

BOOKS RECOMMENDED:

1. Steel E. W. , Water Supply and Sewerage, Mc-Graw Hill.
2. Kshirsagar S. R., Water Supply Engineering, Roorkee Pub house, Roorkee.
3. Birde G. S. , Water Supply and Sanitary Engineering, Dhanpat Rai and Sons, Delhi.
4. Punmia B. C. water Supply Engineering.

7CE05 PROFESSIONAL ELECTIVE – I
(i) ADVANCED WATER TREATMENT

SECTION-A

Unit - I : Requirements of water treatment facilities different unit operations and unit processes.
Coordination of unit operations. Common attributes of water affected by conventional unit operations and processes.
Aeration: rate of gas absorption and desorption, objectives of aeration, gravity aerators and spray aerators, governing factors, design of aerators, removal of methane, C02,H2S taste, design and odour.

Unit-II : Objectives of flocculation, chemical coagulation, concept of surface charge, coagulating effects of electrolytes, zeta potential, coagulants and coagulant aids, factors affecting coagulation.

Perikinetic and orthokinetic flocculation - mixing and stirring devices, flash mixing flocculators, construction and operation of flocculators, problems on design of flocculators. Pebbled bed flocculator.

Unit-III : Sedimentation: objectives, theory of sedimentation discrete settling and hindered settling, settling of floucculant suspension. Ideal settling basin and its efficiency. Design, construction and operation of sedimentation tanks.
Inlet and outlet hydraulics, sludge, removal and disposal, tube and plate settlers. Problems on design of sedimentation tanks.

SECTION-B

Unit-IV : Filtration: objectives, design, construction and operation of rapid and slow sand filters, filtering sand, grain size and size distribution, preparation of filter sand, hydraulics of filtration. Hydraulics of fluidized beds. Scour intensification, high rate, declined rate, upflow biflow, dual media, diatomaceous earth filters.

Unit-V : Disinfection : objectives, different disinfectants, chemical disinfection, theory, factors governing, and kinetics. Disinfection by Ozone. Disinfection by chlorine; free available and combined. available chlorine, break point chlorination, chemical technology and other uses of chlorine, manageable variables.

Unit-VI : Miscellaneous methods of treatment : Water softening: limesoda and zeolite process, split treatment problems on calculation of dose of lime and soda ash. Iron and Manganese Removal : Fluoridation and defluoridation. Desalination. Taste and Odour Removal.

BOOKS RECOMMENDED :

1) Fiar, Geyer & Okun : Water and Waste Water Engg., John Wiley & Sons.
2) Mark J. Hammer : Water and Waste Water Technology, John Wiley & Sons.
3) Steel E.W. & Ghee M.C. : Water Supply & Sewerage, McGraw Hill Co.

7CE05 PROFESSIONAL ELECTIVE – I
(ii) ADVANCED GEOTECHNICAL ENGINEERING

SECTION-A

Unit - I : Clay mineralogy : Introduction, atomic bonds, classification and nomenclature, structure of clay mineral, K lonite. Illite and Montmorillonite groups, physical properties, clay-water relations,

diffused double layer, thixotropy, base exchange capacity formation of different structure in soil deposites, electrical effects, electroosmosis, electrophoresis, stemming potential, zeta potential, clay mineral identification,DTA analysis, X ray diffraction method.

Unit II - Seepage : Flownet for anisotropic soil media, construction of flownet for hydraulic structure on non- homogenous soil, directional variation of permeability in aniosotropic medium. Numerical analysis of seepage in layered soil computation of seepage force, seepage through earthen dam resting on confined and unconfined medium entrance discharge and Transfer condition of line of seepage through earth dam.

Unit-III : Three dimensional consolidation. Equation, solution of 3dimensional consolidation equation, consolidation by vertical sand drain and its design aspect, free strain consolidation with no smear, effect of smear zone on radial consolidation. Calculation of the degree of consolidation with radial drains and solutions of problems based on this.

SECTION – B

Unit IV : Expansive soils: orgin of soil, intensification of expansive soil, swelling potential, factors affecting the swelling, different systems of classification, concept of swelling pressure and its measurements in the laboratory, special constructional measures adopted for the construction on expansive soils, special foundations adopted for the construction in expansive soils, concept of cohesive non-swelling techniques and its effect on expansive soil.

Unit V : Soil stabilization concept of mechanical stabilization, physical and chemical stabilization with organic and inorganic material like line, cement, lime, fly ash and mechanisms, various factors affecting stabilization, determination of bearing capacity of stabilized soil, laboratory and field methods of stabilization, On various properties of soil.

Unit VI : Geotextile: types, specifications, functions and various applications in the field of Geotechnical engineering. Reinforced earth, mechanism of reinforced earth, various constructional methods and its effect towards altering, the properties of soil, field situations for application of this techniques. Theory of Arching, effect of arching, design of yield strip, computation of vertical stresses.

BOOKS RECOMMENDED:

1) Scoth R.F. : Principles of Soil Mechanics.
2) Das B.M. : Advanced Soil Mechanics.
3) Terzaghi : Theoretical Soil Mechanics.
4) International Conference on Expansive Soils.
5) International Conference on Geotextiles.
6) Soil Mechanics for Road Engineers, AMSO Series.

7CE05 PROFESSIONAL ELECTIVE – I
(iii) WATER POWER ENGINEERING

SECTION - A

Unit I : Introduction, sources of energy, importance of water power, estimation of water power potential, primary and secondary power, load factor, pondage and pondage factor, load curve.
Type of hydropower plants:- low and high head, run of river, valley dam, diversion canal, high head diversion, pumped storage underground, general description, layout, topographical requirements of each of above.

Unit-II : Penstocks: general classification, design criteria, economical dia, anchorages and accessories.
Water hammer :- meaning, rigid and elastic water column theory, Allievi's charts.

Unit-III : Surge tanks: Necessity, types, function, location, effect of sudden load change, Hydraulic design of simple surge tanks, stability of surge tanks.

SECTION – B

Unit-IV : Intakes: types, locations, requirements, trashrack and other components, control gates, emergency gates.

Unit-V : Hydel channel:- power canal and forebay, general principles of alignment and capacity, balancing tank.
Turbines:-types, hydraulic features, size, general description of components and layout, specific speed, choice, approximate costs.

Unit-VI : Power house:- types, general layout and approximate dimensions.
Non conventional sources of energy: - tidal power, wind power, geothermal power, solar power, elementary principles and description, application of water power in drilling and blasting of rocks.

BOOKS RECOMMENDED :

1) Dandekar M.M. & Sharma : Water Power Engineering, Vikas Pub. House, Delhi.

2) Brown J.G., Blackie and Practice : Hydro Electric Engg., Vol. I, II & III, W. Sons, London.
3) Mosonyi E. : Water Power Development, Hungarian Academic Sciences, Budapest.
4) Deshmukh M.M. : Water Power Engineering.
5) Davin C. and Sorenson K.C. : Hand Book of Applied Hydraulics, McGraw Hill.

7CE05 PROFESSIONAL ELECTIVE – I
(iv) PRESTRESSED CONCRETE

SECTION-A

Unit I : a) Analysis and design of beams - Rectangular, flanged and I sections, for Limit State of flexure, ultimate flexural strength, recommendations of I.S. codes.
b) Analysis and design of end blocks in post tensional members -primary and secondary distribution zones, Bursting and spalling tensions.

Unit II : a) Shear strength of prestressed concrete beams - mode of failure in beams, recommendations of I.S. code, ultimate shear strength of concrete, Design of shear reinforcement.
b) Deflection and bond in prestressed concrete.

Unit III : Analysis and design of continuous (upto two spans) and fixed beams. Elastic analysis, secondary moments, concordant cable, linear transformations.

SECTION – B

Unit IV : Analysis and design of prestressed concrete structures such as concrete pipes, poles, sleepers, water tanks etc.

Unit V: Analysis and design of portal frames, single storey and limited to two bays (fixed and hinged)

Unit VI: Design of prestressed concrete bridges (simply supported) for I.R.C. loadings or equivalent uniformly distributed loads.

NOTE : Candidates should use the latest I.S. Codes.

BOOKS RECOMMENDED:

1. Guyon Y. : Prestressed Concrete, Vol. I & II, John Wiley and Sons, New York.
2 Krishna Raju, N. : Prestressed Concrete, Tata McGraw Hill Pub. Company, New Delhi.
3 Lin, T. Y. : Prestressed Concrete, Tata McGraw Hill, New Delhi.
4. Dayaratnam, P. : Prestressed Concrete Structures, Oxford and IBH Publishing Company Pvt. Ltd., New Delhi.

7CE05 PROFESSIONAL ELECTIVE – I
(v) ARTIFICIAL NEURAL NETWORK & FUZZY LOGIC

SECTION - A

Unit I : Artificial intelligence, introduction, classification of artificial intelligence, tools of artificial intelligence, applications of A. I. in Civil Engineering.

Unit-II: Expert systems, introduction, classification, tools, applications of expert system in Civil Engineering.

SECTION – B

Unit-III : Neural network, introduction, classification, tools, applications of neural network in Civil Engineering.

Unit-IV : Fuzzy logic, introduction, classification, tools, applications of expert system in Civil Engineering.

BOOKS RECOMMENDED:

1. Rolston D.W. :Principles of Artificial Intelligence and Expert System, McGraw Hill International Edition, 1988.
2. Waterman D.A. : A Guide to Expert Systems, Addision-Wesley Pub. Co., 1985.
3. Koestem C.N. and Maher : Expert System in Civil Engineering, ASCE, 1986.
4. ASCEôs Journal of Computing in Civil Engineering.

7CE05 PROFESSIONAL ELECTIVE – I
(vi) ADVANCED CONCRETE TECHNOLOGY

SECTION-A

Unit-I: Admixtures and construction chemicals: Introduction, admixtures, plasticizers (Water reducers), action of plasticizers, dispersion, retarding effect, superplasticizers (High range water reducers), site problems in the use of plasticizers, retarders, accelerators, air-entraining admixtures, pozzolanic or mineral admixtures, fly ash, silica fume, rice husk ash, metakaolin, ground granulated blast furnace slag (GGBFS), damp and water proofing admixtures, IS code provisions for admixtures.

Unit-II : Durability of concrete: Introduction, strength and durability relationship, volume change in concrete, significance of durability, impact of water cement ratio on durability, factors affecting durability, methods of predicting durability, IS code provisions for durability of concrete.

Unit-III : Deformation in concrete: Introduction, deformation of concrete in Indian climate, permeability, factors contributing cracks in concrete, sulphate attack, alkali aggregate reaction, corrosion of embedded steel, controlling measures.

SECTION – B

Unit-IV: Special concrete and concreting techniques: Introduction to special concrete, Lightweight, aerated, no-fines, high density, fibre reinforced, polymer, prepacked, self-compacted (self leveled), and high volume fly ash (HVFA) concrete.
Introduction to special concreting techniques, Gunite or shotcrete, ferrocement, roller compacted concrete, and ready mix concrete casting and applications.

Unit-V: Repairs and rehabilitations: Introduction, need for repairs, crack width, interaction between permeability, volume change and cracking, polymer modified mortar, bond aid for plasters, guniting aid, silicon based water repellent materials, protective and decorative coatings, injection grout for cracks, coatings to embedded reinforcement, concrete repair systems, stages of repair works.

Unit-VI: Non-destructive testing of concrete: Introduction, rebound hammer, limitations, rebound number and strength of concrete, penetration technique, pullout test, resonant frequency, pulse velocity method, corrosion analyser, rebar locators.
Students must be shown video CD, slides, transparencies and photograph of actual structures.

BOOKS RECOMMENDED:

1. Lea, F. M.: The Chemistry of Cement and Concrete, Edward Arnold (Publishers) Ltd.
2. Neville, A. M. : Properties of Concrete, Pitman Publishing Company.
3. Neville, Brooks : Concrete Technology, ELBS
4. Orchard, D. F. : Concrete Technology, Applied Science Pub Ltd.
5. Shetty, M. S. : Concrete Technology, S. Chand
6. Varshney, R. S. : Concrete Technology, Oxford Pub. House.
7. Krishna Raju : Design of Concrete Mixes, McGraw Hill.
8. Shah and Kale : Reinforced Cement Concrete Design,
9. Sushil Kumar :Treasure of Reinforced Cement Concrete

7CE05 PROFESSIONAL ELECTIVE – I
(vii) ENVIRONMENTAL POLLUTION & RURAL SANITATION

SECTION - A

Unit I : General components of environment. Nature and scope of Environmental pollution, population growth, Degradation due to human activity. Episodes of Environmental pollution.

Unit-II: Water pollution-sources of water pollution, effects on water bodies, D.O. sag curve, pollution control measures, water pollution act
Noise pollution: sources of noise pollution, human tolerance levels, levels of exposure due to various sources, preventive and curative methods.

Unit-III : Report of field visit to municipal waste water treatment plant/ Industrial Effluent treatment plant.

SECTION-B

Unit-IV: Land pollution: solids its effect on the environment, various methods of collection, treatment and disposal of solid waste, Hazardous waste and risk analysis.

Unit V : Environmental Impact assessment : Need for EIA, elements of EIA, Environmental attributes, Nature of Impact -Primary, Secondary, Tertiary, Short Term & Long terms, Local & Regional.

Unit-VI: 1) Rural Sanitation ï Collection & disposal of night soil, Sanitary Latrines.
2) Biogas plant - Capacity & Design.

BOOKS RECOMMENDED :

1) Mishra P.C. : Fundamentals of Air & Water Pollution.
2) Mohan I. : Environmental Pollution & Management, Ashish Pub. House, New Delhi-110026
3) Gilbert M. Masters : Introduction to Environmental Engg. & Science.

7CE05 PROFESSIONAL ELECTIVE – I
(viii) ADVANCED EARTHQUAKE ENGINEERING

SECTION-A

Unit I : Behaviour of structures in past earthquakes : lessons learnt with regards to weak / strong aspects of structural systems.
Ground motion characteristics : choice of ground motion for a major project site.

Unit II: Detailed study of IS : 1893 - 2002 : seismic analysis of buildings using codal previsions, design considerations.

Unit III: Introduction to seismic design : Considerations for bridges, dams, chimneys.

SECTION-B

Unit IV : Vulnerability of buildings : use of Vulnerability Atlas and understanding techno legal issues with regard to buildings.

Unit V : Concepts in repair, restoration and seismic strengthening: retrofitting weakness in existing buildings, aging, weathering, development of cracks, material and equipment for repairs of masonry and concrete structures, study of IS : 13935.

Unit VI : Methodologies for repairs : for walls, roofs, slabs, columns and foundations of buildings in stone, brick or reinforced concrete.

BOOKS RECOMMENDED :

1) Anil K. Chopra : Dynamics of Structures, Prentice Hall of India Pvt. Ltd.
2) James L. Stratta : Manual of Seismic Design, Pearson Education.
3) Jaikrishna, Chandrashekhar, Brajesh Chandra : Element of Earthquake Engineering, Sarita Pub., Meerat.

7CE06 THEORY OF STRUCTURES- II – Lab

PRACTICALS:

The laboratory work will be based on the following experiments (Any five experiments):

1. Influence line diagram for continuous beams.
2. Horizontal reaction of two hinge arch.
3. Forces and displacements in redundant trusses and frames.
4. Minimum two exercise based on theoretical course work.
5. Verification of Betty theorem
6. Verification of Maxwell Reciprocal Theorem.
7. Basic exposure to software for analysis.
8. Computer aided design of structures

Software: Anyone of the following software STAAD, SAP, NASTRAN, ANSYS, BUILD MASTER, SCADDS & STRUDS and any other reputed software (Any TWO)

1. Analysis and design of minimum three storied building
2. Cantilever or counterfort retaining wall
3. Analysis and design of steel structure

A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

7CE07 GEOTECHNICAL ENGINEERING- II – Lab

LIST OF EXPERIMENTS: (Any six)

1. To determine the shear strength by conducting Field Vane shear test.
2. To identify the subsoil strata by conducting soil resistivity / seismic refractivity method
3. To determine the bearing capacity of soil by conducting standard penetration test
4. To determine the soil characteristic by conducting standard penetration test
5. To determine the soil properties by conducting the static cone penetration test.
6. Computation of bearing capacity by analytical approach to verity with field test
7. To determine the C- characteristic with respect to soil log bore presentation and interpretation of exploration
8. To examine the soil characteristic with respect to soil log bore presentation and interpretation of exploration

Compulsory: Introduction to Geotechnical Software, determination of bearing capacity , earth pressure etc. using this software.

7CE08 STRUCTURAL DESIGN- II – Lab

PRACTICALS:

1. Candidates are required to prepare at least two designs based on theoretical course detailed workings are necessary.
   A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

7CE09 PROJECT & SEMINAR

Seminar based on Project shall be delivered in Seventh Semester only. 50 marks shall be given through the internal evaluation done by three member committee one of them will be guide.

Seminar shall be delivered with POWER POINT presentation.

SEMESTER: EIGHT

8CE 01 WATER RESOURCES ENGINEERING - II

SECTION-A

Unit-I: Reservoir Planning : Investigation, selection of site, control levels, Reservoir Sedimmentation, Reservoir Capacity, Calculation of life Reservoir.

Dams : Different types and their suitability-factors governing the selection of types of dam for project

Earth Dams : Types of dams, causes of failure seepage and drainage arrangement, phreatic line, stability analysis, seepage control measures

Unit II : Gravity Dams: Types of dams forces acting, modes of failure; principles of design of straight gravity dams, Elementary and practical profile, Galleries, Earthquake and its effect on dams.

Unit-III: Diversion Head Works :- Selection of site and layout, components of diversion head works, design of weirs on permeable foundation, construction details of Kolhapur type weirs.

Spillways: Types of spillway, spillway capacity, Flood routing through spillways, types of crest gates. Energy dissipaters: meaning, objectives, location. Types hydraulic jump, jet diffusion and Bucket type,

SECTION-B

Unit-IV : Canal Irrigation: Types of canals, Parts of Canal irrigation system, Canal alignment, Design of unlined and lined Canals, Balancing depth, cross section of canal, propose and types of canal lining

Unit-V : Canal Masonry Works: Types and only design principles and description of

1. Regulation works: Canal fallôs, Head Regulator, Cross regulator, Canal escapes and canal outlets.
2. Cross drainage works: Aqueduct, Syphon aqueducts, super passage, canal siphon, level crossing

Unit-VI : Well Irrigation : open wells and tube wells, types of tube walls, duty of tube well water.

Water Management : Water management and distribution, co-operative water userôs organization, warabandi, conjunctive use of water. Water shed Management : Need of watershed management, importance of soil conservation measures, techniques ground water harvesting.

River Training Works : Need and types of river training works.

BOOKS RECOMMENDED :

1) Dr. Modi P.N. : Irrigation, Water Resources & Water Power Engg.

2) Punmia : Irrigation & Water Power Engg.

3) Garg S.K. : Irrigation & Water Power Engg.

4) Dahigaonkar J.G. : T.B. of Irrigation Engg., Wheeler & Co.

5) Varshaney R.S. : Theory of Irrigation Structures, Vol. I & II, Nemchand, Roorkee.

6) Birdie G.S., Das R.C. : Irrigation Engg., Dhanpatrai & Sons.

7) Michael A. M. : Irrigation (Theory & Practice)

8CEO2 ENVIRONMENTAL ENGINEERING–II

SECTION–A

Unit-I: Quantity of storm water, DWF, variation of sewage, flow systems of sewerage - separate combined and partially combined, layouts of sewerage system, capacity of sewers design of sewers Laying out of circular sewers-Boning rod and sight rail method, Testing & maintenance of sewers

Unit-II: Waste water characteristic, sampling of sewage, physical chemical and biological examinations, B.O.D. and C.O.D.,B.O.D. equation, problems on B.O.D Pollution due to domestic and industrial waste. Treatment of sewage - purpose of treatment, preliminary treatment, primary treatment and secondary treatment. Flow diagram for conventional sewage treatment plant. Preliminary Treatment:- Screening, Grit chamber, detritus tank. Primary Treatment:- Sedimentation of sewage

Unit-III: Biological treatment: Trickling filters, low rate & high rate tricking filters, construction details, Re- circulation Modification of trickling filters Activated sludge process - Process description, Methods of aeration, loading rates, Different modified forms of A.S.P.,MLSS & SVI,F/M.

SECTION–B

Unit-IV : Low cost waste treatments - Oxidation ponds, Aerated Lagoon, Treatment and Disposal of sludge - Digestion of sludge, sludge disposal Septic tank, working and design, Disposal of septic tank effluent Disposal of sewage on land and in stream. Effluent standards for disposal on land, into stream and into sewers. MINAS. Self purification capacity of stream

Unit-V: Characteristics of solid waste:- Physical, chemical, biological Analysis

Collection of solid waste:- Types of collection system and services, frequency of collection, methodology involved in setting up collection bins Disposal of solid wastes:- Different methods, sanitary land fill, composting, incineration

Unit-VI : Air pollution: Introduction to air pollution, various pollutants their sources and their effects on man and material, prevention or air pollution at sources, introduction to control devices electrostatic precipitator & cyclones only human tolerance level Introduction to EIA and Environmental Audit.

BOOKS RECOMMENDED :

1) Kshirsagar S.R. : Sewerage and Sewage Treatment, Roorkee Pub House, Roorkee.
2) Steel E.W. Steel : Water Supply & Sewerage, McGraw Hill Book Co.
3) Birdie G.S. : Water Supply and Sanitary Engineering, Dhanpat Rai & Sonõs.
4) Garg S.K. : Waste Water Engineering.
5) Dr. Bhide A.D., Sunderson B.B. : Solid Waste Management in Developing Countries.
6) Rao H.V.N. : Air Pollution.
7) Stern, Wohlers, Boobel, Lowry : Fundamentals of Air Pollution, Academic Press, 1973.

8CE03 PROJECT PLANNING & MANAGEMENT

SECTION-A

Unit-I : Project, Project Stakeholders, Project life cycle - Conceptual Phase, Planning Phase, Execution Phase, Termination phase.
Conceptual Phase - Concept of feasibility study, Budgeting, Cash Flow, Risk assessment plan.
Project planning- Steps, work break down structure, Scheduling, Project Monitoring & Controlling- Concept of Tracking, Reviewing and Rescheduling.
Planning Tools: Basic concept of Gantt Chart, Bar Chart, Mile stone chart ,their advantage , limitations and overcoming measures ,

Unit II : Networking ï Activity ,Event, dummy Activity, Fulersonõs numbering rule, Geometrical consideration.
Critical Path Method: Concept, technique , Critical path , Numerical on Time and Floats computation , concept of Updating Network and its numerical for computation.

Unit III: PERT: Concept, technique, three time estimates, average time, Critical path, slack computation, S.D, Variance, Probability factor, , crash programe , normal and crash cost, normal and crash time, cost slope, Numerical on Probability computation, crashing .

SECTION – B

Unit –IV: Concept of resource smoothening and leveling ,Cost Cuves, Numerical of it.

Introduction to MicroSoft Project Planner software .Various stages and process for Work Breakdown structure, planning, scheduling and resource allocation for project in MSP. One Compulsory assignment for planning, scheduling and resource allocation for construction project using Microsoft Project Planner.

Unit-V: Management- Feyolõs Principal of Management, Functions of management, organization definition, type line, line and staff, functional organization ,quality control, ISO.
Safety management ,construction hazards in multistage building, method of prevention of accident, injury rate, injury severity rate, injury index, National safety council, its role, recommendation, Material management , Objective ,Functions, Inventory, Need for inventory, ABC,EOQ analysis.

Unit VI: Equipment Management :

a) Power shovel: Construction, working, Output, factors affecting, cycle time , Problem n Output.
b) Dragline: Construction, working, output, factor affect ting output, cycle time ,Problem on output .
c) Concrete mixer, Tilting and non-tilting type construction working.

BOOKS RECOMMENDED:

1) Peurifoy R.L. : Construction Planning, Equipment & Method.
2) Srinath L.S. : PERT & CPM.
3) Punmia & Khandelwal : PERT & CPM.
4) Khanna S.K. : Industrial Organization & Management.
5) Satyanarayan : Operations Reserach.

8CE04 PROFESSIONAL ELECTIVE – II
(i) ADVANCED DESIGN OF STEEL STRUCTURES

SECTION - A

Unit-I : (a) Design of foot bridge(N-Truss or Pratt)
(b) Analysis and design for transmission tower lines

Unit-II : (a) Design of self supporting steel chimney and its foundation.
(b) Design of through type truss bridge member for dead load and equivalent live load including top, bottom bracings and portal bracing.

SECTION - B

Unit-III: Design of industrial buildings including gantry grider, gantry column, Design of knee braces.

Unit-IV: a) Design of north light trusses and lattic girder.
b) Design of elevated rectangular, square pressed steel tanks and staging

BOOKS RECOMMENDED:

1. Ramchandra, Design of Steel Structure, Volume ï I and II
2. Arya, Ajmani, Design of Steel Structures
3. Duggal, Design of Steel Structures
4. N. Subrramanyam, Design of Steel Structures, Oxford University Press, 2008.

8CE04 PROFESSIONAL ELECTIVE – II

(ii) ADVANCED WASTE WATER & INDUSTRIAL WASTE TREATMENT

SECTION - A

Unit-I : 1. Physical unit process: screening, mixing, flocculation, sedimentation, floatation.
2. Design of Grit Chambers and Screens.
3. Chemical Unit Processes: precipitation, gas transfer, adsorption

Unit-II : Biological Unit Process: fundamentals of biological treatment. Design of trickling filter & activated sludge process.

Unit-III: 1. Low cost waste water treatment: design of oxidation pond and aerated lagoon
2. Oxidation ditch. Design of Secondary Settling Tank.
3. Methods of disposal of industrial wastes. Equalization tank, Neutralization.

SECTION – B

Unit-IV : General : Effect of discharge of industrial wastewaters on streams, land and environment. Importance and scope. Problems involved in treatment. Variation in quality and quantity of industrial wastewaters. Standards & Criteria
Indian standards for discharge of treated waste water on land, into municipal sewers and natural water courses.
Sampling of Waste Water : Representative sampling. Grab and composite samples.

Unit-V : General Approaches to Planning of Industrial Wastewater Treatment and disposal. Equalization and proportioning Neutralization.
Treating different effluent streams separately. Including/ excluding domestic wastewater along wish the industrial waste. Treating industrial wastewater along with town waste.

Unit-VI : Process flow diagram, characteristics and treatment of various industrial wastes.
Industrial wastes of pulp and paper, textiles, tannery, food, canning, sugar mills, distillery, dairy, Pharmaceutical, Electroplating etc. Case study of any one industry.

BOOKS RECOMMENDED :

1) Matcalf and Eddy : Waste Water Treatment, Disposal and Reuse, McGraw Hill Pub. Co., New Delhi.
2) Rao and Datta : Waste Water Treatment, Oxford & IBH Pub. Co. Pvt. Ltd., New Delhi.

8CE04 PROFESSIONAL ELECTIVE – II

(iii) FINITE ELEMENT METHOD

SECTION - A

Unit- I : Continuum structures, discretisation, finite elements, nodes, variational principle, minimum potential theorem, relation to Rayleigh-Ritz method.

Unit-II : Interpolation, Lagrangian, Hermition shape functions, natural coordinates, area and volume coordinates, coordinate and derivative transformations.

Unit-III : 2-D plane stress and plane strain analysis, constant strain triangle, rectangle. 3D analysis, tetrahedron & parallelepiped elements.

SECTION - B

Unit-IV : Isoparametric elements, plane stress, plane strain and solids, numerical integration.

Unit-V : Beam straight with C and C continuity, numerical integration to cater for membranes, bending and torsion combination.

Unit-VI: Programming aspects, geometry, connectivity, code numbers alternate data types, half band data preparation, flow charts, typical subroutine for assembly, shape functions, soluti6n of equations, stiffness matrix.

BOOKS RECOMMENDED:

1. Desai, C. S., Abel, Introduction to Finite Element Method
2. Cook, Concept and application of Finite Element Method
3. Patwardhan, N. R. Illustrated Finite Element Method
4. Krishnamurthi, C. S., Finite Element Analysis ï Theory and Programmingn

8CE04 PROFESSIONAL ELECTIVE – II
(iv) DAM ENGINEERING
SECTION - A

Unit- I : Introduction to Dam Engineering : Different classification for dams, relative advantages and disadvantages of various dam selection or types of dam, Investigation of dam sites, Engineering surveys, geological investigation, subsurface exploration programme, economic height of dam, Construction machinary, material, money, inventory.

Unit-II : Rockfill dam : Introduction, general characteristics, materials and testing of rockfill material, foundation of rockfill dam, design, rockfill placement, examples.

Unit-III : Arch dam :- components, types, methods for design.
Buttress dam : components, types, forces acting, Buttress spacing, Master curve for economic spacing, preliminary design
Solid Gravity dams : Analysis & Design of gravity dam.

SECTION – B

Unit-IV: Spillways: choice of types, crest gates, hydraulic design, comparison, approach and tail channel, J.H.C. & tail water rating curve Energy Dissipaters: types, components, design of hydraulic jump type, basins, ski-bucket type, roller bucket.

Unit- V: Head Regulators : requirements, types, foundation treatment including uplift consideration, Bank connection, energy dissipation, hydraulic design of opening and barrel, ventilation, types of gates.
Approach Channel, case study for one on rock foundation and one on permeable foundation.
Model Studies: scales design principles, materials, scale effects for model of dams spillways.

Unit-VI : Instrumentation : In earth dam and solid gravity dams, piezo meters, settlement, gauges, (surface monuments, base plate, cross arm) strain meters joint meters, thermometers, stress meters, pore pressure cells, plumb-bob Seismograph. Water level gauges (description, object, location, working, installation of each, design not expected)
Special problems: increasing height of masonry and concrete dams, strengthening, repairs and maintenance, leakage, evaporation controls. evaporation controls.

BOOKS RECOMMENDED :

1) Sharma H.D : Concrete Dams, Metropolitan Book Co, Delhi.
2) Varshney R.S. : Concrete Dam, Ox IBH, Mumbai.

3) Sherard et al : Earth and Rockfill Dam, John Wiley, New York.
4) USBR : Design of Small Dams.
5) USBR : Design of Large Dams.
6) Peurifoy R.L. : Construction, Planning and Equipments, McGraw Hill Book Co.
7) Satyanarayanan : Construction, Planning & Equipment, Standard Pub.
8) USBR : Design of Gravity Dam.

8CE04 PROFESSIONAL ELECTIVE – II
(v) ADVANCED ENGINEERING GEOLOGY

SECTION - A

Unit I : A) Geology & engineering characters of Basalts & other rock formations : study of rock formations of Maharashtra older than Deccantrap from Civil engineering point of view, field characters of basalt flows and older formations which are significant from dam foundation, tunnelling work, watershed development including percolation tanks and construction material.

(B) Geology of dam & reservoirôs : bearing capacity & water tightness of different types of rocks occruing in Maharashtra from construction of gravity dam with important case histories of different dam sites in Maharashtra whose geological problems were encountered and remedial measures were adopted. Set of geological conditions which lead to tail channel erosion with case histories of different dam sites.

(C) Geology of tunnel alignment : geological factors responsible for overbreaks & percolation of water, various geological structures which affects the tunnelling works. Case histories of tunnels & hydro-electric projects, roads, railways & canals driven through different types of Basalts & other rocks occur in Maharashtra.

Unit II: (A) Seismological studies : factors to be to safeguard gravity dams. Detailed studies of active & dead faults. Type & design aspect of the dam to be constructed in seismic zone with cace histories.

(B) Percolation tanks : importance of geological studies for the selection of sites for percolation tanks, geological studies of watershed development projects in Maharashtra including Raleganshindi & Vidarbha region.

(C) Ground water studies : water bearing characters of different types of Basalts. Soil & water preservation techniques of civil engineering significance and under ground bandhara. Exploration of tubewells n alluvium and sandy ï alluvium substrata for drinking water oses procedures and need thereof. Deciding acquifers for tubewell exploration & development of tubewells conducting yield tests of tubewell.

Unit III: (A) eology of soil formation : geological factors which govern the engineering characters of soils. Soil derived from different types of rocks which can be used for casing & hearting of earthen dams. Nature of river alluvium in Maharashtra. Problem water logging & its remedial measures.

(B) Construction material : properties of different types of rocks that can be used as rubble for masonry, road metal, railway ballast, concrete aggregates etc. Problem of alkali aggregate reaction. Scaricity of sand in Deccan trap region, suitability of compact & gdaloidal basalt as a substitute of sand after crushing.

(C) Geology of cut-off trench : geological logging and mapping of cut off trench of irrigation projects. Applicability of grouting in irrigation projects & different grouting techniques.

SECTION - B

Unit IV : (A) Drilling and logging : different methods of drilling. Precautions to be taken during drilling, preservation of cores. Recording of drilling data. Geological logging of the drill & its interpretation. Methods of water intake tests.

(B) Aerial photo interpretation : interpretation of aerial photos from the point of view of rock types, geological structures, selection of dam sites and alignment of roads, railways & ghat interpretation of lineaments for groundwater.

(C) Town planning : role of geology in town planning. Important case histories of the old town planning.

Unit V: **Geophysical** principle of electrical resistivity survey, its utility in determining the depth of overburden, foundation grade rocks, gullies & other geological structures by having case histories of dams & tunnels, significance of electrical resistivity survey in ground water studies, brief introductory ideas regarding seismic, magnetic and gravity surveys and their applications in various fields.

Unit VI: (A) Rock Mechanics : Engineering properties of rocks, general properties, strength of rocks, elasticity of rocks. Residual stresses in rock masses, classification system in rock engineering - Terzaghiõs load classification, Lauffer-Pacher classification. Rock quality gnation (RQD), rock structure rating (RSR), concept of Wickham et.al (1972)

(B) Environmental Geology : role of geology in environmental engineering, geo-environmental : soils as resources, wind erosion, erosion by moving water, predicting & controlling erosion, soil erosion & land use decisions, problem soils. Reactivation of pre faults, earthquakes in Peninsular India, intensity & magnitude, assessment, Himalayan earthquakes, landslides - characterisation, landslide analysis, dimensions of landslide hazard, landslide potential, case histories, subsidence, response to subsidence prediction, costs of subsidence, case histories.

BOOKS RECOMMENDED :

1) P.W.D. Hand Book, Chapter No. 6.
2) Geological Survey of India - Engineering Geology Case Histories, Parts I & II.
3) Auden J.B. : Indian Society of Engineering Geology, Commemoration Volume.
4) Wahlstrom E.E. : Tunnelling in Rocks.
5) Wahlstrom E.E. : Dams, Dam Foundations and Reservoir Sites.
6) Goodman R.E. : Introduction to Rock Mechanics.
7) Bieniawski Z.T. : Rock Mechanics Design in Minning and Tunnelling.
8) Lama R.D. & Vutukuri V.S. : Hand Book of Mechanical Properties.
9) Gupte R.B. : AText Book of Engineernig Geology, Pune Griha Prakashan.
10) Miller : Principles of Remote Sensing.
11) Pandey S.N. : Text Book of Photo Geology.
12) Lundgren L. : Environmental Geology, Prentice Hall Pvt. Ltd.
13) Patwardhan A.M. : The Dynamic Earth System, Prentice Hall Pvt. Ltd.

8CE04 PROFESSIONAL ELECTIVE – II
(vi) MATRIX COMPUTER ANALYSIS OF STRUCTURES

SECTION - A

Unit- I : Solution of simultaneous algebraic equations, Gaussian elimination method, Half-band matrices, computer programme.

Unit-II : Finite difference method, application to plate deflection problems for fixed and simply support conditions.

Unit-III : Flexibility method, static redundancy, flexibility coefficients, compatibility conditions, application to continuous beams, single-bay single story portals, pin joined plane trusses.

SECTION-B

Unit-IV: Stiffness method, kinematic redundancy, equilibrium equations, member stiffness matrix and structure stiffness matrix, assembly procedure, application to continuous beams, pin jointed plane truss, numerical examples upto three unknowns.

Unit- V : Stiffness matrix of plane frame member with axial deformation (6x6), Grid member (6x6), transformation of forces and displacements, member and global coordinate system.

Unit-VI : Data and program organization for stiffness method, various coding systems, member-joint and joint-coordinate relations, member-displacement relations, code number approach, methods of introducing boundary conditions for restrained displacements.

BOOKS RECOMMENDED:

1. Gere, Weaver, Analysis of framed structures
2. Rubinstein, M. F., Matrix computer analysis of structures
3. Matrin, M. C., Introduction to matrix methods of structural analysis

8CE04 PROFESSIONAL ELECTIVE – II
(vii) ADVANCED STRUCTURAL ANALYSIS

SECTION – A

Unit – I: 1. Approximate methods of analysis of multi-bay multi-storey Frames by– (a) Cantilever method, (b) Portal method & (c) Factor method.
2. Shear centre for thin walled beam section.

Unit – II : 1. Infinite & semi-infinite beams resting on elastic foundations.
2. Analysis of beams circular in plan.

Unit –III: 1. Cantilever moment distribution method, application to rigid jointed plane frames.
2. Vierndeel girders - analysis for vertical sway cases only.

SECTION - B

Unit–IV : 1. Finite difference method, application to beam deflection problems
2. Minimum potential principle, Rayleigh & Rayligh-Ritz approach to continuous problems, application to simply

supported and cantilever beams using power series and trigonometric series.

Unit – V: Introduction to theory of elasticity - (treatment in Cartesian co-ordinates), state of stress at a point, stress – equilibrium equations, strain-components, stress -strain relations, generalized Hooke's law, strain plane stress and plane conditions, stress and compatibility for 2D.

Unit–VI: 1. Analysis of columns loaded laterally.
2. Structural response to earthquake, analysis of multistoried frames by I.S. code provisions.

BOOKS RECOMMENDED:

1. Norris, Wilbur, Elementary Structural Analysis
2. Timoshenko & Goodier, Theory of Elasticity
3. Jaikrishna, Chandrashekharan, Element of Earthquake Engineering, Sarita Publication, Meerut (U.P.)
4. Vazirani & Ratwani : Advanced Theory of Structures.
5. Ross C.T.F.: Advanced Stress Analysis.

8CE04 PROFESSIONAL ELECTIVE – II
(viii) ROCK MECHANICS

SECTION - A

Unit I : Introduction, properties and testing. Introduction to Rock Mechanics and its field applications, identification of common rocks, physical & mechanical characteristics of rock material. Field & Laboratory testing of rocks. Classification of rock masses for engineering purpose.

Unit II: Rock excavation : Blasting - objectives, blasting materials, blasting methods, open cut blasting. control blasting operation, precautions. Drilling, braking & cutting. Machines used for rock excavation.

Unit III: Rock reinforcement & Grouting : Rock bolting – bolting methods & materials.
High capacity of rock anchors - types of rock anchors, anchor grouting, civil engineering applications. Bolted & anchor supports. Rock grouting - objectives, types of treatment, grouting material, grouting methods, quality control & monitoring of grouting.

SECTION-B

Unit IV: Rock strength & deformability : modes of rock failure, stress-strain behaviour in compression, Mohr- Coloumb failure criteria, Griffths crack theory, empirical criteria for failure, effect of size

on strength. Plane of weakness in rocks, joint orientation & roughness. Deformability of rocks - elastic & non- elastic behaviour, influence of time on rock deformation, viscous behaviour & creep.

Unit V: Rock foundation & slope stability : rock foundation ï allowable bearing pressures, stress & deflection in rock under footing, failure mechanisms, subsiding & swelling rocks, base heave & remedies, foundation anchoring. Rock slopes - modes of failure, factors affecting, analysis of slopes.

Unit VI: Underground opening : types of boring machine, cutting tools, muck handling. Opening in competant rock, horizontally layered rocks & rock with inclined layers, plastic behavior around tunnels, time dependent behaviour of tunnels, underground opening in blocky rocks - Block theory. Review of design methods of tunnels - Empirical & semi-empirical methods. Support & stabilisation.

BOOKS RECOMMENDED:

1) Goodman R.E. : Introduction to Rock Mecanics.
2) Franklin J.A., Dusseault M.B. : Rock Engineering.
3) Franklin J.A., Dusseault M.B. : Rock Engineering Applications.
4) Stagg K.G., Zienkiewicz O.C. : Rock Mechanics in Engineering Practice.

8CE04 PROFESSIONAL ELECTIVE – II
(ix) ADVANCED DESIGN OF R. C. C. STRUCTURES

SECTION - A

[BY LIMIT STATE METHOD]

Unit-I : 1) Design of Portal frame up to two bay two storied symmetrical frame for symmetrical loading.
2) Design of circular slab for uniformly distributed load only, Introduction to grid floor slab.

Unit-II : 1) Design of a footbridge and simply supported slab deck bridge for I.R.C.class A loading.
2) Design of RCC girder (T beam) bridge for I.R.C.class A loading.

SECTION – B

Unit-III : 1) Structural response to earth quake, Analysis of multistoried frame by seismic coefficient method.
2) Design of square bunkers using Rankine theory. Design of Silos.

Unit-IV: 1) Design of R.C.C. Intze tanks.
2) Design of staging for Intze tanks with raft foundation.

BOOKS RECOMMENDED:

1. Suhil Kumar, Treasure of R. C. C. Design
2. Jain, A. K., Reinforced Concrete (Limit State Method)
3. Shah, Karve, Design of R. C. C. Structures
4. N. Krishna Raju, Advanced R. C. C. Design
5. Rajgopalan, K., Storage Structures.

8CE 05 WATER RESOURCES ENGINEERING – II – Lab

TERM WORK : Five problems from the following to be worked out by the students whenever necessary scale drawing on half empirical size must be drawn : Practical examination shall consist of viva ï voce.

1. Fixing control levels of Reservoir from given data.
2. Cross section, plan, L-section of Earth dam showing all components; details of drainage of downstream casing.
3. Design and Drawing of elementary and practical profile of gravity dam.
4. Design and drawing of diversion weir on permeable foundation.
5. Design and Drawing of ogee spillway with energy dissipaters.
6. Computer Aided design of unlined and lined canal.
7. Drawing of any Four canal structure (No design)
8. Field visit

8CE06 ENVIRONMENTAL ENGINEERING – II - Lab

1) Analysis of waste water (any four) ï BOD (for domestics waste), COD (for industrial waste), Solids (Volatile), SVI, Nitrogen, Chlorides
2) Air sampling & Analysis of SPM.
3) Physical characteristic of solid waste
4) Sketches of sewers appurtenances ï Manholes ï different types storm water inlets, overflows, inverted siphons, automatic flushing tanks, ventilation in sewers.
5) Report of Field visit to Municipal wastewater treatment plant/Industrial Effluent treatment

8CE07 PROJECT & SEMINAR

Complete Project Report in a group of Maximum 9 students shall be submitted.

Out of 75 internal marks, 25 marks shall be given through the internal viva by three member committee one of them will be guide.

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
MECHANICAL ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER : SEVEN

7ME01 MACHINE DESIGN AND DRAWING – II

Unit I : a) Design of Shaft: Material, Design on the basis of strength considering shaft subjected to
- Twisting moment only
- Bending moment only
- Combine twisting and bending moment
- Design on the basis of rigidity.

b) **Design of Key** ï types, strength of key

c) **Design of Coupling** ï types, requirments of good couplings, design of sleeve coupling, clamp or compression coupling, rigit flange coupling, flexible flange coupling.

d) **Design of fly-wheel :** Puction, coefficients of fluctuation of speed and energy, energy stored in fly wheel, constrution, stresses in fly wheel arms and rim, Design of fly wheel based on T-M diagram, fly wheel for Otto cycle engines and punching machines. (12 Hrs)

Unit II: a) **Antifriction Bearings** : Types of bearing, construction, desingations, standard load ratings by AFBMA for static and dynamic loads, life of bearings, selection of bearings, lubrication, mounting and enclosure,

b) **Journal bearings :** lubrication of bearings, stable lubrication, Thick film lubrication, pressure distribution , minimum film thikckness, relations of variables-viscocity, coefficient of friction, speed, pressure, length and diameter, bearing modules, viscocity-Temperature chart, sommerfeld number, selection of lubricant, design procedure and numericals.

c) **Design of belts :-**
Flat belts ï types, material and construction of belt, type of drives, slip, creep, Design of belt.
V-Belts- Consruction and types, design of V Belts.

d) **Wire Rope-** Selection, Construction, classifiction, designations, stresses in wire rope, selection of wire rope for given loads.

Unit III :- Design of Gear Classification, law of gearing, forms and system of teeth, interferemce. beam strengthof teech, dynamic tooth load, wear tooth lead, tooth failure.

a) Spur gear - Design of gear

b) Helical gear ï Classification face width, formative teeth number, strength of gear Design of gear

c) Bevel gear ï Classification, pitch angles, strength of gear, Design of gear

d) Worm gear ï Types, efficiency of gear, Design of gear.

Unit IV : a) Design of I.C. Engine parts : Design of Cylinder, Pistion, Piston rings, Piston pin, connecting rod and crank .

b) Design and drawing of Governor (Parts and Assembly) Types of Governors, Design procedure and problems, Hartnellôs Governor (including design of Spring, spindle, lever and bails).

BOOKS RECOMMENDED :

TEXT BOOKS -

1) Machine Design fundamentals- Mechaincal designer workbook, J.E. Shigley, published by Mc graw Hill .
2) Machine Design, R.S.Khurmi and Gupta J.K. published by Eurasia Publishers- New Delhi.
3) Machine Drawing, N.D.Bhat,Charotar Publication

REFERENCE BOOKS :

1) Machine Design, Maleev nd Hartman, published by C.B.S. Publication New Delhi.
2) Machine Component Design, Willian Orhwein, published by Jaico Publishing House- N.Delhi
3) Machine Elements in Mechanical M.F. Spotts
4) Machine Design, Black P.H. Published by Mc Graw Hill,
5) CAD CAM Conepts & applications, Chenna Kesava, PHI Publications
6) Design Data Book by- P.S.G. Koimbatore
7) Design Data Book by Mahadevan
(Use of any data book from the above will be permitted during the examination).

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7ME02 ENERGY CONVERSION – II

SECTION – A

UNIT I: Reciprocating, Air Compressions :- Industrial uses of compressed air , Methods of compression and efficiencies of compression, Methods of reducing losses during compression

single and multistaging of compressions, clerance volume and its effect on work done and volumetric efficiency, condition for minimum work in tow stage compression, intercooling and its effects, Overall, isothermal and adiabatic efficiencies, IHP, BHP, requirements and after cooler. (7 Hours)

UNIT II: Rotary Compressors :- Comparison between reciprocating and rotary compressors, difference between fans, blowers and compressors, general equations for rotary machines, Vane, Roots blower, construction, working and velocity diagrams of centrifugal and axial flow compressors, performance characteristics of blowers and compressors. (8 Hours)

UNIT III: Definitions, classifications of refrigeration systems : Air refrigeration, Bell-column cycle, reversed cannot cycle, revered Brytion cycle, vapour compression refrigeration, vapour asorption refrigeration based on solar and waste gear recovery. Analysis of simple saturated vapour compression cycle, representation on T-s, Ph diagrams, Problem on simple saturation cycle, Need for CFC free refrigerants.
Air conditioning :- Definitions, classification and applications. Phychromatic properties, phychrometriccharts. (8 Hours)

SECTION – B

UNIT IV: Classification of gas turbines, construction and working Gas turbine ideal and actual cycles constant volume, constant pressure, (Open and Closed) cycle analysis, Inter coolong, Regeneration and reheating application, optimum and maximum pressure ratios,work rations, Performance characteristics. Fields of application of gas turbine power plant,Introduction to Jet Propulsion, Ram jet, turbo jet. (No numerical treatment for Jet Propulsion). (8 Hours)

UNIT V: NUCLEAR POWER:- Fussion, fission, Chain reaction, conversion and breeding in nuclear fission, components of water, gas cooled, liquidized metal cooled thermal reactors.

UNIT VI: Introduction to renewable energy, Wind Energy, solar, fuel cell, bio-gas, MHD, basic requirmenets, Advantages, Disadvantages and applications. (7 Hours)

RECOMMENDED BOOKS :-

TEXT BOOKS :

1. Steam and gas turbines R, Yadav; Central Publication Allahabad.
2. Thernal Engineering, Domkundwar, Kothandarawar, Dhanpat Rai & Co.
3. Power Plant Engineering; R.K.Rajput; Laxmi publication

4. Solar Energy by S.P.Sukhatme; Tata Mcgraw-HIll in New Delhi

REFERENCE BOOKS :

1. Thermal engineering by Mahesh M.Rathore; Tata Mcgraw-Hill in New Delhi
2. Gas Turbines Theory- By Cohen and C.F.Rogers, P.H.I.H. Saravanamuttoo Heritage Publishers,
3. Gas Turbines and Rotary compressors, Khajuria and Dubey, Dhanpat Rai & Co.
4. Thermal Engineerinng : R.K.Rajput, Laxmi Publication.
5. Renewable Energy; Godbfrey Boyle, Oxford University Press.

7ME03 INDUSTRIAL MANAGEMENT & COSTING

UNIT I: Concept, Principles and Techniques of Management; Evolution of management thoughts, functions of management, organization structure & relationship.

UNIT II: Marketing and Management : Marketing stretegy market research, buying, motives, types of market, new product development, Product life cycle, Sales Organization, advertising, methods of selling, consumer behaviour.

UNITIII: a) Functions of personnel management, Human resource planning, Recruitment, training and development , workers participation in management, joint culsultation, collective bargaining.

b) Materials management, classes of materials, scope of material control, scope and function of purchasing department, purchasing procedure, inventory control, ordering procedure, material identification, store function.

SECTION - B

UNIT IV : Objectives, functions, principle factors of estimating and estimating procedure, Estimation of weights & materials, Estimation of machining time, estimation of fabrication cost, forging cost, foundry cost.

UNIT V : a) Introduction to costing and costing Techniques: Definitions, objectives, elements of costs, components of cost, job costing, simple process costing, normal and subnormal losses in process, waste, scrap. (8 Hours)

UNIT VI: a) Financing of business :- Basis of business finance, need of finance, Kinds of capital, sources of fixed & working capital.

b) Financial statements :- Profit and loss statement, balance sheet

c) Depreciation Analysis :- Causes and significance, meethods of calculation of deprecdiation. (7 Hrs)

TEXT BOOKS:

1. Management-principles, processes and practicals, Anil Bhat, Aryakumar; Oxford University Press
2. Management Accounting; Paresh Shah; Oxford University Press
3. Estimating and costing; TTTI Madras.

REFERENCE BOOKS:

1. Essentials of Management; Koontz, Harold; Mcgraw-Hill Education(India)
2. Cost Accounting; Jawahar Lal; Tata Mcgraw Hill Publishing
3. Cost Accounting by Bhar.

7ME04 AUTOMATION ENGINEERING

SECTION - A

UNIT I: Automation &Types, Aucomation for mass manufacturing and assembly, Automation of continuous processing systems, Detroit type automation, Automated flow lines. Methods of work part transport, transfer mechanisms, control function . General terminology and anaylsis of automated flow line,partial automation, assembly, systems and Line balancing.

UNIT II: NC/CNC :- Basic concept, N.C. controls- point to point , straight-cut and continuous path control, machine control units, closed system, NC machine components, tooling, CNC & DNCs, Manual part programming formats, programming languages,- APT,ADAPT, EXAPT etc. NC/CNC Programming- Various Programming codes, Manual part programming for drilling, Milling and turning operations, Examples of APT, Sensors and adaptive control in machining, Applications and economics of CNC. (12 Hrs.)

UNITIII: ROBOTICS :- Introduction to cybernetics, Evolution of industrial robots, Robots anatomy, Arm geometry, drive system and end efforts, sensors, Evolution of geometrical configurations for robots Programming techniques of Robots.

Applicaion of Robots in manufacturing, casting, welding, painting, m/c loading, handling, heat treatment, assemly, inspection, etc. Technicql Specifications of a Robot, Robot economics. (9 Hrs)

SECTION - B

UNIT IV : GROUP TECHNOLOGY AND PROCESS PLANNING : Introduction-Part families, part classification and coding systems, Group technology machine cells, advantage of group technology

The planning function, retrieval type process planning system, Generative process planning systems Benefits of CAPP, Expert systems and expert system approach to CAPP. (09 Hrs)

UNIT V: FMS : Introduction, schematic of FMS, FMs cells, Componenets of FMS, Relation of Group Technology, with FMS, Planning, Simulation and analysis of FMS, Applications of FMS.

Material handling : Automated storage and Retrieval system (ASRS), aomagted Guided Vehicle (AGV)etc. (08 Hrs)

UNIT VI: Computer INtegrated Manufacturing; Introduction, Sequence of functins in CIM,elements of CIM system, CIM Wheel, structure of CIM database system. Guidelines for CIM development, benefits of CIM shop floor control and process monitoring.

Automated inspection and testing : Introduction to automated inspection, Advantages over traditional method. On-line & off-line inspection, CMM construction, types & working. (09 Hrs)

TEXT BOOKS:

1. Production system, Automation and CIM, Mikhal Groover, Pearson Publications.
2. CNC Machines; M.Adithan & B.S.Pabla; New Age International.

REFERENCE BOOKS:

1. Robotics; Yarem Koren, Mcgraw Hill.
2. Computer aided Manufacturing; P.N.Rao, N.K.Tiwari and & T.K.Kundra; Tata Mcgraw Hill.
3. Machine Tool Design; N.K.Mehta, Tata Mcgraw Hill.
4. Computer Control of Manufacturing; Yarem Koren, Tata Mcgraw Hill.
5. CAD/CAM/CIM ; Radhakrishnan & Subramanium; New age International.

PROFESSIONAL ELECTIVE – I

7ME05 (1) NON-CONVENTIONAL ENERGY SYSTEMS

SECTION – A

Unit I :- Introduction :- Renewable & Non-renewable resourses. Solar Radiaton- Solar Constant basic earth-sun angles spectrum distribution of extra terrestrial radiations and its variation, Solar time, Direction of beam radiation, comportation of radiation inclined surfaces, solar charts, measurements of diffiuse & global & direct radiations, duration of sunshine hours,computation of radiation data, Alteration of solar radiation by the atmosphere.

Unit II : Radiation transmission through covers :- Reflection and absorption of radiation, optical properties of cover systems in trnsmittance effects of surface layers on transmittance,

transmittance absorptace product. Solar Energy collections;- Heat transfer for solar energy utilization, flat plate eollections such as liquid & air collector, collector overall heat transfer coefficient, temperature distribution between the tubes & the collector effiencney factor useful heat gain , heat removal and flow factor, Testing of collectors & effects of various parameters on the performance. INtroduction to various systems of concentrating collectors

Unit III: Solar energy Utilisation :- Application of solar energy in heating, cooling, pumping, power production, distillation, drying,solar cookers, solar pond, solar fuanaces, Solar Energy Storage:- Methods of storage such as sensible, latent heat & thermochemical storage,selection of method of storage, properties of storage materials and different arrangements of storages. (No alphabetical treatment)

SECTION - B

Unit IV: Energy from Ocean : Tidal Power :- Types of tidal plants such as single and two basin plants, power developed and operation of tidal power plant. Occean thrmal energy conversion system. Ocean temp. profile, OTE Power plant development, controlled flassh evaporation, indirect vapour cycle, Salinity differences conversion of salinity grandient resources, cosmotic pump, dylitic battery, etc.

Wind power :- Wind speed data, power in the wind, wind power development, types of wind miles, application for pumping and power generation. (8 Hours)

Unit V: Biomass Energy Resourses; Mechanism of green plant photosynthesis, effiency of conversion, solar energy plantation, Biogas- Types of Biogas plants, factors affecting production rates, Pyrolysis, Gasifess Types & Classification of vegetable oils a a liquid fuel and their properties, esterification process, formation of Biodiesel, Biodiesel & its properties, suitable species for Biodiesel formation and its cultivation, byproduct formation during esterification, Biodiesel economics. (8 Hours)

Unit VI : Directy Energy Conversion :- Photo voltage cells: Principle, concept of energy conversion, conversion efficiency, powr output and performance, sotrage, FuelCells : Principles types of fuel cells, convrsion efficiency, Geothermal energy resources, power genration methods like vapour dominated, water dominated, flash steam, binary fluid and total flow concept of power generation. (7 Hours)

TEXT BOOKS :-

1. Solar Energy, S.P.Sukhatme,TMH
2. Non-Conventional Energy Sources,G.D.Rai,Khanna Publications

REFERENCE BOOKS :-

1. Treatise on Solar Energy : H.P. Garg; John Wiley & Sons
2. Renewable Energy Conversion, Trnsmission and Storage, Bent Siresen; Elsevier Publication
3. Renewalle Energy; GodfreyBoyle, Oxford University Press, Mumbai.

7ME05 PROFESSIONAL ELECTIVE – I
(2) TOOL ENGINEERING

SECTION – A

Unit I : Theory of metal cutting : Chip formation, shear angle, shear strain-velocity relatios, undeformed chig thickness, Force relations, Merchant circle, energy consideration in metal cutting, Tool wear tool life, tool life criterion, mach inability, tool materials, properties & types, Newly invented tool material and their types, cutting fluids. (08 Hours)

Unit II : Single point cutting tools-classification and nomenclature, various systems of nomenclature,single point cutting tool design, recommended speed, feed and tool angles determination, clamping arrangements and form tools. Twist drills & Reamers ï Geometry types, cutting forces, Numerical on Power & torque. (09 Hours)

Unit III :
i) Broaches ï Geometric elements of broach teeth, classification of broaches, design of broaches, cutting forces.
ii) Miling cutters- Geometry elements of broach teeth, classificatio of broaches, design of broaches, cutting forces.
iii) Thread cutting tools:- Geometry of taps and dies.
iv) Gear cutting tools :- Geometry of gear shaper cutter, gear hobs. (09 Hours)

SECTION - B

Unit IV : Jigs & Fixtures : Design economics, principles of locations, types of locations,prevention of jamming, problmes of chip & dust in location, use of dowle, Reducant location, Principles of clamping, types of clamps, power clamping, Tool guiding & tool setting, types of drill bushes, types of drill jigs & their designs, Turning, Milling, Grinding, Broaching and Assembly fixtures, Indexing devices in jigs & fixtures . (10 Hours)

Unit V : Press tools, Classification of presses,Theory of sheet metal cutting, clearance, cutting force calculations, Methods of reducing cutting forces, centre of pressure & its significance, classification of press working operations, Theory of bending, spring back action in metals, drawing fundamentals, calculation of drawing & bending forces, planning for cupping operation, stock layout. (09 Hours)

Unit VI : Design of press working tools, Types of die construction, function & nomenclature of die components Cutting Dies-Blanking & Punching, Forming Dies-Forming, Drawing and Bending etc. Design of Compount, Combination and progressive dies. Miscellaneous dies- Horn die, cam-action die, rubber & bulding die, sub-press die. (9 Hours)

TEXT BOOKS :

1. Fundamentals of Tool Design, -A.Kumar (Dhanpatrai & Sons)
2. A text book of Production Engineering -P.C.sharma (S.Chand Publication)

REFERENCE BOOKS :

1. Tool Design - Cyril Donaldson (Tata Mcgram Hill)
2. Jigs & Fixtures - P.H.Joshi (Tata Mcgram Hill)
3. Metal Cutting Theory & Cutting Tool Design- Arshinov (Mir Publications)
4. Tool Design - ASTME (ASTME)
5. Fundamentals ofMetal Cutting & M/c Tools - Juneja (Age Internatinoal) .

PROFESSINAL ELECTIVE - I

7ME05 (3) ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

SECTION – A

Unit-I : Introduction toArtificial Intelligence (AI) – Overview of AI, definition and importance of knowledge based systems, representation of knowledge, knowledge organization, knowledge manipulation, acquisition of knowledge. (6 Hours)

Unit II: Introduction to Expert Systems - Features of expert systems, knowledge enginering, basis expert system terminology, human experts and artificial experts, algorithmic nd heuristic methods, difference between conventional programms and expert systems, Architecture of expert systems. (8)

Unit III : Knowledge Representation ï Rule based methods, rule execution, forward chaining and backward chaning, knowledge representation using semantic nets, structure of semantic nets, Frame-based methods . (8 Hours)

SECTION – B

Unit IV : Expert system Tools – Types of tools for expert system building, system building aids, support facilities, debugging aids, I/O faciliteis, explantation facilities, knowledge base editors, stages in the development of expert system tools, procedure oriented methods, object-oriented methods, logic-based methods, access-oriented methods. (7)

Unit V : Building an expert system ï Development phased in expert system building, development constraints, reliability, maintainibitlity, examples of expert systems, diffiulties in development of exprt systems (7)

Unit VI: Fuzzy Engineerig- Fuzzy logic, fuzzy expert systems, fuzzy setts, membership functions, fuzzy rules for approximate reasoning, fuzzy inference generation, deffufication, development of rules matrix, applications of fuzzy expert systems for design of industrial controllers,

RECOMMENDED BOOKS :

TEXT BOOKS :

1. A guide to Expert Systems by Donald a.Waterman, Pearson
2. INtroduction to Artificial intelligence & Expert Systems by Dan W.Peterson, PHI
3. Fuzzy Logic by John Yen, Reza Langari, Pearson

REFERENCE BOOKS :

1) Expert Systems ï Theory & Practice, By Ermine, Jean Louis,PHI
2) Expert systems in Engineering , By D.T.Pham.JFS Pub.
3) Expert system application bySumit Vadera,Sigma press
4) Artificial Intelligence by Winston P.H.,Pearson

7ME05 PROFESSIONAL ELECTIVE – I

(4) MECHATRONCS

SECTION - A

Unit I : Introduction to Mechatronics –
Definition, Block diagram & Example, Basics of Sensors, Position & Speed Sensors, Proximity Sensors & Switches, LVDT, Digital optical encoder, Temperature Sensors Actuators-Functions, Electromagtic Principles, Solenoids and Relays, working of DC motors and stepper motors, hydralic and pneumatic actuators, (6 Hrs.)

Unit II: Data Acquisition: Analog signal processing using operational amplifier- Indroduction, types of amplifiers, sample and hold circuts, introduction to data acaquisiton, sampling thermo, Quantizing theory, Analog to digital conversion, Analog to digital convertor, Digital to analog conversion, Multiplexer. (6)

Unit III: Mechatronic Systems – control architecture Introduction, Control architecture, Analog circuuits, digital circuits, Design of logic networks, sequntial logic, flip-flops, application of flip-flops, micro-controlrs, Programmable logic controller. (6 Hrs)

SECTION - B

Unit IV: Control Valves –
Study of different control components and pneumatic & Hydraulic system- Construction, worling and function of Directional control valve, Flow control valves, Pressure relief valve, pressure reducing valve, sequence valve with symbols.

Unit V : Pneumatic System –
Design and analysis of pneumatic circuits, Synchronizing, Power chucking operations, controlling the rate of speed of piston, circuit to move with piece around a corner, circuit to move a work piece at a constant speed . (6 Hrs)

Unit VI : Hydraulic System –
Design nd analysis of Hydraulic systems-Sequencing, pneumohydralic, regeneration circuit, circuit to control tool movement on lathers, grinders, etc.

TEXT BOOKS :

1. Introduction to Mechatronics and Measurement systems- 2/e by Aciatore and M.B.Histant, Tata Mcgraw Hill edition.
2. Pneumatics and Hydrautics by H.L.Stewart.

REFERENCE BOOKS :

1) Introduction to Mechatronics by Appus Kuttan K.K.- Oxford Univesity Press.
2) Mechatronics ï A multidisciplinary approach 4/e by W.Bolton- Pearson Publication,
3) Automation, Production systms and CIM by M.PGroover- Pearson Publication.

7ME 06 PROJECT & SEMINAR

7MEO7 MACHINE DESIGN AND DRAWING - II – LAB.

List of Exercises for Term Work :

1) Sheet 1 : Design of shaft
2) Sheet 2 : Design of coupling or any one type of gears.
3) Sheet 3 : Design of I.C. Engine Part (any one based on sysllabus)
4) Sheet 4 : Preparation of detail drawing of simple machine assembly (Pedestal bearing, Plumer block, simple eccentric, stuffing box, Cross head, Tail stock, Tool post, C-clamp, Screw jack, Boiler sfety valve ï Any1 of these)
5) Sheet 5 : Preparation of assembly drawing of simple machine assembly (Any 1 machine from Practical 4)

Note :- Any one from the above list should be done using Computer Programming/software.

7MEO8 ENERGY CONVERSION II – LAB.

List of Experiments :

Any six of the following :-

1. Trial on reciprocating compressor.
2. Trial on centrifugal blower.
3. Studies of domestic refrigerator.
4. COP calculation of vapour compression system.
5. Study of room air conditioner.
6. Study of gas turbine with the help of models.
7. Study of Pyrheliometer and measurement of dirct radiation.
8. Study of testing of a flat plate controler
9. Study of Solar still and trial on it.
10. Study of a photovoltac system.

Practical Examination shall consist of viva voce based on above term work.

7MEO9 AUTOMATION ENGINERING – LAB.

PRACTICALS :-

At least six practicals will be based on the following topics.

1. Preparation of Manual part program for Point-to-Point control. Ex; Drilling Operation.
2. Preparation of Manufal part program for two-axis CNC turning operatio.
3. studyof working & Progrmming of XY plotter.
4. Programming Examples on APT.
5. Study of performance of Robots.
6. Simullation of CNC Machining.
7. Case study of CAPP.
8. Case study on GT.
9. Performance on NC and CNC m/c.
10. Study of computer aided quantity control (CAQC).

PRACTICAL EXAMINATION :-

Practical Examination shall consist of viva voce based on above term work and syllabus.

7ME10 PROFESSIONAL ELECTIVE – I

(1) NON-CONVENTIONAL ENERGY SYSTEMS – LAB.

List of practicals :

Any six practicals will be based on the following topics :-

1. Study of Pyrhlimeter and measurement of direct radiatoin.
2. Study of pyranometer and measurement of global and difuse radiation.
3. Study of sunshine recorder and measurement of sunshine hours.
4. Study and testing of a flat plate recorder.

5. Study of various concentrating collectors..
6. Study of a solar absorption of refregerating system.
7. Study of a solar dryer.
8. Study of wind mill and trial on it.
9. Study of a bio-gas plant.
10. Study of sterling cycle engine and a trial on it.
11. Study of a Solar Still and trial on it.
12. Study of a gasifier and trial on it.
13. Study of a Photovoltaic system & trial on it.

Practical Examination :
Practical Examination shall consist of viva voce based on the term ï work and syllabus.

7ME10 PROFESSIONAL ELECTIVE – I
TOOL ENGINEERING – LAB.

TERM WORK : ANY EIGHT OF THE FOLLOWING .

1. Design & drawing of single point cutting tool.
2. Design & drawing of form tools.
3. Design & drawing of drill.
4. Design & drawing of broach.
5. Design & drawing of milling cutter.
6. Study of geometry of reamer.
7. Study of gear cutting tools.
8. Measurement of forces inOrthogonal cutting by Dynamometer.
9. Study of Geometry of taps and dies.
10. Design & Drawing of press tools.
11. Design & drawing of jigs.
12. Design & drawing of fixtures.

Practical Examination :
Practical Examination shall consist of viva voce based on the term ï work and syllabus.

7ME10 PROFESSIONAL ELECTIVE – I
(1) ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS - LAB

Practical : The students are expected to perform five practicals based on the above syllabus.

7ME10 PROFESSIONAL ELECTIVE – I
(2) MECHATRONICS – LAB.

PRACTICALS : At least six practicals will be based on the above syllabus.
Practical Examination :
Practical Examination shall consist of viva voce based on the term ï work and syllabus.

SEMESTER: EIGHTH

8ME 01 PROFESSIONAL ELECTIVE – II
(1) AUTOMOBILE ENGINEERNIG

SECTION – A

Unit I :- Classification ofautomobiles, chasis types, Power Unit-Functions and locations power for propulsion, engine mounting, engine parts- types, construction and functions, Multiple cylinder engines, General considerations of engine balancing, firing order..
(7 Hrs)

Unit II : Fuel feed systems - fuel fees systems for petrol engines. Fuel pumps, fuel filtrs, Air filters, Basic principles of MPFI and CRDI.Multipoint fuel injection Systems (MPFI) Common Rail Diesel Injection Systems (CRDI) Controlling system : purpose, types of cooling systems, liquid cooling system-water jacket ports, water pump and radiators, by pass rectractulator system, temeprature indicator, antifreeze, mixtures, troubles and remedies of cooling system.

Unit III: The electrical system, Battery Capacity, standard capacity ratings, starter motor drive-Bendix drive, over running clutch, solenoid switch and shitf, Ignition system;- Battery coil ignition system, Ignition timing and its effect on engine performance, Ignition advance mechanisms, Electronic Ignition system.

SECTION – B

Unit IV : Transmission system : Layout, types of clutches, single plate friction clutch and multiple clutch, clutch adjustments, clutch troubles an remedies, Gear Boxes :- Sliding mesh, constant mesh and synchromesh gear box, function of over drive, trouble shooting and remedies, torque convertor, automatic transmisson, Propelier shaft, hotckiss drive, torque tube drive, differential.
(8 Hrs)

Unit V: Breaking system:- Mechanical, hydraulic brakes, power brakes, and vaccum brakes Fault finding and maintance of brakes, Steering system :- Fuction, types of linkages. steering gears, steering gear ratio, wheel balancing, wheel alighment castor, king pin inclination, toe-in & toe-out & their effect, introduction to powe steering.

Unit VI : Suspensions:- Rigid axle and independent syspension system, shock absorbers. Auto lubrication :- Types of lubrication, their tests and ratings, multi-viscocity oils, chasis lubrication, Engine lubrication :- types of lubricaing system, full premier system, dry sump system, oil pump, oil filters system- by pass system, full

flow system, oil breather, crankcase ventimeter, Engine lubrication troubles and remedies.

TEXT BOOKS :

1. Automobile Engineering- Vol.I & II, Kirpal Singh, Standard Publishers Distributors
2. Automobile Engineering ï R.K.Rajput; Laxmi publications, New Delhi.

REFERENCE BOOKS :

1. Automotive Mechanics; Crouse & Anglin, TMH.
2. Automotive Mechanics ; J Heitner; East West Press
3. Automotive Mechanics ; S.Srinivisan; TMH.

8ME01 PROFESSIONAL ELECTIVE – II
(2) PRODUCTION PLANNING AND CONTROL

SECTION – A

Unit I :- INTRODUCTION

Objectives and Advantages of PPC, Production procedure, functions of PPC, production consumptions cycle, centralised & decentralised PPC, Pre-requisite of PPC.

Unit II :- PRODUCTION FORCASTING :-

Introduction, definition and importance of forecasts, Qualitative model: Delphi techniques, Quantitative models :- Simple moving average, weighted moving average, simple experimental smoothing.

Forecasing error and selection of forecasting model. Types of forecaste: Constant,linear cycle forecaster,Verification and conrolling, The moving range chart, Average MR, out of control conditions.

UNIT III: PRODUCTION PLANNING : - The production order, Procedure for formulating Production order, masier Program, Basic problems in production planning, Quantities in batch production, criteria for batch, size determination, minimum cost batch size, production range, Maximum profit Batch size, Maximum return, Rate of return, Economic Batch size.

SECTION – B

Unit IV : MACHINE OUTPUT :

Machine output, multi machine supervision by one operator, Machine interforcence, Ashcroft lalbles, average number of consecutive servicing task, the Ashcraft Number.

Unit V: ANALYTICAL STRUCTURE OF INVENTORY : - Definition of inventory, Types of inventory and the classification, structure of inventory problems and its analysis, the relevent cost, objectives of carrying inventories, selective inventory analysis. Static Model :- General characteristic, incremental analysis, opportunity cost, cost of risk, decision criteria under uncertaincy.

Unit VI: A) DYNAMIC MODEL :- CERTAINITY CASE ;- General characteristic, optimum lot size model win constant demand, quntity discounts.

Risk Case :- General characteritics, P-system and Q-system.

B) Material Requirment planning (MRP) :- Introduction to MRP, Manufacturing Resource Planning (MRP-IT), just in time (JIT), comparasion of MRP, MRP-II, Enterprenureship Resource Planning (ERP) (8 Hrs.)

TEXT BOOKS :

1. Elements of Production Planning and Control by Simuel Eilon ï Universal Publishing Corporation ltd.Mumbai
2. Production Control ï John E.Biegal- Prentice Hall of India.
3. Inventory control, Theory & Practice- Start & Miller

REFERENCE BOOKS :

1. Production Planning and control and Management:- K.C.Jain & L.N.Agrawal.
2. Production & Operation Mgmt.;- E.E.Adam, Jr.R.J.Ether, Prentics Hall of India.
3. Industrial Engineering and Production Management- M.Mahajan-Dhanpat Rai.

8ME01 PROFESSIONAL ELECTIVE – II
(3) MANAGEMENT INFORMATION SYSTEM

SECTION - A

Unit I : Basis of MIS :

What is a system, what is information and data, necessity of prompt, accurate & relevent information for effective decision making, decision tables, Types of information, organisational structure and types of information within them, Fact gathering techniques. (8 Hrs.)

Unit II : System of Anaylsis & Design :

Phases of system development procedure, project request form system proposal, cost/benefit analysis functional specifications, detailed system descriptio, system acceptance criteria, audit and control requirments, structured system development, data flow diagram, context analysis diagram, exploding a process,

structured analysis, structured design,structure charts, coding schemes, input form design, system protection . (8 Hrs.)

Unit III : A) **Development of MIS**
Long Range plans of MIS, Class of Information, information requirment, implementation of MIS, Management of Quality in the MIS, Orgaisation for the development of MIS,Factors of success & failure of MIS.

B) **Choice of Information Technology** :
Nature of IT decision, Strategic decision, Configuration decision, Evaluation, IT implementation plan. (8 Hrs.)

SECTION – B

Unit IV : Introduction of MIS :
Priliminaries of Information System Technology Data base Management System **:** Concepets, Models, design, Performance monitoring & Turning, Security in the database environment MIS & RDBMS. DBMS Software ORACLE (8 Hrs)

Unit V : a) Decision Support Systems (DSS) :
Concept & Philosophy AI, Knowledge based expert system, MIS & Role of DSS.

b) Enterprise Management System (EMS) :
Introduction to ERP, basic feature, benefits, selection and implementation EMS & MIS.

c) Business preoces Re-inenginering (BPR) ; Introduction, Business process,Processl Models of Organisation and value stream model of organization, MIS& BPR. (8 Hrs)

Unit VI ; Application of MIS

A) Application in Manufacturing Sector:- Personal Management, Materials Management, Marketing Management.

B) Application in Service Sector like Hospitals, Airlines, Hotels, Banks, Insurance. (8 Hrs)

TEXT BOOKS :

1) Management Information System - W.S.Jawadekar (TMH, 2010)
2) Information Systems for operation & Mgmt.-Voichdan, Homer.
3) Management Information Systems - Ross.

8ME01 PROFESSIONAL ELECTIVE – II
(4) ADVANCED MANUFACTURING SYSTEMS

SECTION – A

Unit I : Total Quality Management(TQM) : Understanding quality, commitment & ledership Customer satisfaction involment

Performance measures- Case Study IMplementation of TQm Case Study (10)

Unit II : Total Producive Maintanance (TPM) Introduction outline of TPM Concepts of ñKobetsu-Kaizenò, ñJishu-Hozenò Planned Maintenance Systems Operation & Maintenance skill upgrade training initial control, ñHInshitu-Hozenò concept. (10)

Unit III : Business Process Re-Engineering (BPR) : Introduction, Reengg.Rethinking The new world of work who will Re-Engineer? Succeeding at Re-Engg.-case study. (10)

SECTION – B

Unit IV : Value Engineering (VE) Introduction Value Orientation The variouis phases ofVE like orientation phase INformation phase, function phase .... etc.How to manage the VE progrmme case study **(10)**

Unit V : Concurrent Engineering (CE) Introduction to CE & need of CE CE tools ADvances in design & manufacturing Engineering Design for manufacture, design for assembly Rapid phototyping Concurent approaches in design, manufacturing and aspects of engg.

Unit VI : Just in Time (JIT) Introduction to JIT What is Toyota Production Systems Design, Development & Management of JIT Manufacturing systems, Implementation of JIT.

BOOKS RECOMMENDED:

TEXT BOOKS :

1) Besterfield D.H. etal ñTotal Quality Management,ò PHI New Jersy , 1995.
2) Johan S.Okland,òTQMò: Text with Cases, Butterworth einemamn, Oxford, 1995.
3) ñTPM edited notesò by Japan Institute of Plant Management.
4) Michel Hammer & Jones Champy, ñRe-Engineering the Corporation, Nicholas Brealey, London, 1994.
5) G.Joganathan, ñGetting MOre at Less Cost : The Value Engineering Wayò, Tata Mcgraw Hill, 1992.

REFERENCE BOOKS:

1) Andrew Kausik, :Concurrent Engineering : Automation, Tools & Techniquesò, John Willey & Sons.
2) Chanan S. Syan & Unny Menon, ñConcurrent Engineering: Concept, Implementation & Practice, Champman & Hall.
3) M.G.Korgaonkar, ñJust in Time Manufacturingò, Macmillan India Ltd. New Delhi, 1992.

8ME02 PROFESSIONAL ELECTIVE – III
(1) REFRIGERATION & AIR CONDITIOING

SECTION – A

Unit I : Introduction to automotive air conditioning- Vapour compression system:- Analysis of simple vapour compression system. Use of pressure enthalpy. Temperature entropy charts. Effect of operating conditions such as evaporation and condesion pressure, superheating and sub cooling Actual vapour compression system, Refrigerants :- classification: primary & secondary refrigerants, desirable properties of refrigerants; merits & demerits of commonly used refrigerants such as Ammonia R-12, R-22 and their selections and eco friendly refrigeration 134 a, HFC.

Unit II: Multi stage pressure systems;- multistage compression: choice of intermediate pressure, complete multi-stage compressions. Multi evaporator systems; single compression individual expansion value, single compression multi expansion valve, individual compressor multi expansion valves, cascade systems, its applications to cryogenics Air liquefaction processes- Linde-Hampson (No numerical treatment to air liquefaction system) (10 Hours)

Unit III : Refrigeration systems components & controls:- brief study of refrigerants compressor, condensers, evaporators, expansion valves, drier, fillers, selection criteria for the components of vapours compression systems Flow controls, temperature controls, pressure controls and safety devices. Defrosting systems, testing & charging of refrigeration systems, leak detection. (No analytical treatment is expected) (8 Hours)

SECTION – B

Unit IV : Psychromeric properties of moisair psychrometric chart, concept of thermodynamic wet ï bulb temperature, representations of Psychromeric process on Psychromeric charts, mixing of air, evaporating cooling, air washers. Human comfort:- metabolism of human body, factors influencing comfort, concept of effective temperature, optimum effective temperature & comfort charts. (7 Hours)

Unit V : Classification of air conditioning systems & applications. Unitary system package, window type & split type air conditioning. Central system:-System components, types:- direct expansion system, all water system & all air system. Water, summers & year

round air conditioning. Transmission & distribution. Types of supply air ducts, consideration for selection & location of outlet, distribution partners of outlet, location of return air opening & introduction to duct design.
(No numerical treatment is expected) (9 Hours)

Unit VI : Load calculation & applied Psychromety-basic consideration at heat gains/losses sensible & latent , heat due to occupancy lightening, appliances, products, process, air conditioning systems, safety factor cooling load estimates, heating load estimates. Sensible heat factor by pass factor, apparatus dew point, effective sensible heat factor (8 Hours)

BOOKS RECOMMENDED :
TEXT BOOKS :

1. Refrigeration & air conditioning; C.P.Arora; Tata Mcgraw Hill Publication.
2. Refrigeration & air conditioning; Arora, Domkundwar;Dhanpat Rai Publication.

REFERENCE BOOKS:

1. Principles of Refrigeration; J.Dossat; Pearson Education, Asia publication
2. Refrigeration & air conditioning- P.L.Balaney
3. Refrigeration & air conditioning- Manohar Prasad.

8ME02 PROFESSIONAL ELECTIVE – III
(2) MACHINE TOOL DESIGN

SECTION – A

Unit I : General requirement of machine tool design kinematics of m/c tool :- Various driving systems used in machine tools, basic design consideration in the design of variable speed range in the machine tools, layout of speed in geometric, logarithmic & earthmatic progression saw diagrams, range ratio, graphical represenation of speed on structural and ray diagrams, design of speed & feed boxes and their classification. (8 Hours)

Unit II : a) Mechanical, electrical, Hydraulic stepless regulation of speeds.\
b) Machine tool structure (bed,column, cross-rail) functions & their requirements design criteria for machine tool structure design procedure factors effecting stiffness for machine tool structure & their profile. (8 Hours)

Unit III : Static & dynamic rigidity, methods of increasing rigidity of structure, machine tool clasfic system, procedure for assessing dynamic stability, dynamic charactorstics, single degree &

multidegree of ferrdom systems, Experimental determination of dynamic charactorstics of m/c tool, dynamic characteristics of cutting process, statrility analysis, single degree, multidegree (8 Hrs)

SECTION – B

Unit IV: Vibrations of machine tools :- Effects vibration on m/c tool on cutting condns, workpiece, Sources of cibrations, types of vibrations (forced, chatter, stickup vibrations) and its minimization.

Shock absorberm,isolated tool bioder, chatter in milling lathe, grinding, reduction of chatter in design & production stages. (8 Hrs)

Unit V : a) Machine tool guideways & slideways :- Fuctions, shapes of guideway, materials, methods of adjusting clearance inguideways, design of slideways for wear resistence, determination of maximum and average pressure, on slide way, Hydraulic guideway, antifriction guidway, protecting devices for slideway. (8 Hrs)

Unit VI: machine tool spindle and bearings :- Fuctions, requirment, types and materials of spindle, machines tool compliance, design of spindle, antifriction bearing, performance indices, Hydrostatic journal bearing, hydrodynamic bearing. (8 Hrs)

BOOKS RECOMMENDED:
TEXT BOOKS:

1. Principles of Machine Tools ï Base & Pal
2. M/c Tool Design ï N.K.Mishra.

REFERENCE BOOKS:

1. Machine Tool Design Vol. I,II,III,IV, N. Acherkar (Mir Pub.)
2. Principles of Machine Tools ï Sen & Bhattacharya
3. Design Principles of Metal ï Kondsberger Cutting Machine Tools
4. Machine Tool Desting Vol. I to VI ï CMIT, Banglore.

8ME02 PROFESSIONAL ELECTIVE- III
(3) FINITE ELEMENT METHOD

SECTION - A

Unit I: **Introduction :** Application, Advantages, Steps of FEM, Stress and Equilibrium, Boundary conditions, Strain Displacement Relations, Stress-strain Relations, Von mises stress, Temperature effect, Potential Energy & Equilibrium, Gelerkinôs Method, stiffness (Displacement) Method. (7 Hrs)

Unit II: **Matrix Algebra & Gausian Elimination :** Matrix Multiplication, Transposition, Diagonal Matrix, Symetric Matrix, Upper Triangular Matrix, Determinant of Matrix, Matrix Inversion Eligen values & Elgenvectors, Gaussian elimination. (7 Hrs)

Unit III: **ID Problems :** Finite Element modeling, coordinate Shape function, The potential Energy approah, The Galerkinôs Approach, assemblies of the global stiffness matrix and loac vectors, Properties of stiffness Matrix, Treatment of boundary conditions, quadratic Shape Functions, Temperature Effects. (7 Hrs)

SECTION – B

Unit IV : **2D Problems for CST :** Constant strain triangle, isoperimetric Representation , potential Energy energy approach, element stiffness, galaerkinôs approach, temperature effects, problem modeling and boundary conditions. (7 Hrs)

Unit V: **Development of equations:** Truss equations, derivation of the stiffness, matrix for a bar element in local coordinate, global stiffness matrix, beam equation. Beam stiffness, example assemblage of beam stiffness matrix, plain stress & plain stress stiffness equations, basic concept of plain stress and plain strain, derivation of the CST stiffness matrix and equations Treatment of body and surface forces. (7 Hrs)

Unit VI: **Heat Transfer :** Derivation of the basi differential equations, Heat transfer with conduction, radiation, ID Formulation using variational method.

Fluid Flow : Derivation of the basic differential equations, Id Finite Element formulation, Computer Implementation (prepossessing, post processing, input data file, mesh generation)

BOOKS RECOMMENDED:
TEXT BOOKS:

1. Introduction to Finite Element Engineering ï T.R.Chandrupatla, Belegunda; PHI
2. A First course in Finite Element Method- Darya Logon, Thompson Learning (TL Publisher)

REFERENCE BOOKS:

1. The Finite Element Method in Engineering- S.S.Rao, Elsveir Pub., 4th Edition.
2. Fundamentals of Finite Element Method analysis ï D.V.Huttan, Tata Mcgraw Hill

3. Concept & Applications of Finite Element Analysis ï Robert D.Cook
4. Finite & Boundary Element Method in Engineering ï O.P.Gupta
5. An Introduction to Finite Element Method- J.N.Reddy, Tata Mcgraw Hill, 2nd Edition, 2005.

8ME02 PROFESSIONAL ELECTIVE - III
(4) ROBOTICS

SECTION – A

Unit I : **Fundamentals of Robotics-** Introduction, Automation & Robotics-robot applications robotic systems, robot anatomy and robot configurations, Joint types used in robots, robot wrists, joint notation schemes, work value for various robot anatomies, robot Specifications**.** (8 Hrs.)

Unit II : **Robots end-effectors**-classification of end-effectors, mechanical grippers, hooking or Lifting grippers, grippers for molten metals, plastics, vacuum cups,magnetic grippers Electrostatic grippers, multiple grippers, internal & external grippers, drive systems for gripers, active & passive grippers**.** (7 Hrs.)

Unit III : **Robot drives & control-**pneumatic power drives, hydraulic systems, electric drives, robot controllers-servo and non servo systems, motion control of robots, point to point and continuous path control, teaching of robots, robot programming methods. (7 Hrs.)

SECTION – B

Unit IV : **Robot Sensors :** Scheme of robotic sensors, contact type sensors, force, torque, touch, position, velocity sensors, non-contact type sensors, electro-optical imaging sensors, proximity sensors, range imaging sensors, robot environment and robot input/output interfaces, machine intelligence, safety measures in robots**.** (7 Hrs.)

Unit V : **Robot Kinematics-** Forward & reverse kinematics, forward and reverse transformation of two DOF & three DOF 2-D manipulator, homogeneous transformations.

Unit VI : **Quantitative Techniques for economic performance of robots-** Robot investment coats, robot operating expenses. methods of economic evaluation, method of pay-back period, return on investment method, discounted cash flow method. (7 Hrs.)

RECOMMENDED BOOKS :

TEXT BOOKS :

1) Robotics Technology & Flexible Automation by S.RDeb, Tata Mcgraw Hill.

2) Industrial Robotics by M.P.Groover, McGraw Hill.

REFERENCE BOOKS:

1. Robotics for Engineering, Korean Yoram, McGraw Hill.
2. Robots & Manufacturing automation by Asfahal, C.Ray, John Wiley.
3. Robotic Engineering by Richard D.Klafter, PHI.

8ME03 I. C. ENGINES
SECTION – A

UNIT I : **Introduction to IC Engines and cycle analysis:** Basic of I.C. Engines , Details of two stroke and four stroke engines, Air standard cycles, Fuel air cycle and actual cycle. Variation in specific heat, Dissociation and their effect on engine performance. Review of other losses in IC engines. (7 Hrs)

UNIT II: **Fuels and alternative fuels :** Conventional fuels for IC engines, requirement, properties, fuel additive, limitations of fossil fuels. Review of various alternative/non-conventional fuels . Studies of fuel injection systems : Fuel pump and their working, different types of fuel feed systems, studies of injectors nozzles, Bosch type fuel pump. (8 Hrs)

UNIT III: **Combustion SI Engine:-** Stages of combustion, factors influencing various stages, Normal and abnormal combustion, Detonation, Factors responsible for detonation. Effect of detonation. Octane rating of fuel, Requirement of combustion chambers for SI engines, important types, relative advantages and disadvantages and application. (8 Hrs.)

SECTION - B

UNIT IV: **Combustion in CI. Engines:-** Stages of combustion in CI Engines, Delay period, factor affecting delay period, diesel knock, cetane rating, Requirements of combustion chamber for CI Engines. Methods of generating turbulence in combustion chamber. Types of combustion chambers for CI Engies. (8 Hours)

UNIT V: **Performance testing of IC Engines:** Evaluation of various performance parameters of IC Engines including heat balance, sheet and excess air calculation. Methods of determination of friction power. Supercharging : Basic principles, objectives, arrangements for super charging, advantages and limitations of super charging (8 Hours)

UNIT VI: **Emission from IC Engines :** review, their effect on human health, cause of formation and approaches to control this pollutants. Study of BIS, EURO emission norms, IC Engines: Recent trends: Microprocessor based engines, management multi-point fuel

injection engines, common rail direct injections engines, variable valve timing engines. (8 Hours)

TEXT BOOKS:

1. Internal combustion Engines - M.L.Mathur & Sharma Dhanpatrai & Sons.
2. Internal combustion Engines ï V.Ganeshan, Tata Mcgraw Hills.

REFERENCE BOOKS :

1. Internal combustion Engines Fundaments- John B. Heywood, Mcgraw Hills
2. Internal combustion Engines & Air Pollution- Obert E.F.Intext Educational.

8ME04 OPERATION RESEARCH TECHNIQUES

SECTION – A

UNIT I : Operations Research : Introduction, characteristics, Phases, Limitations, Models and classification of O.R.Models.
Linear Programming : Formulation, Standard Form, Graphical and simplex methods, Primal-Dual relationship. (8 Hrs)

UNIT II : Transportation Models : Introduction, LP Formulation of transportation problems, Methods for finding initial solution, MODI method.
Assignment Models : Introduction, Mathematical statement and solution methods of assignm. Problems, variations of assignment Problems. (6 Hrs)

UNIT III: **Network Models :** Network construction, PERT analysis, CPM analysis, cost analysis & Crashing the network, Updating resources smoothing and leveling. (6 Hrs)

SECTION- B

UNIT IV: Waiting line models : Introduction, characteristics, classification, analysis of M/M/1 and M/M/s models.
Sequencing : processing of n jobs through two machines, n jobs through m machines, two jobs through m machines**.** (7 Hrs)

UNIT V : **Replacement models :** introduction, value of money, individual and group replacement policies.
` **Simulation :** introduction, Monte Carlo simulation, advantages and limitations, applications of simulation to queuing models, inventory models, maintenance models , etc. (7 Hrs)

UNIT VI: Dynamic programming: introduction, characteristics, applications of dynamic programming to capital budgeting, production

scheduling, travelling sales men, cargo loading problems, etc. (6 Hrs)

RECOMMENDED BOOKS:

TEXT BOOKS:

1. Operations Research and Theory applications- II ed.J.K.Sharma; Macmilan Business Books
2. Operations Research; Prem kumar Gupta, D.S.Hira; S.Chand & Co. ltd.

REFERENCE BOOKS:

1. Inroduction to Research Operation, 7th Edition; Hiller/Lieberman; Tata Macgraw Hills.
2. Operations Research : An Introduction, 7th Edition, H.A.Taha; PHI.
3. Operations Research: Principles and practices; 2nd Edition, Ravindran, Philips, Solberg, John Willey & Sons.
4. Operations Research: Kapoor .

8 ME05 PROJECT & SEMINAR

8ME06 PROFESSIONAL ELECTIVE- III
(1) REFRIGERATION & AIR CONDITIONING - LAB.

List of Practicals :-

Any six of the following should be conducted and a report there of should be submitted

1. Trial on Vapour compression system.
2. Trial on Air-conditioning system.
3. Study of Electrolux system.
4. Study of Water cooler.
5. Study of window Air conditioner.
6. Study of household refrigerator.
7. Study of desert cooler.
8. Study of cold storage plant.
9. Testing and changing of refrigeration system.
10. Study of defrosting system.
11. Study/trial of ice plant.
12. Study of various refrigeration and air-conditioning controls.

Practical Examination:

It shall consists of viva-voce based on term work and syllabus.

8ME06 PROFESSIONAL ELECTIVE- III
(2) MACHINE TOOL DESIGN - LAB.

PRACTICALS :-

(1) Design of speed box.
(2) Design of feed box.
(3) Design of combination guide way.

(4) Design of combination guide way.
(5) Acceptance lists
(6) Pneumatic trainer
(7) Hydraulic Trainer.
(8) Design of Laths bed

Note :- At least 6 practicals from above list should be done.

PRACTICAL EXAMINATION:-

It shall consists of viva-voce based on term work and syllabus.

8ME06 PROFESSIONAL ELECTIVE- III
(3) FINITE ELEMENT METHOD- LAB.

PRACTICAL EXAMINATION:-

It shall consists of viva-voce based on term work and syllabus.

8ME06 PROFESSIONAL ELECTIVE- III
(4) ROBOTICS – LAB.

PRACTICAL : The students are expected to perform 5 practicals based on the above syllabus

8ME07 I. C. ENGINES- LAB.

List of Experiments :

Any six of the following practical should be performed and

1. Performance test on a single cylinder diesel engine.
2. Performance test on a single cylinder petrol engine.
3. Evaluation of the heat balance for single cylinder diesel engine.
4. Performance test on a multi-cylinder petrol engine.
5. Mors test on multi-cylinder petrol engine.
6. Trial on petrol/ diesel engine to plot p-0 and p-V diagram.
7. Measurement of exhaust gas emission from S.I.engine
8. Measurement of smoke density of CI engine exhaust.
9. Study of Bosch type single plunger fuel pump.
10. Study of various types of fuel injectors and nosels.

It shall consist of viva-voce based on term work and syllabus.

8ME08 OPERATION RESEARCH TECHNIQUES - LAB.

List of Practicals:-

At least 6 practical from above list should be done.

1. Formulation of LPP from real life situation.
2. Solution of LPP by using MS Excel.
3. Case study of transportation problems.
4. Case study of assignment problems
5. Case study on project network.
6. Case study on sequencing problems
7. Constructing and solving the simulation model from real life situations
8. Study of Replacement model through different problems.
9. Case study on dynamic programming problems.

External Practical Examination ï Viva voce on the term work and syllabus.

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
ELECTRICAL (ELECTRONICS & POWER) ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER : SEVENTH

7 EP01/7EL01/7EE01 CONTROL SYSTEM - II

SECTION-A

Unit I : Compensation Techniques:
Introduction, Preliminary considerations of Classical Design, Lead Compensator, Lag Compensator, Lag- Lead Compensator, Cascade Compensation in time domain, Cascade compensation in Frequency domain, Feedback compensation in frequency domain .

Unit II : State Space Techniques I:
State, state space and state variables; SISO/MIMO linear systems state variable models - differential equations, Transfer Functions, Block Diagrams and State Diagrams (Signal Flow Graphs); Transfer functions decomposition - Phase variable forms, Canonical forms and Jordan canonical form; Transfer function - state model; Transfer matrix; State equations solution - State transition matrix (STM); STM Computation ï Laplace transformation, Canonical transformation and Cayley Hamilton theorem; Time response ï SISO Systems.

Unit III : State Space Techniques II:
Concept - controllability and observability; SISO/MIMO Linear systems -Gilbertôs method and Kalmanôs test; SISO controllable systems Design -state feedback.

SECTION-B

Unit IV Sampled Data Control Systems:
Representation, Z Transforms. review, Sampler and Hold - zero order hold; Sampling theorem; Z Transform analysis ï open loop and closed loop sampled data systems, Z Transfer functions, Difference equation solution and response; Z Transform Method,. Discrete Systems Response, Open and closed loop systems pulse transfer functions - Different sampler locations; Digital Controller - transfer function; Stability analysis - S and Z Domain relationship, Juryôs Test and Bi-Linear Transformation, Root and root locus method.

Unit V : Non-Linear System Analysis I :
Non-linear system behavior ï types and characteristics; Describing functions - typical non-linearity and their

characteristics; Stability analysis - Describing function method and Limit cycles; Limitations - describing function method.

Unit VI : Non-Linear System Analysis II

Linearization - Around operating point; Singular points ï Classification and Nature; Phase-plane method - non- linear systems analysis; Phase trajectories construction ï analytical method and graphical method by isocline method; Stability analysis - limit cycle; Limitations - phase-plane method.

TEXT BOOKS:

1. I.J. Nagrath and M. Gopal ï Control System Engineering,Wiley Eastern Limited, New Delhi.
2. K . Ogata - Modern Control Theory, Prentice Hall of India Pvt. Ltd. New Delhi.
3. Modern Control System, Richard Dorf, Robert Bishop, PEARSON education, 11th edition 2008

REFERENCE BOOKS:

1. Control Engineering, D.Ganesh Rao, k.Chennavenkatesh, 2010
2. D.Roy Choudhary, Modern Control Engineering,Prentice Hall of India Pvt Ltd. New Delhi.
3. R.C. Sukla ï Control Systems Dhanpat Rai & Co.Pvt Ltd.

7EP02/7EL02/7EE02 POWER SYSTEM OPERATION & CONTROL

SECTION-A

Unit I : Economic Operation – Part I

Meaning of optimum scheduling, UCP and LSP; Input ï Output characteristics, Heat rate characteristic, Incremental fuel rate, Incremental fuel cost; Methods of obtaining incremental fuel costs; Conditions for incremental loading; Optimum scheduling of generation between different units (Only Two plant system without transmission loss).

Unit II : Economic Operation – Part II

Transmission loss as a function of plant generation; Calculation of loss co-efficient (Two plant system); Incremental transmission loss; Optimum scheduling of generation between different plants including transmission loss; Concept and significance of penalty factor; Automatic load dispatch: Operation and Functions.

Unit III : A. Generator Control Loops

Concept of real and reactive power; Effect of real and reactive power on system parameters; Philosophy of real and reactive power control; Basic generator control loops.

B. Automatic Voltage Regulator (AVR)

Functions of AVR; Types of Exciter; Brushless AVR loop: Exciter modeling, Generator modeling, Transfer function block diagram representation, Static performance, dynamic response, Stability compensation, Effect of generator loading.

SECTION-B

Unit IV : Automatic Load Frequency Control

Automatic generation control (AGC); Speed governing system; Transfer function modeling: Governor, Hydraulic valve actuator, Turbine, Generator, Load; Transfer function representation of an isolated generator; Static performance of speed governor; Closing of ALFC loop.

Unit V : Control Area

Meaning; Primary ALFC Loop: Static response, Dynamic response, physical interpretation of results; Secondary ALFC loop; Integral Control; Pool operation; Tie-line Modeling; Two area system ï Dynamic response; Tie-line bias control.

Unit VI : Steady-State Instabilities

Natural torsional oscillatory modes in power system; Natural mode of a single generator operating onto infinite bus; Effect of damper winding; Effect of changing excitation; Power system stabilizer; Introduction to modern control application.

TEXT BOOKS :-

1. O. L. Elgerd ï Electric Energy Systems Theory: An Introduction ï Second edition, McGraw-Hill Book Comp. N. Y. 1987.
2. Power System Operation & Control, N.V.Ramana, PEARSON education, 2010.
3. Power System Operation by R.Miller, J.H.Malinowski, TMH, 2nd reprint 200

REFERENCE BOOKS :

1. L. K. Kirchamayor ï Economic Operation of Power System- Wiley Estern Pvt. Ltd., New Delhi.
2. Hadi Saadat ï Power System Analysis ï WCB/McGraw-Hill International Edition 1999
3. I. J. Nagrath, D. P. Kothari ï Modern Power System Analysis ï Second edition, Tata Mc-Graw Hill Publishing Company, New Delhi
4. P. S. R. Murty ï Power System Operation and Control ï Tata Mc-Graw Hill Publishing Company, New Delhi.
5. Wood and Wollenberg ï Power Generation, Operation and Control ï Willey ï Inter Science Publication.

7EP03 /7EL03/7EE03 ELECTRICAL POWER - II

SECTION-A

Unit I :: Symmetrical components

Definition and choice, Alpha operator, transformation matrices, sequence components, power invariance, line and phase sequence quantities relations, three phase delta/star transformer bank- sequence voltages and currents relationship; power system elements ï sequence impedance and sequence networks ; Various three phase transformer connections ï zero sequence rules; Unbalanced load system ï application.

Unit II : Symmetrical Fault Analysis

Transmission line transients, three phase symmetrical short circuit at alternator terminals, Power system fault calculations, short circuit MVA, Current limiting reactors, ring system and tie bar system, Circuit breaker rating calculation.

Unit III : Unsymmetrical Fault Analysis

L-G, L-L-G and L-L faults at unloaded generator terminals, Equivalent sequence network diagram, Fault impedance, Unsymmetrical faults through impedance, Power system faults-loaded and unloaded conditions.

SECTION-B

Unit IV : Overvoltages

Causes ï internal and external; Voltage surge, Basic insulation level, Protection ï earthing screen, overhead ground wire, lightning arresters.

Unit V: HVDC Transmission Basic principle, Transmission equipments, Comparison with AC links, Inverters ï reactive power requirement; Converters, DC links, Circuit breaking, ground return, Economic distance, modern developments.

Unit VI : Flexible AC Transmission Systems (FACTS)

FACTS concept, Elements, Controllers, Comparison with Conventional AC Transmission system.

TEXT BOOKS :-

1. Power System Engineering by D.P.Kothari, I.J.nagrath TMH 2nd edition, 9th reprint 2010
2. Power System Analysis, N.V.Ramana, PEARSON education, 2010
3. Power System Analysis, Arthur R. Bergen, Vijay Vittal,2nd Edition, 2009, PEARSON Education
4 Modern Power System Analysis by D.P.Kothari, I.J.nagrath TMH 3rd edition, 20th reprint 2010

5. Power System Analysis by Hadi Saadat TMH, 1st reprint 2004
6. Electrical Power System, by Syed A. Nasar TMH,Revised 1st edition 2011

REFERENCE BOOKS :-

1. S. Rao ï ñEHV A.C. and HVDC Transmission Engineering and Practiceò, Khanna Publishers, New Delhi.
2. Narain G. Hingorani and Lazlo Gyugyi ï ñUnerstanding FACTS: Concepts and Technology of Flexible AC Transmission Systems.
3. Yong Hua Song and Allan T. Johns - ñFlexible AC transmission Systems (FACTS), T and D reference bookò Westing house.

7EP04 /7EL04/7EE04 SWITCHGEAR & PROTECTION

SECTION-A

Unit I : Circuit Interruption

Circuit breaker control circuit, Fault clearing process, Auto-reclosure, Arc phenomenon- maintenance, properties and interruption theories; AC circuit breakers- current interruption, transient recovery voltage (TRV), rate of rise of TRV, factors affecting TRV, ratings; Inductive and Capacitive current interruptions, current chopping.

UnitII : A. Fuses Types, Constructional features, operation, Characteristics and Applications

B. Circuit Breaker (Part ï I)

Air break, Air blast, Bulk oil and minimum oil-types, constructional features, operationand application.

Unit III : Circuit Breaker (Part – II)

SF_6 , Vaccum, Miniature, Earth leakage and Moulded Case ï types, Constructional features, operation and application; Testing, Instalation and Maintenance.

SECTION-B

UnitIV: A. RelayingPrinciple

Components, Essential features, Characteristics, Terminology, CTôs and PTôs, Relay classification.

B. ElectromagneticRelays

Overcurrent, Directional, Distance and Differential ï types, constructional features, operation, characteristics and application.

Unit V : Protection of Transmission Lines

Relaying schemes ï overcurrent, earth fault, directional, distance and differential; Parallel feeders and ring mains protection, Carrier current relaying, Overload and Power swing.

Unit VI : **A.** Other Power System Elements Protection Transformers, Motors, Generators and Buses.

B. Static Relaying

Basic concepts, equipments, comparators, Characteristics realization ï overcurrent, directional, differential and distance relay. Microprocessor based relay introduction.

TEXT BOOK:-

1. Sunil S. Rao ï ñSwitchgear and Protectionò Khanna Publications New Delhi

REFERENCE BOOKS: -

1 R. T. Lythall ï ñSwitchgear Handbookò J and P Newness Butterworth, London.

2 C. R. Mason ï ñThe Art and Science of Protective Relayingò

3 A. R. Van and C Warringtan ï ñProtective Relaying , Vol 1 and 2,ò Chapman Hall, London.

4 Geosonoviz ï ñHigh Voltage Circuit Breakersò

5 V. A. Slabikov ï ñGeneration Protection and Switchgearò CIT, Coimbatore.

6 Badri Ram and B. N. Vishwkarma ï ñPower System Protection and Switchgearò Tata Mc-Graw Hill Publishing Company Limited, New Delhi.

7 B. Ravindranath and M Chander ï ñPower System Protection and Switchgearò Wiley Eastern Ltd, New Delhi.

8. Handbook of switchgear by BHEL, TMH 6th reprint,2010

7EP05 /7EL05/7EE05/ 7EX 05 PROFESSIONAL ELECTIVE - I

(1) PROCESS CONTROL SYSTEMS

SECTION-A

Unit I : Electronics Instruments for Measurement of Electrical Parameters Advantages of Electronic Instruments, Electronic Voltmeters Electronic Multimeters, differential volt meter, Digital voltmeter, Q meter, vector impedance meter, vector voltmeter.

Unit II: **Signal Generation and Analysis**

Signal generators, Function generators. Wave analyzer Harmonic Distorsion Analysers, spectrum Analysis.

Unit III: **Signal Counting and Recording**

Decade counting Assembly, Binary counter, Decimal counter, Decade counter with digital disply, universal counter, Digital readot devices, storage type CRO, Servotype X-Y recorder.

SECTION-B

Unit IV : **Signal conditioning and Conversions.**

Frequency characteristics of various types of signals,active filters bandpass,low pass and high pass filters using opAmps. Various techniques od A/D and D/A conversions. Modulation and demodulation PCM techniques, phase locked loop.

Unit V: **Signal Processing**

Pulse times, triggered elayed sweeps, discrete pulse delay circuits, pulses equencing, analog multiplexers and demultiplexers, digital multiplexing sample and hold circuits, serial and parallel digital data conversion. Signal transmission, Analog and digital telemetry techniques, MODEM and UART, keyboard and character generators, tape recorder,

Unit VI : Introduction to Processor and Processor based Techniques. Introduction to PLC, PLC architecture, programming; ladder diagram and examples, micro controller based instrumentation

TEXT BOOKS: -

1. H.S. Kalsi ï Electronic Instrumentation, - Tata Mc-Graw Hill Publishing Company, New Delhi.
2. Cooper, Helfrick ï Electronic Instrumentation and Measurement Techniques, A Prentice Hall of India. New Delhi.

REFERENCE BOOKS: -

1. B.R. Gupta-Electronics and Instrumentation ï Wheeler Publishing.
2. Rangan, Sharma & Mani ï ñInstrumentation ï devices & Systems.ò Tata Mc-Graw Hill Publishing Company, New Delhi.
3. R.P. Jain-Digital Electronics, Tata Mc-Graw Hill Publishing Company, New Delhi.
4. Microprocessors and Digital Systems, by:D.V. Hall,Tata Mc-Graw Hill Publishing Company, New Delhi.
5. Shoen Beck- Electronic Communication, Prentice Hall of India. Pvt. Ltd. New Delhi.
6. B. Ram- fundamental of Microprocessors, Dhanpat Rai & Sons, New Delhi.
7. A.K. Sawhney ï Acourse in Electrical & Electronics Instrumentation, Dhanpat Rai & Sons, New Delhi.

7EP05/ 7 EX 03 PROFESSIONAL ELECTIVE - I

(2) COMPUTER ORGANISATION

Unit-I: Basic strucutre of computer: Hardware & software.Addressing methods. Program sequencing. concept of memory locations & address. Main memory operation. Instructions & instruction sequencing. Addressing modes. BasicI/O operations. Stacks. Queues & subroutines.

Unit-II: **Processing Unit:** fundamental concepts. execution of a comlete instruction. hardwired control, performance consideration. Microprogrammed control; microinstructions, microprogram sequencing, microinstruction prefetching, emulation.

Unit-III: I/O organizatiion: accessing I/O devices,interrupts, direct memory access:bus arbitration. I/O hardware:processor bus and interfacing circuiuts,standard I/O interfaces: SCSI bus, backplane bus standard.

Unit-IV: **Memory Unit:** basic concepts,semiconductor RAM memories,internal organization, static & dynamic RAMs, ROMs. speed, size & cost considerations.Cache memories: performance considerations. Virtual memories, address translation,memory management requirements.

Unit-V: Arithmetic; number representation. design of fast adders,signed addition and subtraction. Multiplication of positive numbers, Boothsôalgorithm, Integer division.Floating-point numbers and related operations.

Unit-VI: **Computer Peripherals:** Input-output devices like video displays,video terminals, graphics input devices,printers.Online storage devices: magnetic disks,magnetic tape systems, CD-ROM systems. Communication devies: Modems.

TEXT BOOK:

V.Carl Hamacher & S. Zaky ñ Computer Organizationò (4/e) McGraw-Hill(ISE).

REFERENCES BOOKS:

1. Stallings. W. ñ Computer Organization & Arcitectureò (5/e) (Pearson Education).
2. Tenanbaum A.S.ò Structured Computer Organizationò (5/e) (Pearson Education).
3. Hayes J.P. ñComputer Architecture & Organizationô(4/e) (McGraw-Hill).

7EP05 / 7EL05 / 7EE05 PROFESSIONAL ELECTIVE - I

(3) COMPUTER METHODS IN POWER SYSTEM ANALYSIS

SECTION-A

Unit I : **Representation of power systems for computerized analysis :** Mathematical models of Synchronous generator for steady state and transient analysis . Transformer with tap changer, transmission line,phase shifter and loads.

Unit II : **Topology of Electric Power Systems** ï Network Graphs , Incidence matrices, fundamental loop and cutest matrices,

primitive impedance and admittance matrices, equilibrium equations of networks . Singular and Nonsingular transformation of network matrices .

Unit III : **Formation of bus impedances and admittances matrices by algorithm** ï Modification of bus impedance and admittance matrix to account for change in networks. Derivation of loop impedance matrix.

Three phase network elements ï transformation matrix ï incidance and network matrices for three phase l networks . Algorithm for formulation of 3 phase bus impedance matrix.

SECTION-B

Unit IV: **Short circuit studies :** Three phase networks , Symmetrical components. Theveninôs theorem and short circuit analysis using bus impedance matrix . Short circuit calculations for balanced three phase networks using bus impedance matrix.

Unit V: **Load flow studies :** formation of load flow problem ï Gauss Seidel method ï Newton Unit III Raphson method ï decoupled method, fast decoupled methods ï sparsity technique.

Unit VI : **Stability studies of power system** ï Development of mathematical model for multimachine system stability analysis ï Formation of equations and methods of solutions .Transient stability analysis including synchronous machines , system networks and loads . Solution of state equation by modified Euler method and Runge Kutta 4th order Approximation method.

TEXT BOOKS:

1) L.P.Singh : Advanced Power System Analysis and Dynamics, WEL.
2) Y.Wallach : Calculations and programs for Power System Network.
3) G.W.Stage and A.H.El-Abiad : Computer Methods in Power System Analysis, McGraw Hill.

REFRENCE BOOKS:

1) R.N.Dhar : Computer Aided Power System Operation and Analysis, TMC.
2) Computer Techniques in Power System Analysis, by M.A.PAi TMH 10th reprint 2011

7EP05/ 7EL05/7EE05 PROFESSIONAL ELECTIVE - I
(4) ARTIFICIAL INTELLIGNCE

SECTION-A

UNIT I : Introduction
Biological Neurons and their artificial models, introduction to neural computing
Components of neuron, input and output weight, threshold,weight factors, transfer
Functions ,concepts of supervised and unsupervised learning.

UNIT II: Supervised Learning :
Single Layer network, perceptron, Linear Separability, Training algorithm and limitations .
Multilayer Network : Architecture of feed forward network ,learning rule, generalized
Delta rule,learning function . Back propagation algorithm.

UNIT III: Unsupervised Learning:
Introduction, Counter propagation networks, Kohonenôs self organizing maps.
Hopfields networks.

SECTION-B

UNIT IV: Introduction:
Uncertainty in information,basic concepts of Fuzzy sets , operations on fuzzy sets , properties.
Fuzzy relations : operations,properties ,value assignments.

UNIT V : Membership Functions:
Features, fuzzification, membership value assignments, Fuzzy Rule based
Systems, Graphical technique of inference.
Defuzzification : Lambda-cuts for Fuzzy sets and Fuzzy relations , Defuzzification methods

UNITVI : Genetic Algorithm (GA):
Introduction to genetic algorithm,working principle,coding of variables, Fitness function. GA operators , similarities & differences between GAs and Traditional methods; Unconstrained and constrained optimization using Genetic Algorithm , real coded GA ,Advanced GA, global optimization using GA .

TEXT BOOKS

1 J.M. Zurada : Introduction to Artificial Neural Network, Jaico Publishing House

2 Meherotra Kishan ,Mohan C.K, Ranka Sanjay : Elements Of Artificial Neural networks Penram Int Pub Mumbai.
3 D.E Goldberg ,Addision Genetic Algorithm in Search Optimization and Machine Learning Wesley Publication
4 Kalyanmoy Deb Optimization for Engineering Design Algorithms and Examples, Prentice Hall of India New Delhi.
5 M.Kishan, Mohan C.K., Ranka Sanjay; Elements of Artificial Neural Networks, Penram Int. Publications.

REFRENCE BOOKS:

1. G.J. Khir and T.A. Folger : Fuzzy sets , Uncertainity and Information PHI Publication
2. Koska Bart Neural Network & Fuzzy systems Prentice Hall of India Pvt Ltd , New Delhi

7EP06/ 7EL06/7EE06 PROJECT & SEMINAR

7EP07/ 7EL07/7EE07 ELECTRICAL POWER II - LAB

Any TEN experiments based on contents of 7EP03 ELECTRICAL POWER - II

7EP08/ 7EL08/7EE08 SWITCHGEAR & PROTECTION -LAB

Any TEN experiments based on contents of 7EP04 SWITCHGEAR & PROTECTION

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SEMESTER : EIGHT

8EP01/8EL01/8EE01 POWER SYSTEM STABILITY

SECTION-A

Unit I : Basic Concepts
Meaning of stability, Steady state, Transient and Dynamic stability limits; Three Phase Synchronous Machine-circuit representation, voltage equation and Parkôs Transformation; Transient and Sub transient state analysis and Phasor diagrams, Voltage behind the transient and sub transient impedances, Parameters and Time Constants determination.

Unit II: Steady State Stability - I
Steady state stability limit-short transmission line, Two machines system, Medium and Long transmission line, Clarkeôs diagrams for system with and without loss, Effect of inertia, Conservative criterion, Synchronizing coefficients and Multi machine system.

Unit III: Steady State Stability – II
Saturation effect, Saturated reactance, Equivalent reactance and its graphical determination; Short circuit ratio, Governor action and automatic voltage regulator effects.

SECTION-B

Unit IV: Transient State Stability – I
Review of basics concepts, Transient state stability and equal area criterion, Swing equation and its point by point solution, Critical clearing angle and time.

Unit V: Transient State Stability – II
Type of faults, Grounding and high speed re-closing effects, Pre-calculated swing curves and their use, Faults clearing Time, Excitation and governing action effects, Stability improvement methods, Multi machine problem, Network analyzer, Digital Computer role.

Unit VI: Excitation System
Unit exciter and common bus system, Self and separate excitation, Exciter type of and their description, Exciter drives, Quick response excitation system, Voltage-current methods differential equations for obtaining voltage ï time curves, Exciter response from voltage time curves, Dispersion coefficient, Constant leakage Inductance, Eddy current effects on exciter response, Loaded exciter response, Exciter response improvement methods.

TEXT BOOKS :

1 E W Kimbark- Power System Stability, Vol.1 and 3, Dover Publications Inc., New York.

2 Power System Stability & Control by Prabha Kundur, TMH 11th reprint 2011

3. S.B Crary- Power System Stability, Vol.1 and 3, Hohn Wiley and Sons, New York.

REFERENCE BOOKS:

1 L.P Singh ï Computer Aided Power System Operation and Dynamics, Wiley Eastern Ltd. New Delhi.

2 I.J.Nagrath and D.P.Khothari ï Modern Power System Analysis, Tata Mc-Graw Hill Publishing Company, New Delhi.

8EP02/8EL02/8EE02/7EX05(III) HIGH VOLTAGE ENGINEERING

SECTION-A

Unit I : Breakdown in Gases
Insulating materials Classification, Gases as insulating media, Ionization and decay process, Breakdown in gases, Townsendôs law, Streamer mechanism of spark pashanôs law, Corona discharge, Electronegative gases.

Unit II: Breakdown in Liquid and Solid Dielectrics
Breakdown in pure and commercial liquids, Sold dielectrics and composite dielectrics, High voltage bushings, Guarding, Shielding, Field plotting.

Unit III: Lightning and Switching Over Voltage and Protection
Lightning strokes to lines and towers; Mechanism, Characteristics and protection of transmission lines from lightning; Lightning arrestors, Insulation co-ordination of HV and EHV power system and substation.

SECTION-B

Unit IV: High Voltage and Current Generation, Generation of high d.c, a.c and impulse voltages, Standard impulse wave shapes, Switching surges, and High impulse generator.

Unit V: High Voltage and Current Measurement Peak voltage, Impulse voltage and High direct measurement methods, Non-destructive measurement and testing, High voltage dielectrics loss and capacitance measurement, Radio frequency and Partial discharge measurement.

Unit VI: High Voltage Testing and E.H.V.Lines Design.
Basic terminology, Testing ï Insulators, Bushings, Cables, Transformers, Surge diverters and Isolators; Electric shock and threshold current, Capacitance of long objects, Electromagnetic interference, E.H.V. line insulation design based upon transient over voltage.

TEXT BOOK :

1. M.S.Naidu and V.Kamraju ï High Voltage Engineering, Tata McGraw Hill Publishing, Company, New Delhi.

REFERENCE BOOKS-

1. E.Kuffer and W.S.Zaenglo- High Voltage Engineering, Pergamon Press,
2. Rokosh Das Begamudre- EHV AC. Transmission Engineering, Wiley Easter Ltd. New Delhi.
3. E.Kuffer and M.Abdullaha _High Voltage Engineering, Pergamon Press
4. M.S.Naidu and V.N.Maller- SF6 and Vaccum Insulation for High Voltage Application, Khanna Publications, Delhi.
5. Prof.D.V.Razeving (Translated from Russian by Dr.M.P.Chaurasia) ï High Voltage Engineering, Khanna Publications, Delhi.
6. An introducation to High Voltage Engineering by Subir Ray, Prentice ï Hall & India, Private Limited, New Delhi.
7. High Voltage Engineering by C.L. wadhawa New Age international (P) Ltd. Publications

8EP 03/8EL03/8EE03 DIGITAL SIGNAL PROCESSING

SECTION - A

UNIT-I : Introduction to DSP, Frequency domain description of signals & systems, Discrete time sequences systems, Linearity unit sample response, Convolution, Time invariant system, Stability criteria for discrete time systems, Solutions of linear difference equations.

UNIT-II : Introduction to Fourier transform of Discrete Time Signal and its properties, Inverse Fourier transform, DFT and its properties , Circular convolution, Linear convolution from DFT, FFT, decimation in time and frequency algorithm.

UNIT-III: Sampling of Bandpass signals-Representation of Bandpass signals, sampling of bandpass signals, discrete time processing of continuous time signal; Analog to digital conversion-sample and hold, quantization and coding, analysis of quantization errors, oversampling of A/D converter; Digital to Analog conversion-sample and hold, first order hold, linear interpolation with delay, oversampling of D/A converter

SECTION-B

UNIT-IV: Filter categories, Direct form I, Direct form II, Cascade and parallel structure for IIR and FIR Filter, Frequency sampling structures for F.I.R. filter, Steps in Filter Design, Design by Pole Zero Placements, FIR filter design by Windowing method, Rectangular, Triangular and Blackman window.

UNIT-V : Analog filter types, Butter worth, Elliptic filter, Specification and formulae to decide to filter order, Methods to convert analog filter into IIR digital, Mapping of differential, Impulse invariant, Bilinear, Matched Z transformation.

UNIT-VI: DSP Processors and applications- DSP Microprocessors architectures, fixed point, floating point precision, algorithm design, mathematical, structure and numerical constraints, DSP programming, filtering, data conversion; Real time processing consideration including interrupts

TEXT BOOKS:

1. Proakis & Monolakis D.G, óDigital Signal Processingô, PHI Publication
2. Oppenhavm & Scheffer, óDiscrete Time Processingô, John Wiley Publication
3. Digital Signal Processing, P Ramesh Babu,SCITECH Publications, Chennai, 4th edition,2010

4. Mitra S.K, óDigital Signal Processingô, TMH Publication

8EP 04/8EL04/8EE04 PROFESSIONAL ELECTIVE - II
(1) ELECTRIC DRIVES & CONTROL

SECTION-A

UNIT I : Introduction to Electrical Drives: Concept, Classification and Advantages. Basic elements, Components of load torque, Torque equation, Equivalent values of drive parameters. Types of mechanical loads. Selection of motor and Controller, Classes of duty, Stability of an electrical drive. Comparison of AC and DC drives.

UNIT II: Starting and Braking of Electrical Drives: Solid-state starters, soft starting, Calculation of starting/acceleration/reversal time and energy loss during starting. Types, advantages, limitations and purposes/objectives of electrical braking, Braking of d c and induction motors.

UNIT III: DC Drive Control Basic machine equations, schewe of control, Single phase separately excited drives, singleï phase- series motor drives, power factor improvement, Three-phase separately excited drive, Closed loop control, PLL control, microcomputer control.

SECTION-B

Unit-IV: Ac drive control: Basic principle of operation, speed control of induction motor, stator voltage control, varible frequency control, Rotor resistance control, slip-power recovery scheme, Synchronus motor drive, Microprocessor controlled AC Drive.

UNIT V: Vector controlled Drive,Principle of Vector Control, Equivalent ckt. Direct v.c., Flux vector estimation, Indirect v.c., v.c. of line side pular rectifer exator flux oriented v.c., v.c. of current fed inventer drive & cycloconverter drive servorless control speed estimation controls ï EKF method

UNIT VI: Direct torque & adoptaive controlled Drive Torque Expression o& control strategy self tuning control MRAC sliding mode control self commissiong of drive, Study of electrical drives in rolling mills, paper mills, cement mills, sugar mills, textile mills, traction and machine tool applications.

REFERENCE BOOKS :

1. Power Electronics : (Converts, Application & Design) ï Mohan/ Undeland/ Rossing- John wiley
2. Power Electronics : M.D. Singh, K.B. Khan Chardalli ï TMH

3. Power Electronics : M.H. Rashid ï Pearson Education
4. B.K. Bose : Modern Power Electronics and AC Drive, Pearson Education
5 G. K. Dubey Fundamentals of Electrical Drives, , Narosa Publishing House,2005
6 . Electric Drives ï Concepts & Applications by V.Subrahamanyam, TMH 2nd edition 2010

8EP 04/8EL04/8EE04 PROFESSIONAL ELECTIVE - II
(2) POWER QUALITY

SECTION - A

Unit I: Introduction
Power Quality Definition, Need for Power Quality, Sensitive Loads, Nonlinear Loads, Interconnected Power System, Deregulation, Utilities, End Users, Lawyers,

Unit II: Power Quality Characteristics
Power Quality Theory, Types of power Quality Problems, Voltage Swells, Long-Duration Over voltages, Under voltages, Interruptions, Transients, Voltage Unbalance, Voltage Fluctuations, Harmonics, Electrical Noise, Sources of Power Quality Problems, Utility Side of the meter, End-User Side of the meter, Effects of Power Quality Problems, Power Quality Problem-Solving Procedures, Power Quality Solutions,

Unit III: Power Quality Standards
Power Quality Standards Organizations, Institute of Electrical & Electronics Engineers (IEEE), American National Standards Institute(ANSI), International Electrotechnical Commission(IEC Other International Standards Organizations, Purpose of Power Quality Standards, Types of Power Quality Standards, Voltage Sag (Dip) Standards, Transients of Surges, Voltage Unbalance, Voltage Fluctuation or Flicker Standards, Harmonics Standards, Transformer Overheating Standards, Natural Conductor Loading Standards, Static Electricity, Telephone Power Quality Standards, Grounding and Wiring Standards,
Sensitive Electronics Equipments Standards, Trends in Power Quality Standards.

SECTION -B

Unit IV: Power Quality Solutions
Reduce Effects on Sensitive Equipment, Reduce or Eliminate Cause, Reduce or Eliminate Transfer Medium, Install Power Conditioning Equipments, , Surge Suppressors, Noise Filters, Isolation Transformers, Line-Voltage Regulators, Motor-

Generator Sets, Magnetic Synthesizers, Static VAR Compensators (SVCs), Uninterruptible Power Supply (UPS), Solid-State Switches, Harmonics Solutions, Selection of Appropriate Power Conditioning Equipment, Grounding and Wiring Solutions

Unit V: Wiring and Grounding
Wiring Principles, Grounding Principles, Power System, Utility Power System Grounding,Telecommunication System Grounding, End-User Power System Grounding, Wiring and Grounding Problems, Ground Loops, Electromagnetic Interference (EMI) Noise, Loose Connections, Grounding for Lightning and Static Electricity, Attack of the Triplens, Solutions That Cause Problems, Wiring Solutions, Separation, Selection of Wire and Cables, Shielding, Grounding Solutions, Ground Rods, Ground Ring, Ground and Reference Signal Grids, Other Grounding Systems, Isolated Grounds, Multipoint Grounding, Separately Derived Source Grounding, Reference

Unit VI: Power Quality Measurement Tools & Power Quality Surveys
Kilowatt-Hour Meter, Multimeters, Average-responding versus True RMS Meters, Crest Factor and Bandwidth, Other Selection Considerations, Oscilloscopes, Disturbance Analyzers, Harmonics Analyzers, Purpose of a Power Quality Surveys (Checkup or Examination), Planning a power Quality Surveys.

TEXT BOOKS: -

1. Barry W. Kennedy: Power Quality Primer, McGraw-Hill
2. Electrical Power System quality by R.C.Dugan, M.F.McGranghan, S.Santoso, H.W.Beaty TMH 2nd edition 2011

REFERENCE BOOK: -

1. G.T. Heydt: Power Quality Stars in a circle Publication, Indiana, 1991.

8EP 04/8EL04/8EE04 PROFESSIONAL ELECTIVE - II
(3) EMBEDED SYSTEMS

Unit-I : Introduction: Embedded systems design, Embedded system architecture, Embedded systems model, An Overview of Programming Languages and Examples of Their Standards, Standards and Networking, Multiple Standards-Based Device Example: Digital Television (DTV).

Unit-II: Embedded Hardware Building Blocks and the Embedded Board, powering the hardware, Instruction Set Aarciteture (ISA) architecture model, internal processor design and its performance.

Unit-III: Memory: ROM, RAM and auxiliary memory, Memory Management of Extemal Memory , Performance of memory .I/ O

: Managing Data: Serial vs. Parallel I/O , Interfacing the I/O Components ,I/O performance.Buses: arbitration, timing and performance.

Unit-IV: Device Drivers: Device Drivers for Interrupt-Handling, Memory Device Drivers, On-board Bus Device Drivers, Board I/O Driver. Embedded OS: Multitasking and Process Management, Memory Management ,.

Unit-V: Embedded OS : I/O and File System Management ,OS Standards: POSIX, OS Performance Guidelines. Middleware :meaning and examples. Application layer software: meanings and examples.

Unit-VI: Embedded system design & implementation: Defining the System-Creating the Architecture and Documenting the Design, Stages in creating an Embedded System Architecture. Implementing the Design. Quality Assurance and Testing of the Design.

TEXT BOOK:

Tammy Noergaard ñEmbedded Systems Architectureò Elsevier Newnes Publication.

REFERENCE BOOKS:

1. Rajkamal , ñEmbedded Systems, Architecture, Programming & Designò TMH.
2. Jane W. S. Liu óReal Time Systemsò, Pearson Education
3. Vahid & Givargis ñEmbedded System Designò John Wiley & Sons P Ltd.
4. Peter Marwedel ñEmbedded Systems Designò Springer, Netherland.

8EP 04/8EL04/8EE04 PROFESSIONAL ELECTIVE - II

(4) GENERALISED MACHINE THEORY

SECTION-A

Unit I : Elements of Generalized Theory: essentials of rotating machines, conventions, basic two pole machines, transformer with movable secondary transformer and speed voltage in armature, kions, primitive machine, leakage fluge, voltage and torque equations.

Unit II : Linear transformations in machines: invariance of power transformation from displaced brush axis, three-phase to two-phase transformation power invariance, transformation from rotating axes to stationary axes, impedance matrix, application of generalized theory, electrical torque, limitations of generalized theory.

Unit III: D.C.Machines: separately excited DC generators and motors formulation of mathematical model, steady state and transient analysis, Ward-Leonard system of speed control.

Steady state analysis of DC series, shunt and compound machine and their characteristics cross-field machines, metadyne transformer, metadyne generator.

SECTION-B

Unit IV: Poly-phase synchronous machine, three phase synchronous machine, steady state and transient analysis, phasor equations and phasor diagram, power angle characteristics, DWR synchronous machine generalized mathematical model, steady state analysis, phasor diagram.

Unit V: Induction Machine: Transformations, electrical performance, equation, steady state analysis, equivalent circuit, torque-slip characteristics.High torque cage motors- deep bar rotor and double cage rotor induction motors, steady stateanalysis, comparison between single cage and double cage motors.

Unit VI: Generalized theory of single-phase series motor, repulsion motor and scharge motor and steady state analysis.

TEXT BOOKS :

1. M.B.Say: Introduction to Unified Theory of Electrical Machine, ELBS.
2. SEELY: Electromechanical Energy Conversion

8EP 05/8EL05/8EE05 PROJECT & SEMINAR

8EP06 DIGITAL SIGNAL PROCESSING - LAB

Any TEN experiments based on contents of
8EP03/ 8EL03/ 8EE 03 DIGITAL SIGNAL PROCESSING

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
ELECTRICAL & ELECTRONICS ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER : SEVENTH

7EX01 UTILISATION OF ELECTRICAL ENERGY

SECTION-A

Unit I : Concept of electrical drive, classification, advantages of electrical drive, selection criterion for electrical motor, size, specification and type of motor, mechanical features of motor, transmission of drive, industrial application, general workshop, Textile mill, Paper mill, Cement mill, Coal mining, Sugar mill, Printing industry.

Unit II: Types of duties, continues, intermittent and short time, heating and colling of motor, rating calculations for these duties, use of fly wheel and fly wheel calculations. Introduction for conducting and reporting the test on induction motors as per Indian standard.

Unit III: Characteristics of DC motors, three-phase induction motors, single-phase induction motors. Quadrantal diagram of speed-torque characteristics of motors, starting methods, different methods of speed control, braking of motors, plugging, rheostatic and regenerative braking.

SECTION -B

Unit IV: Requirement of ideal traction system, system of track electrification and their comparison, speed time curves, energy consumption calculation, calculation of tractive efforts.

Unit V : Traction motors, general features and types, characteristics, control of locomotive motor coaches, series-parallel control. Overhead equipments, collector gear for overhead equipments.

Unit VI:
a) Nature of light-units, luminous efficiency, Glare production of light, Polar curves, control of light by reflection, refraction and diffusion. Lighting calculations, factory lighting, flood lighting, street lighting.
b) Methods of heating and welding furnaces

TEXT BOOKS:

1) E.O.Taylor : Utilization of Electric Energy in SI Units, published by Orient Longman Ltd.
2) S.K.Pillai : A First Course in Electrical Drives, published by New Age International.

REFERENCE BOOKS:

1) Vedam Subrahmanyam : Electric Drives, published by Tata McGraw Hill Publishing Co. Ltd., New Delhi.
2) C.L.Wadhwa : Generation Distribution and Utilization of Electrical Energy, published by New Age International Pvt. Ltd.
3) Specification of Three Phase Induction Motors as per Indian Standard, published by Indian Standard Institute, New Delhi.
4) H.Pratap : Utilization of Electrical Energy.

7EX02 ELECTRONIC COMMUNICATION

Unit I : **Signal and Noise : -** Audio signals, frequency range speech and music, sound intensity, loudness, level, frequency response, bandwidth, bandwidth requirement for different types of signals such as telegraph, telephone speech, music and video Noise: External and internal noise, noise figure, signal to noise ratio, noise figure measurement.

Unit II: **Modulation Techniques : -** Amplitude modulation theory, Frequency spectrum representation of AM, Modulation index side bands, power relations, current relations and voltage relation in the AM wave. Frequency modulation and phase modulation, frequency deviation, modulation index, frequency spectrum.

Unit III: **AM Transmitters : -** Principles of DSB-FC, DSB-SC, SSB-SC modulation and their comparison, Details of DSB-FC transmitter, Generation of DSB-SC by using balanced modulators (FET & Diodes), DSB-SC transmitter. Generation of SSB-SC by phase-shift method.

Unit IV : **AM Receivers : -** TRF receiver, superhetrodyne receiver, details of each block such as RF amplifier, Oscillator, IF amplifier, Diode detector, audio amplifier. Mixer: Principle, Need and type of AGC, Practical radio receiver circuit with AGC, characteristics such as selectivity, sensitivity, and fidelity communication receiver.

Unit V : **FM Transmitter : -** Circuits for direct FM generation using FET and varactor diode. Circuit & analysis of Indirect FM generation, Narrow band and wide band FM, their comparison, de-emphasis and pre-emphasis. FM transmitter & stereo FM transmitter.

Unit VI : **FM Receivers :-** Details of FM receiver, blocks such as RF amplifier, local oscillator, IF amplifier, Mixer, audio Ampl. AGC, limiter, FM discriminator, single slope and balanced slope detector, analysis of Foster seeley and ratio detectors, stereo FM receiver.

TEXT BOOK :

1. Kennedy G.: Electronics Communication System, Tata McGraw Hill Co.New Delhi.

REFERENCE BOOKS :-

1. Young P.H.: Electronics Communication Techniques, A Bell and Howell Co. Indiana.
2. Martin James. : Telecommunication and the Computer, Prentice Hall Inc. New Jersey.
3. Roddey D. Coolen S.: Electronics Communication, Prentice Hall India Pvt. Ltd.
4. Beck, Robert and J.Schoen: Electronics Communication, Modulation and Transmission, A Bell and Howell Co.

7EX03 COMPUTER ORGANISATION

Unit-I: Basic strucutre of computer: Hardware & software.Addressing methods. Program sequencing. concept of memory locations & address. Main memory operation. Instructions & instruction sequencing. Addressing modes. BasicI/O operations. Stacks. Queues & subroutines.

Unit-II: Processing Unit: fundamental concepts. execution of a comlete instruction. hardwired control, performance consideration. Microprogrammed control; microinstructions, microprogram sequencing, microinstruction prefetching, emulation.

Unit-III: I/O organizatiion: accessing I/O devices,interrupts, direct memory access:bus arbitration. I/O hardware:processor bus and interfacing circuiuts,standard I/O interfaces: SCSI bus, backplane bus standard.

Unit-IV: Memory Unit: basic concepts,semiconductor RAM memories, internal organization, static & dynamic RAMs, ROMs. speed, size & cost considerations.Cache memories: performance considerations. Virtual memories, address translation,memory management requirements.

Unit-V: Arithmetic; number representation. design of fast adders,signed addition and subtraction. Multiplication of positive numbers, Boothsô algorithm, Integer division.Floating-point numbers and related operations.

Unit-VI: Computer Peripherals: Input-output devices like video displays, video terminals, graphics input devices,printers.Online storage devices: magnetic disks,magnetic tape systems, CD-ROM systems. Communication devies: Modems.

TEXT-BOOK:

V.Carl Hamacher & S. Zaky ñ Computer Organizationò (4/e) McGraw-Hill (ISE).

REFERENCE BOOKS :

1. Stallings. W. ñ Computer Organization & Arcitectureò (5/e) (Pearson Education).
2. Tenanbaum A.S.ò Structured Computer Organizationò (5/e) (Pearson Education).
3. Hayes J.P. ñComputer Architecture & Organizationô(4/e) (McGraw-Hill).

7EX04 POWER ELECTRONICS - II

SECTION-A

UNIT I : Introduction to Electrical Drives: Concept, Classification and Advantages. Basic elements, Components of load torque, Torque equation, Equivalent values of drive parameters. Types of mechanical loads. Selection of motor and Controller, Classes of duty, Stability of an electrical drive. Comparison of AC and DC drives.

UNIT II: Starting and Braking of Electrical Drives: Solid-state starters, soft starting, Calculation of starting/acceleration/reversal time and energy loss during starting. Types, advantages, limitations and purposes/objectives of electrical braking, Braking of d c and induction motors.

UNIT III: DC Drive Control Basic machine equations, schewe of control, Single phase separately excited drives, singleï phase- series motor drives, power factor improvement, Three-phase separately excited drive, Closed loop control, PLL control, microcomputer control.

SECTION-B

Unit-IV: Ac drive control: Basic principle of operation, speed control of induction motor, stator voltage control, varible frequency control, Rotor resistance control, slip-power recovery scheme, Synchronus motor drive, Microprocessor controlled AC Drive.

UNIT V: Vector controlled Drive,Principle of Vector Control, Equivalent ckt. Direct v.c., Flux vector estimation, Indirect v.c., v.c. of line side pular rectifer exator flux oriented v.c., v.c. of current fed inventer drive & cycloconverter drive servorless control speed estimation controls ï EKF method

UNIT-VI Direct torque & adoptaive controlled Drive Torque Expression o& control strategy self tuning control MRAC sliding mode control self commissiong of drive, Study of electrical drives in rolling mills, paper mills, cement mills, sugar mills, textile mills, traction and machine tool applications.

REFERENCE BOOKS:

1. Power Electronics : (Converts, Application & Design) ï Mohan/ Undeland/ Rossing- John wiley
2. Power Electronics : M.D. Singh, K.B. Khan Chardalli ï TMH
3. Power Electronics : M.H. Rashid ï Pearson Education
4. B.K. Bose : Modern Power Electronics and AC Drive, Pearson Education
5 G. K. Dubey Fundamentals of Electrical Drives, , Narosa Publishing House,2005
6 Electric Drives ï Concepts & Applications by V.Subrahamanyam, TMH 2nd edition 2010

7EX05 PROFESSIONAL ELECTIVE - I
(1) PROCESS CONTROL SYSTEMS

SECTION - A

Unit I : Electronics Instruments for Measurement of Electrical Parameters Advantages of Electronic Instruments, Electronic Voltmeters Electronic Multimeters, differential volt meter, Digital voltmeter, Q meter, vector impedance meter, vector voltmeter.

Unit II : Signal Generation and Analysis Signal generators, Function generators. Wave analyzer Harmonic Distorsion Analysers, spectrum Analysis.

Unit III : **Signal Counting and Recording:** Decade counting Assembly, Binary counter, Decimal counter, Decade counter with digital disply, universal counter, Digital readot devices, storage type CRO, Servotype X-Y recorder.

SECTION-B

Unit IV: **Signal conditioning and Conversions:**
Frequency characteristics of various types of signals,active filters bandpass,low pass and high pass filters using opAmps. Various techniques od A/D and D/A conversions. Modulation and demodulation PCM techniques, phase locked loop.

Unit V: **Signal Processing :**
Pulse times, triggered elayed sweeps, discrete pulse delay circuits, pulses equencing, analog multiplexers and demultiplexers, digital multiplexing sample and hold circuits, serial and parallel digital data conversion. Signal transmission, Analog and digital

telemetry techniques, MODEM and UART, keyboard and character generators, tape recorder,

Unit VI : Introduction to Processor and Processor based Techniques. Introduction to PLC, PLC architecture, programming; ladder diagram and examples, micro controller based instrumentation

TEXT BOOKS:

1. H.S. Kalsi ï Electronic Instrumentation, - Tata Mc-Graw Hill Publishing Company, New Delhi.
2. Cooper, Helfrick ï Electronic Instrumentation and Measurement Techniques, A Prentice Hall of India. New Delhi.

REFERENCE BOOKS :

1. B.R. Gupta-Electronics and Instrumentation ï Wheeler Publishing.
2. Rangan, Sharma & Mani ï ñInstrumentation ï devices & Systems.ò Tata Mc-Graw Hill Publishing Company, New Delhi.
3. R.P. Jain-Digital Electronics, Tata Mc-Graw Hill Publishing Company, New Delhi.
4. Microprocessors and Digital Systems, by:D.V. Hall,Tata Mc-Graw Hill Publishing Company, New Delhi.
5. Shoen Beck- Electronic Communication, Prentice Hall of India. Pvt. Ltd. New Delhi.
6. B. Ram- fundamental of Microprocessors, Dhanpat Rai & Sons, New Delhi.
7. A.K. Sawhney ï Acourse in Electrical & Electronics Instrumentation, Dhanpat Rai & Sons, New Delhi.

7EX05 PROFESSIONAL ELECTIVE - I
(2) POWER SYSTEM SIMULATION

SECTION-A

Unit I : Representation of power systems for computerized analysis : Mathematical models of Synchronous generator for steady state and transient analysis . Transformer with tap changer, transmission line,phase shifter and loads.

Unit II : Topology of Electric Power Systems ï Network Graphs , Incidence matrices, fundamental loop and cutest matrices, primitive impedance and admittance matrices, equilibrium equations of networks . Singular and Nonsingular transformation of network matrices .

Unit III : Formation of bus impedances and admittances matrices by algorithm ï Modification of bus impedance and admittance matrix to account for change in networks. Derivation of loop impedance matrix.

Three phase network elements ï transformation matrix ï incidance and network matrices for three phase l networks . Algorithm for formulation of 3 phase bus impedance matrix.

SECTION-B

Unit IV : Short circuit studies : Three phase networks , Symmetrical components. Thevenin's theorem and short circuit analysis using bus impedance matrix . Short circuit calculations for balanced three phase networks using bus impedance matrix.

Unit V: Load flow studies : formation of load flow problem ï Gauss Seidel method ï Newton Unit III Raphson method ï decoupled method, fast decoupled methods ï sparsity technique.

Unit VI : Stability studies of power system ï Development of mathematical model for multimachine system stability analysis ï Formation of equations and methods of solutions .Transient stability analysis including synchronous machines , system networks and loads . Solution of state equation by modified Euler method and Runge Kutta 4th order Approximation method.

TEXT BOOKS:

1) L.P.Singh : Advanced Power System Analysis and Dynamics, WEL.
2) Y.Wallach : Calculations and programs for Power System Network.
3) G.W.Stage and A.H.El-Abiad : Computer Methods in Power System Analysis, McGraw Hill.

REFERENCE BOOKS:

1) R.N.Dhar : Computer Aided Power System Operation and Analysis, TMC.
2) M.A. Pai : Computer Techniques in Power System Analysis, TMH

7EX05 PROFESSIONAL ELECTIVE - I
(3) HIGH VOLTAGE ENGINEERING

SECTION-A

Unit I : Breakdown in Gases
Insulating materials Classification, Gases as insulating media, Ionization and decay process, Breakdown in gases, Townsend's law, Streamer mechanism of spark pashan's law, Corona discharge, Electronegative gases.

Unit II: Breakdown in Liquid and Solid Dielectrics
Breakdown in pure and commercial liquids, Sold dielectrics and composite dielectrics, High voltage bushings, Guarding, Shielding, Field plotting.

Unit III: Lightning and Switching Over Voltage and Protection
Lightning strokes to lines and towers; Mechanism, Characteristics and protection of transmission lines from lightning; Lightning arrestors, Insulation co-ordination of HV and EHV power system and substation.

SECTION-B

Unit IV: High Voltage and Current Generation, Generation of high d.c, a.c and impulse voltages, Standard impulse wave shapes, Switching surges, and High impulse generator.

Unit V: High Voltage and Current Measurement Peak voltage, Impulse voltage and High direct measurement methods, Non-destructive measurement and testing, High voltage dielectrics loss and capacitance measurement, Radio frequency and Partial discharge measurement.

Unit VI: High Voltage Testing and E.H.V.Lines Design.
Basic terminology, Testing ï Insulators, Bushings, Cables, Transformers, Surge diverters and Isolators; Electric shock and threshold current, Capacitance of long objects, Electromagnetic interference, E.H.V. line insulation design based upon transient over voltage.

TEXT BOOK :

1. M.S.Naidu and V.Kamraju ï High Voltage Engineering, Tata McGraw Hill Publishing, Company, New Delhi.

REFERENCE BOOKS :

1. E.Kuffer and W.S.Zaenglo- High Voltage Engineering, Pergamon Press,
2. Rokosh Das Begamudre- EHV AC. Transmission Engineering, Wiley Easter Ltd. New Delhi.
3. E.Kuffer and M.Abdullaha _High Voltage Engineering, Pergamon Press
4. M.S.Naidu and V.N.Maller- SF6 and Vaccum Insulation for High Voltage Application, Khanna Publications, Delhi.
5. Prof.D.V.Razeving (Translated from Russian by Dr.M.P.Chaurasia) ï High Voltage Engineering, Khanna Publications, Delhi.
6. An introducation to High Voltage Engineering by Subir Ray, Prentice ï Hall & India, Private Limited, New Delhi.
7. High Voltage Engineering by C.L. wadhawa New Age international (P) Ltd. Publications

7EX05 PROFESSIONAL ELECTIVE - I
(4) WIND ELECTRICAL SYSTEMS

SECTION A

Unit I : Fundamentals of Wind Turbines
Power Contained in Wind, Thermodynamics of Wind Energy, Efficiency Limit for Wind Energy Conversion, Maximum Energy Obtainable for a Thrust-operated Converter,Efficiency Limit for a Thrust ï operated Converter Types of Wind Energy Conversion Devices, Dutch Windmills, Multiblade Water ï pumping Windmills , High ï speed Propeller ï type Wind Machines The Savonius Rotor, The Darrieus Rotor, Aerodynamics of Wind Roto Aerodynamic Efficiency, Power ï Speed Characteristics, Torque ï Speed Characteristics, Wind Turbine Control Systems, Control Strategy.

Unit II: Wind Site Analysis and Selection
Wind Speed Measurements Robinson Cup Anemometer, Pressure Tube Anemometer, Hot Wire Anemometer, Wind Speed Statistics Statistical Wind Speed Distributions, Site and Turbine Selection

Unit III: Basics of Induction and Synchronous Machines
The Induction Machine, Constructional Features, Steady-state Equivalent Circuit Model, Performance Characteristics, Saturation Characteristics, Modified Equivalent Circuits, Effect of Rotor-injected Emf ï Slip Power Recovery Scheme, Dynamic d-q Axis Model

The Wound-field Synchronous Machine, Constructional Features, Dynamic Machine Equations, Steady-state Operation, Steady-state Model with Rectifier Load, The Permanent Magnet Synchronous Machine Constructional Aspects, Steady-state Equations, Power Flow Between Two Synchronous Sources, Induction Generator Versus Synchronous Generator

SECTION B

Unit IV: Grid-connected and Self-excited Induction Generator Operation
Constant-voltage, Constant-frequency Generation, Single-output System

Double-output System with a Current Converter , Equivalent Circuits, Reactive Power and Harmonics, Double-output Systems with a Voltage Source Inverter, Reactive Power Compensation, Variable-voltage, Variable-frequency Generation, The Self-excitation Process, Circuit Model for the Self-excited Induction Generator, Analysis of the Steady-state Operation, The Steady-state Characteristics, The Excitation Requirement, Effect of a Wind Generator on the Network

Unit V: Generation Schemes with Variable-speed Turbines
Classification of Schemes, Operating Area Induction Generators , Cage Rotor Induction Generator, Doubly Fed Induction Generator, Wound-field Synchronous Generator, The Permanent Magnet Generator

Unit VI: Hybrid Energy System
Diesel Generator and Photovoltaic System, Diesel Engine, Photovoltaic Power Generation Wind-Diesel Hybrid System. System With No Storage, System With Battery Backup Wind-Photovoltaic Systems, Wind Solar hybrid system

TEXT BOOK :-
S.N.Bhadra, S.Banerjee, D.Kastha Wind Electrical System, Oxford University Press, India.

7EX06 PROJECT & SEMINAR

7EX07 UTILISATION OF ELECTRICAL ENERGY - LAB
Any TEN experiments based on contents of
7EX01 UTILISATION OF ELECTRICAL ENERGY

7EX08 COMPUTER ORGANIZATION - LAB
Any TEN experiments based on contents of
7EX03 COMPUTER ORGANIZATION

7EX09 POWER ELECTRONICS - LAB
Any TEN experiments based on contents of
7EX04 POWER ELECTRONICS - II

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SEMESTER: EIGHTH

8EX01 POWER SYSTEM OPERATION & CONTROL

SECTION-A

Unit I : Economic Operation – Part I
Meaning of optimum scheduling, UCP and LSP; Input ï Output characteristics, Heat rate characteristic, Incremental fuel rate, Incremental fuel cost; Methods of obtaining incremental fuel costs; Conditions for incremental loading; Optimum scheduling of generation between different units (Only Two plant system without transmission loss).

Unit II : Economic Operation – Part II
Transmission loss as a function of plant generation; Calculation of loss co-efficient (Two plant system); Incremental transmission loss; Optimum scheduling of generation between different plants including transmission loss; Concept and significance of penalty factor; Automatic load dispatch: Operation and Functions.

Unit III : A. Generator Control Loops

Concept of real and reactive power; Effect of real and reactive power on system parameters; Philosophy of real and reactive power control; Basic generator control loops.

B. Automatic Voltage Regulator (AVR)

Functions of AVR; Types of Exciter; Brushless AVR loop: Exciter modeling, Generator modeling, Transfer function block diagram representation, Static performance, dynamic response, Stability compensation, Effect of generator loading.

SECTION-B

Unit IV : Automatic Load Frequency Control

Automatic generation control (AGC); Speed governing system; Transfer function modeling: Governor, Hydraulic valve actuator, Turbine, Generator, Load; Transfer function representation of an isolated generator; Static performance of speed governor; Closing of ALFC loop.

Unit V : Control Area

Meaning; Primary ALFC Loop: Static response, Dynamic response, physical interpretation of results; Secondary ALFC loop; Integral Control; Pool operation; Tie-line Modeling; Two area system ï Dynamic response; Tie-line bias control.

Unit VI : Steady-State Instabilities

Natural torsional oscillatory modes in power system; Natural mode of a single generator operating onto infinite bus; Effect of damper winding; Effect of changing excitation; Power system stabilizer; Introduction to modern control application.

TEXT BOOKS :-

1. O. L. Elgerd ï Electric Energy Systems Theory: An Introduction ï Second edition, McGraw-Hill Book Comp. N. Y. 1987.
2. Power System Operation & Control, N.V.Ramana, PEARSON education, 2010.
3. Power System Operation by R.Miller, J.H.Malinowski, TMH, 2nd reprint 2009

REFERENCE BOOKS :

1. L. K. Kirchamayor ï Economic Operation of Power System- Wiley Estern Pvt. Ltd., New Delhi.
2. Hadi Saadat ï Power System Analysis ï WCB/McGraw-Hill International Edition 1999
3. I. J. Nagrath, D. P. Kothari ï Modern Power System Analysis ï Second edition, Tata Mc-Graw Hill Publishing Company, New Delhi
4. P. S. R. Murty ï Power System Operation and Control ï Tata Mc-Graw Hill Publishing Company, New Delhi.

5. Wood and Wollenberg ï Power Generation, Operation and Control ï Willey ï Inter Science Publication

8EX02 SWITCHGEAR & PROTECTION

SECTION-A

Unit I : Circuit Interruption

Circuit breaker control circuit, Fault clearing process, Auto-reclosure, Arc phenomenon- maintenance, properties and interruption theories; AC circuit breakers- current interruption, transient recovery voltage (TRV), rate of rise of TRV, factors affecting TRV, ratings; Inductive and Capacitive current interruptions, current chopping.

Unit II : A. Fuses Types, Constructional features, operation, Characteristics and Applications

B. Circuit Breaker (Part ï I)

Air break, Air blast, Bulk oil and minimum oil-types, constructional features, operationand application.

Unit III : Circuit Breaker (Part – II)

SF_6, Vaccum, Miniature, Earth leakage and Moulded Case ï types, Constructional features, operation and application; Testing, Instalation and Maintenance.

SECTION-B

UnitIV : A. RelayingPrinciple

Components, Essential features, Characteristics, Terminology, CTôs and PTôs, Relay classification.

B. ElectromagneticRelays

Overcurrent, Directional, Distance and Differential ï types, constructional features, operation, characteristics and application.

Unit V : Protection of Transmission Lines

Relaying schemes ï overcurrent, earth fault, directional, distance and differential; Parallel feeders and ring mains protection, Carrier current relaying, Overload and Power swing.

Unit VI : A. Other Power System Elements Protection Transformers, Motors, Generators and Buses.

B. Static Relaying

Basic concepts, equipments, comparators, Characteristics realization ï overcurrent, directional, differential and distance relay. Microprocessor based relay introduction.

TEXT BOOK :

1. Sunil S. Rao ï ñSwitchgear and Protectionò Khanna Publications New Delhi

REFERENCE BOOKS :

1 R. T. Lythall ï ñSwitchgear Handbookò J and P Newness Butterworth, London.

2 C. R. Mason ï ñThe Art and Science of Protective Relayingò

3 A. R. Van and C Warringtan ï ñProtective Relaying , Vol 1 and 2,ò Chapman Hall, London.

4 Geosonoviz ï ñHigh Voltage Circuit Breakersò

5 V. A. Slabikov ï ñGeneration Protection and Switchgearò CIT, Coimbatore.

6 Badri Ram and B. N. Vishwkarma ï ñPower System Protection and Switchgearò Tata Mc-Graw Hill Publishing Company Limited, New Delhi.

7 B. Ravindranath and M Chander ï ñPower System Protection and Switchgearò Wiley Eastern Ltd, New Delhi.

8. Handbook of switchgear by BHEL, TMH 6th reprint,2010

8EX03 EMBEDED SYSTEMS

Unit-I : Introduction: Embedded systems design, Embedded system architecture, Embedded systems model, An Overview of Programming Languages and Examples of Their Standards, Standards and Networking, Multiple Standards-Based Device Example: Digital Television (DTV).

Unit-II: Embedded Hardware Building Blocks and the Embedded Board, powering the hardware, Instruction Set Aarciteture (ISA) architecture model, internal processor design and its performance.

Unit-III: Memory: ROM, RAM and auxiliary memory, Memory Management of Extemal Memory , Performance of memory .I/ O : Managing Data: Serial vs. Parallel I/O , Interfacing the I/O Components ,I/O performance.Buses: arbitration, timing and performance.

Unit-IV: Device Drivers: Device Drivers for Interrupt-Handling, Memory Device Drivers, On-board Bus Device Drivers, Board I/O Driver. Embedded OS: Multitasking and Process Management, Memory Management ,.

Unit-V: Embedded OS : I/O and File System Management ,OS Standards: POSIX, OS Performance Guidelines. Middleware :meaning and examples. Application layer software: meanings and examples.

Unit-VI: Embedded system design & implementation: Defining the System-Creating the Architecture and Documenting the Design, Stages in creating an Embedded System Architecture.

Implementing the Design. Quality Assurance and Testing of the Design.

TEXT BOOK:

Tammy Noergaard ñEmbedded Systems Architectureò Elsevier Newnes Publication.

REFERENCE BOOKS:

1. Rajkamal , ñEmbedded Systems, Architecture, Programming & Designò TMH.
2. Jane W. S. Liu óReal Time Systemsò, Pearson Education
3. Vahid & Givargis ñEmbedded System Designò John Wiley & Sons P Ltd.
4. Peter Marwedel ñEmbedded Systems Designò Springer, Netherland.

8EX04 PROFESSIONAL ELECTIVE - II
(1) POWER SYSTEM MANAGEMENT

SECTION-A

UNIT-I : Principle and Practice of Management:

Basic Concepts- basic concepts of management-Role and importance of management in modern society, management as a profession

The Process of Management- The process of management; planning, organizing, directing, controlling, decision-making, leading etc.

Management Concepts- Managerial authority and responsibility-delegation and decentralization- Line and staff concepts-concepts in e-commerce etc.

UNIT-II : Marketing & Production/Operation Management:

Marketing Management- Introduction to Marketing, Marketing strategy, Consumer Behaviour, Marketing Research, Product/ Services Decisions, Pricing Products/Services, Distribution management, Advertising & Sales promotion etc.

Production/Operation Management- Introduction to Production Planning and Process, Issues in Material and Inventory Management, Quality control and Management (quality circle, ISO 9000 series, just-in-time, TQM.), Maintenance Management, Purchasing Decision.

UNIT-III : Project, Financial & Human Resource Management:

Project Report: Preparation of -Project Report, Profit and Loss statement, Balance Sheet.

Financial Management: Costing- Principles, types- operating, marginal, incremental, embedded etc, Budgeting & financial planning, Risk management etc.

Human Resource Management: Human resource planning- concepts & process, Job analysis & description- recruitment, selection process, Training & development, Employee welfare, issues related to management of trade union.

SECTION-B

UNIT-IV: Dimensions of Power System Restructuring

Power system Restructuring:: Introduction to Power Sector Reforms/Restructuring/ Deregulation ï issues, prospects and lessons to developing countries

Environmental dimensions in power sector: Pollution & Depletion of natural resources, Waste Management, environmental legislation, green power, strategies for environmental management in power sector.

Rural Electrification: Issues relating to revised definition of village electrification, issues in electrifying remaining villages, decentralized generation and distribution for rural electrification etc.

Power Sector Restructuring in India: History, Problems and status in India, Accelerated Power Development and Reform Programme (APDRP), Reforms in G,T, D sector, Electricity Act:2003- issues, Problems & prospects, Legal and regulatory framework, Rural Electrification Programme, Environmental Pollution Programme.

UNIT-V: Management issues in Power Sector:

Financing of power sector:: Financial problems of SEBs, strategies - for financing capacity addition to generation, transmission and rural electrification, Risk management in power sector.

Human Resource development in power utilities: Change management, Training & Development, Culture of empowerment and accountability etc.

Transmission & Distribution Management: Transmission management under open access- transmission Pricing/Tariff, Congestion Management, Micro distribution models- private investors, Multi Licensee System, Distribution Management, Power Quality, Demand Side Management, Energy Metering, Accounting and Auditing, SCADA etc.

UNIT-VI: Marketing issues in Power Sector:

Issues of Power Tariff, Prices in Competitive Electricity Markets, Bidding strategy, Availability Based Tariff (ABT), Embedded and Spot pricing, Power Trading, Market Operations in Electric Power Systems, Marketing of energy and services in competitive electricity markets.

TEXT BOOKS:

1. Koontz H., Oôdonnel C. and Whierich: Principle of Management, Tata McGraw Hill Publishing Co., Ltd., New Delhi
2. Muhlemann , Production Operation Management, Macmillan publication
3. Dencenzo & Robbins, Human Resource Management
4. Monappaa, Human Resource Management, Macmillan Publication
5. Ramaswamy & Namamkumari, Marketing Management Macmillan Publication
6. Philip Kotler, Marketing Management, PHI, New Delhi

REFERENCE BOOKS:

1. Economic Evaluation of Projects in the Electricity Supply Industry, by H. Khatib.
2. Fundamentals of Power System Economics, by Daniel S. Kirschen, Goran Strabac
3. Energy and Power Risk Management by Alexander Eydeland, KrzysztofmWolyniec
4. Power System Economics, by Steven Stoft
5. Market Operations in Electric Power Systems, by M. Shahidehpour, H. Yamin, Zuyi Li.
6. Electricity Economics, by Geoffrey Rothwell, Tomas Gomez
7. Modelling Prices in Competitive Electricity Markets (The Wiley Finance Series), by Derek W. Bunn.
8. A Shock to the System, by Timothy J. Brennan, Karen L. Palmer, Raymond J. Kopp, Alan J. Krupnick, Vito Stagliano, Dallas Burtraw.
9. Power pricing by Dolan & Siman, The free Press,1996
10. Customer Choice: Purchasing Energy In A Deregulated Market: by Albert Thumann
11. Indiaôs Power Sector Reforms Update, Paryas, Pune

8EX04 PROFESSIONAL ELECTIVE - II

(2) FUZZY LOGIC & CONTROL

SECTION - A

UNIT - I: THE MATHEMATICS OF FUZZY CONTROL:

Basic definitions, a-level sets, comparison with classical (crisp) sets Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, Fuzzy complement, t-norms, t-conorms, combination of operations, aggregation operations. , fuzzy relations, the extension principle

UNIT–II: THEORY OF APPROXIMATE REASONING:

Fuzzy numbers, linguistic variables, arithmetic operations on intervals, arithmetic operations on fuzzy numbers, lattice of fuzzy numbers, fuzzy equations.

Linguistic variables, Fuzzy proportions, Fuzzy if- then statements, inference rules, compositional rule of inference.

Unit-III: **Fuzzy Relations:** Crisp versus fuzzy relation, projections and cylindric extensions, binary fuzzy relations, binary relations on a single set, fuzzy equivalence relations, fuzzy compatibility and fuzzy ordering relations.

Possibility Theory: Fuzzy measures, evidence theory, possibility theory, fuzzy sets and possibility theory.

SECTION - B

Unit -IV: **Fuzzy Logic:** An overview of classical logic, multivalued logic, fuzzy propositions, fuzzy quantifiers, linguistic hedges, inference from conditional fuzzy propositions, inference from conditional and qualified propositions.

NON-LINEAR FUZZY CONTROL: FKBC as a linear transient element, PID like FKBC, sliding mode FKBC, Sugeno FKBC.

Unit -V: **FUZZY KNOWLEDGE BASED CONTROLLERS (FKBC):** Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzyfication and defuzzyfication procedures. Simple applications of FKBC (washing machines, traffic regulations, lift control, etc).

UNIT-VI: **ADAPTIVE FUZZY CONTROL:** Process performance monitoring, adaption mechanisms, membership functions, tuning using gradient descent and performance criteria. Set organizing controller model based controller.

TEXT BOOKS:

1. An Introduction to Fuzzy Control- D. Diankar, H. Hellendoom and M. Reinfrank- Narosa Publishers India, 1996.
2. Fuzzy Sets Uncertainty and Information- G. J. Klir and T. A. Folger- PHI IEEE, 1995.

REFERENCE BOOKS:

1. Essentials of Fuzzy Modeling and Control- R. R. Yaser and D. P. Filer -John Wiley, 1994.
2. Fuzzy Logic With Engineering Applications- Timoty Ross,- McGraw Hill.
3. Fuzzy Logic Intelligence Control And Information- Yen- Pearson education.

8EX04 PROFESSIONAL ELECTIVE - II
(3) RPC & FACTS CONTROLLER

UNIT-I: **CONTROL OF VOLTAGE AND REACTIVE POWER**
Introduction, Generation and absorption of reaction power, relation between voltage, power and reactive power at a node,

methods of voltage control. Injection of reactive power, use of tap changing transformers, combined use of tap changing transformers and reactive power injection.

Unit II: Introduction to FACTS- Basic Types of FACTS controllers, Description and definition of FACTS controllers ï Benefits from FACTS technology- Static Var Compensator(SVC): Principle of operation, configuration and control, Thyristor Controlled Series compensator(TCSC): Principle of operation, configuration and control, Application of TCSC for damping electromechanical Oscillations, Application of TCSC for mitigation of SSR ï

Unit III: Static Compensator(STATCOM): Principle of operation, configuration and control ï Static Synchronous Series Compensator(SSSC): Principle of operation, configuration and control, Thyristor Controlled Phase Angle Regulator(TCPAR): Principle of operation, configuration and control, Unified Power Flow Controller(UPFC): Principle of operation, configuration and control, Simulation of UPFC, Steady state model of UPFC, Interline Power Flow Controller(IPFC) - Principle of operation, configuration and control.

Unit IV: Oscillation Stability Analysis and Control: Introduction ï Linearised model of power systems installed with FACTS based Stabilisers ï Heffron-Phillips model of a SMIB system installed with SVC, TCSC and TCPS ï Heffron-Phillips model of a SMIB system with UPFC ï Heffron-Phillips model of a Multimachine system installed with SVC, TCSC and TCPS

Unit V: Analysis and Design of FACTS based stabilisers: Analysis of damping torque contribution by FACTS based stabilisers installed in SMIB systems, Design of robust FACTS based stabilisers installed in SMIB systems by phase compensation method - Selection of installing locations and feed back signal for FACTS based stabilizers

Unit VI: Transient Stability control with FACTS: Introduction ï Analysis of Power systems installed with FACTS devices: Power transmission control using Controllable Series Compensation(CSC), Power Transmission Control using SSSC, Power Transmission Control using UPFC, Power Transmission Control using Phase Shifting Transformer(PST), Power Transmission Control using UPFC, Control of FACTS devices for transient stability improvement ï General considerations of FACTS control strategy: CSC,SSSC, SVC, STATCOM and UPFC control strategy ï General Structure of the FACTS devices control.

REFERENCE BOOKS :-

1. ó*Reactive Power Control in Power Systems*ô T J E Miller,John Wiley, 1982
2. ó*Computer modeling of Electrical Power Systems*ô J Arriliga and N R Watson, ï John Wiley, 2001
3. ó*Understanding FACTS*ô N G Hingorani and L Gyugyi, IEEE Press, 2000
4. ó*Flexible ac Transmission Systems(FACTS)*ô, Y.H. Song and A.T. Johns, IEE Press, 1999

8EX04 PROFESSIONAL ELECTIVE - II
(4) POWER QUALITY

SECTION - A

Unit I: Introduction

Power Quality Definition, Need for Power Quality, Sensitive Loads, Nonlinear Loads, Interconnected Power System, Deregulation, Utilities, End Users, Lawyers,

Unit II: Power Quality Characteristics

Power Quality Theory, Types of power Quality Problems, Voltage Swells, Long-Duration Over voltages, Under voltages, Interruptions, Transients, Voltage Unbalance, Voltage Fluctuations, Harmonics, Electrical Noise, Sources of Power Quality Problems, Utility Side of the meter, End-User Side of the meter, Effects of Power Quality Problems, Power Quality Problem-Solving Procedures, Power Quality Solutions,

Unit III: Power Quality Standards

Power Quality Standards Organizations, Institute of Electrical & Electronics Engineers (IEEE), American National Standards Institute(ANSI), International Electrotechnical Commission(IEC Other International Standards Organizations, Purpose of Power Quality Standards, Types of Power Quality Standards, Voltage Sag (Dip) Standards, Transients of Surges, Voltage Unbalance, Voltage Fluctuation or Flicker Standards, Harmonics Standards, Transformer Overheating Standards, Natural Conductor Loading Standards, Static Electricity, Telephone Power Quality Standards, Grounding and Wiring Standards, Sensitive Electronics Equipments Standards, Trends in Power Quality Standards.

SECTION -B

Unit IV: Power Quality Solutions

Reduce Effects on Sensitive Equipment, Reduce or Eliminate Cause, Reduce or Eliminate Transfer Medium, Install Power Conditioning Equipments, , Surge Suppressors, Noise Filters,

Isolation Transformers, Line-Voltage Regulators, Motor-Generator Sets, Magnetic Synthesizers, Static VAR Compensators (SVCs), Uninterruptible Power Supply (UPS), Solid-State Switches, Harmonics Solutions, Selection of Appropriate Power Conditioning Equipment, Grounding and Wiring Solutions

Unit V: Wiring and Grounding

Wiring Principles, Grounding Principles, Power System, Utility Power System Grounding,Telecommunication System Grounding, End-User Power System Grounding, Wiring and Grounding Problems, Ground Loops, Electromagnetic Interference (EMI) Noise, Loose Connections, Grounding for Lightning and Static Electricity, Attack of the Triplens, Solutions That Cause Problems, Wiring Solutions, Separation, Selection of Wire and Cables, Shielding, Grounding Solutions, Ground Rods, Ground Ring, Ground and Reference Signal Grids, Other Grounding Systems, Isolated Grounds, Multipoint Grounding, Separately Derived Source Grounding, Reference

Unit VI: Power Quality Measurement Tools & Power Quality Surveys Kilowatt-Hour Meter, Multimeters, Average-responding versus True RMS Meters, Crest Factor and Bandwidth, Other Selection Considerations, Oscilloscopes, Disturbance Analyzers, Harmonics Analyzers, Purpose of a Power Quality Surveys (Checkup or Examination), Planning a power Quality Surveys.

TEXT BOOKS: -

1. Barry W. Kennedy: Power Quality Primer, McGraw-Hill
2. Electrical Power System quality by R.C.Dugan, M.F.McGranghan, S.Santoso, H.W.Beaty TMH 2nd edition 2011

REFERENCE BOOK: -

1. G.T. Heydt: Power Quality Stars in a circle Publication, Indiana, 1991.

8EX05 PROJECT AND SEMINAR

8EX06 EMBEDED SYSTEMS - LAB
Any TEN experiments based on contents of
8EX03 EMBEDED SYSTEMS

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
ELECTRICAL (ELECTRICAL & POWER) ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER : SEVENTH

7 EL01/7EP01/7EE01 CONTROL SYSTEM - II

SECTION-A

Unit I : Compensation Techniques:
Introduction, Preliminary considerations of Classical Design, Lead Compensator, Lag Compensator, Lag- Lead Compensator, Cascade Compensation in time domain, Cascade compensation in Frequency domain, Feedback compensation in frequency domain .

Unit II : State Space Techniques I:
State, state space and state variables; SISO/MIMO linear systems state variable models - differential equations, Transfer Functions, Block Diagrams and State Diagrams (Signal Flow Graphs); Transfer functions decomposition - Phase variable forms, Canonical forms and Jordan canonical form; Transfer function - state model; Transfer matrix; State equations solution - State transition matrix (STM); STM Computation ï Laplace transformation, Canonical transformation and Cayley Hamilton theorem; Time response ï SISO Systems.

Unit III : State Space Techniques II:
Concept - controllability and observability; SISO/MIMO Linear systems -Gilbertôs method and Kalmanôs test; SISO controllable systems Design -state feedback.

SECTION-B

Unit IV Sampled Data Control Systems:
Representation, Z Transforms. review, Sampler and Hold - zero order hold; Sampling theorem; Z Transform analysis ï open loop and closed loop sampled data systems, Z Transfer functions, Difference equation solution and response; Z Transform Method,. Discrete Systems Response, Open and closed loop systems pulse transfer functions - Different sampler locations; Digital Controller - transfer function; Stability analysis - S and Z Domain relationship, Juryôs Test and Bi-Linear Transformation, Root and root locus method.

Unit V : Non-Linear System Analysis I :
Non-linear system behavior ï types and characteristics; Describing functions - typical non-linearity and their

characteristics; Stability analysis - Describing function method and Limit cycles; Limitations - describing function method.

Unit VI : Non-Linear System Analysis II
Linearization - Around operating point; Singular points ï Classification and Nature; Phase-plane method - non- linear systems analysis; Phase trajectories construction ï analytical method and graphical method by isocline method; Stability analysis - limit cycle; Limitations - phase-plane method.

TEXT BOOKS:

1. I.J. Nagrath and M. Gopal ï Control System Engineering,Wiley Eastern Limited, New Delhi.
2. K . Ogata - Modern Control Theory, Prentice Hall of India Pvt. Ltd. New Delhi.
3. Modern Control System, Richard Dorf, Robert Bishop, PEARSON education, 11th edition 2008

REFERENCE BOOKS:

1. Control Engineering, D.Ganesh Rao, k.Chennavenkatesh, 2010
2. D.Roy Choudhary, Modern Control Engineering,Prentice Hall of India Pvt Ltd. New Delhi.
3. R.C. Sukla ï Control Systems Dhanpat Rai & Co.Pvt Ltd.

7 EL02/7EP02/7EE02 POWER SYSTEM OPERATION & CONTROL

SECTION-A

Unit I : Economic Operation – Part I
Meaning of optimum scheduling, UCP and LSP; Input ï Output characteristics, Heat rate characteristic, Incremental fuel rate, Incremental fuel cost; Methods of obtaining incremental fuel costs; Conditions for incremental loading; Optimum scheduling of generation between different units (Only Two plant system without transmission loss).

Unit II : Economic Operation – Part II
Transmission loss as a function of plant generation; Calculation of loss co-efficient (Two plant system); Incremental transmission loss; Optimum scheduling of generation between different plants including transmission loss; Concept and significance of penalty factor; Automatic load dispatch: Operation and Functions.

Unit III : A. Generator Control Loops
Concept of real and reactive power; Effect of real and reactive power on system parameters; Philosophy of real and reactive power control; Basic generator control loops.

B. Automatic Voltage Regulator (AVR)
Functions of AVR; Types of Exciter; Brushless AVR loop: Exciter modeling, Generator modeling, Transfer function block diagram representation, Static performance, dynamic response, Stability compensation, Effect of generator loading.

SECTION-B

Unit IV : Automatic Load Frequency Control
Automatic generation control (AGC); Speed governing system; Transfer function modeling: Governor, Hydraulic valve actuator, Turbine, Generator, Load; Transfer function representation of an isolated generator; Static performance of speed governor; Closing of ALFC loop.

Unit V : Control Area
Meaning; Primary ALFC Loop: Static response, Dynamic response, physical interpretation of results; Secondary ALFC loop; Integral Control; Pool operation; Tie-line Modeling; Two area system ï Dynamic response; Tie-line bias control.

Unit VI : Steady-State Instabilities
Natural torsional oscillatory modes in power system; Natural mode of a single generator operating onto infinite bus; Effect of damper winding; Effect of changing excitation; Power system stabilizer; Introduction to modern control application.

TEXT BOOKS :-

1. O. L. Elgerd ï Electric Energy Systems Theory: An Introduction ï Second edition, McGraw-Hill Book Comp. N. Y. 1987.
2. Power System Operation & Control, N.V.Ramana, PEARSON education, 2010.
3. Power System Operation by R.Miller, J.H.Malinowski, TMH, 2nd reprint 200

REFERENCE BOOKS :

1. L. K. Kirchamayor ï Economic Operation of Power System- Wiley Estern Pvt. Ltd., New Delhi.
2. Hadi Saadat ï Power System Analysis ï WCB/McGraw-Hill International Edition 1999
3. I. J. Nagrath, D. P. Kothari ï Modern Power System Analysis ï Second edition, Tata Mc-Graw Hill Publishing Company, New Delhi
4. P. S. R. Murty ï Power System Operation and Control ï Tata Mc-Graw Hill Publishing Company, New Delhi.
5. Wood and Wollenberg ï Power Generation, Operation and Control ï Willey ï Inter Science Publication

7 EL03/ 7EP03/7EE03 ELECTRICAL POWER - II

SECTION-A

Unit I :: Symmetrical components
Definition and choice, Alpha operator, transformation matrices, sequence components, power invariance, line and phase sequence quantities relations, three phase delta/star transformer bank- sequence voltages and currents relationship; power system elements ï sequence impedance and sequence networks ; Various three phase transformer connections ï zero sequence rules; Unbalanced load system ï application.

Unit II : Symmetrical Fault Analysis
Transmission line transients, three phase symmetrical short circuit at alternator terminals, Power system fault calculations, short circuit MVA, Current limiting reactors, ring system and tie bar system, Circuit breaker rating calculation.

Unit III : Unsymmetrical Fault Analysis
L-G, L-L-G and L-L faults at unloaded generator terminals, Equivalent sequence network diagram, Fault impedance, Unsymmetrical faults through impedance, Power system faults-loaded and unloaded conditions.

SECTION-B

Unit IV : Overvoltages
Causes ï internal and external; Voltage surge, Basic insulation level, Protection ï earthing screen, overhead ground wire, lightning arresters.

Unit V: HVDC Transmission Basic principle, Transmission equipments, Comparison with AC links, Inverters ï reactive power requirement; Converters, DC links, Circuit breaking, ground return, Economic distance, modern developments.

Unit VI : Flexible AC Transmission Systems (FACTS)
FACTS concept, Elements, Controllers, Comparison with Conventional AC Transmission system.

TEXT BOOKS :-

1. Power System Engineering by D.P.Kothari, I.J.nagrath TMH 2nd edition, 9th reprint 2010
2. Power System Analysis, N.V.Ramana, PEARSON education, 2010
3. Power System Analysis, Arthur R. Bergen, Vijay Vittal, 2nd Edition, 2009, PEARSON Education
4 Modern Power System Analysis by D.P.Kothari, I.J.nagrath TMH 3rd edition, 20th reprint 2010

5. Power System Analysis by Hadi Saadat TMH, 1st reprint 2004
6. Electrical Power System, by Syed A. Nasar TMH,Revised 1st edition 2011

REFERENCE BOOKS :-

1. S. Rao ï ñEHV A.C. and HVDC Transmission Engineering and Practiceò, Khanna Publishers, New Delhi.
2. Narain G. Hingorani and Lazlo Gyugyi ï ñUnerstanding FACTS: Concepts and Technology of Flexible AC Transmission Systems.
3. Yong Hua Song and Allan T. Johns - ñFlexible AC transmission Systems (FACTS), T and D reference bookò Westing house.

7 EL04/7EP04/7EE04 SWITCHGEAR & PROTECTION

SECTION-A

Unit I : Circuit Interruption

Circuit breaker control circuit, Fault clearing process, Auto-reclosure, Arc phenomenon- maintenance, properties and interruption theories; AC circuit breakers- current interruption, transient recovery voltage (TRV), rate of rise of TRV, factors affecting TRV, ratings; Inductive and Capacitive current interruptions, current chopping.

UnitII : A. Fuses Types, Constructional features, operation, Characteristics and Applications

B. Circuit Breaker (Part ï I)

Air break, Air blast, Bulk oil and minimum oil-types, constructional features, operationand application.

Unit III : Circuit Breaker (Part – II)

SF_6 , Vaccum, Miniature, Earth leakage and Moulded Case ï types, Constructional features, operation and application; Testing, Instalation and Maintenance.

SECTION-B

UnitIV: A. RelayingPrinciple

Components, Essential features, Characteristics, Terminology, CTôs and PTôs, Relay classification.

B. ElectromagneticRelays

Overcurrent, Directional, Distance and Differential ï types, constructional features, operation, characteristics and application.

Unit V : Protection of Transmission Lines

Relaying schemes ï overcurrent, earth fault, directional, distance and differential; Parallel feeders and ring mains protection, Carrier current relaying, Overload and Power swing.

Unit VI : A. Other Power System Elements Protection Transformers, Motors, Generators and Buses.

B. Static Relaying

Basic concepts, equipments, comparators, Characteristics realization ï overcurrent, directional, differential and distance relay. Microprocessor based relay introduction.

TEXT BOOK:-

1. Sunil S. Rao ï ñSwitchgear and Protectionò Khanna Publications New Delhi

REFERENCE BOOKS: -

1 R. T. Lythall ï ñSwitchgear Handbookò J and P Newness Butterworth, London.

2 C. R. Mason ï ñThe Art and Science of Protective Relayingò

3 A. R. Van and C Warringtan ï ñProtective Relaying , Vol 1 and 2,ò Chapman Hall, London.

4 Geosonoviz ï ñHigh Voltage Circuit Breakersò

5 V. A. Slabikov ï ñGeneration Protection and Switchgearò CIT, Coimbatore.

6 Badri Ram and B. N. Vishwkarma ï ñPower System Protection and Switchgearò Tata Mc-Graw Hill Publishing Company Limited, New Delhi.

7 B. Ravindranath and M Chander ï ñPower System Protection and Switchgearò Wiley Eastern Ltd, New Delhi.

8. Handbook of switchgear by BHEL, TMH 6th reprint,2010

7 EL05/7EP05/7EE05/ 7EX05 PROFESSIONAL ELECTIVE - I
(1) PROCESS CONTROL SYSTEMS

SECTION-A

Unit I : Electronics Instruments for Measurement of Electrical Parameters Advantages of Electronic Instruments, Electronic Voltmeters Electronic Multimeters, differential volt meter, Digital voltmeter, Q meter, vector impedance meter, vector voltmeter.

Unit II: Signal Generation and Analysis

Signal generators, Function generators. Wave analyzer Harmonic Distorsion Analysers, spectrum Analysis.

Unit III: Signal Counting and Recording

Decade counting Assembly, Binary counter, Decimal counter, Decade counter with digital disply, universal counter, Digital readot devices, storage type CRO, Servotype X-Y recorder.

SECTION-B

Unit IV : Signal conditioning and Conversions.
Frequency characteristics of various types of signals,active filters bandpass,low pass and high pass filters using opAmps. Various techniques od A/D and D/A conversions. Modulation and demodulation PCM techniques, phase locked loop.

Unit V: Signal Processing
Pulse times, triggered elayed sweeps, discrete pulse delay circuits, pulses equencing, analog multiplexers and demultiplexers, digital multiplexing sample and hold circuits, serial and parallel digital data conversion. Signal transmission, Analog and digital telemetry techniques, MODEM and UART, keyboard and character generators, tape recorder,

Unit VI : Introduction to Processor and Processor based Techniques. Introduction to PLC, PLC architecture, programming; ladder diagram and examples, micro controller based instrumentation

TEXT BOOKS: -

1. H.S. Kalsi ï Electronic Instrumentation, - Tata Mc-Graw Hill Publishing Company, New Delhi.
2. Cooper, Helfrick ï Electronic Instrumentation and Measurement Techniques, A Prentice Hall of India. New Delhi.

REFERENCE BOOKS: -

1. B.R. Gupta-Electronics and Instrumentation ï Wheeler Publishing.
2. Rangan, Sharma & Mani ï ñInstrumentation ï devices & Systems.ò Tata Mc-Graw Hill Publishing Company, New Delhi.
3. R.P. Jain-Digital Electronics, Tata Mc-Graw Hill Publishing Company, New Delhi.
4. Microprocessors and Digital Systems, by:D.V. Hall,Tata Mc-Graw Hill Publishing Company, New Delhi.
5. Shoen Beck- Electronic Communication, Prentice Hall of India. Pvt. Ltd. New Delhi.
6. B. Ram- fundamental of Microprocessors, Dhanpat Rai & Sons, New Delhi.
7. A.K. Sawhney ï Acourse in Electrical & Electronics Instrumentation, Dhanpat Rai & Sons, New Delhi.

7 EL05/7EP05/7EX03 PROFESSIONAL ELECTIVE - I
(2) COMPUTER ORGANISATION

Unit-I: Basic strucutre of computer: Hardware & software.Addressing methods. Program sequencing. concept of memory locations & address. Main memory operation. Instructions & instruction sequencing. Addressing modes. BasicI/O operations. Stacks. Queues & subroutines.

Unit-II: Processing Unit: fundamental concepts. execution of a comlete instruction. hardwired control, performance consideration. Microprogrammed control; microinstructions, microprogram sequencing, microinstruction prefetching, emulation.

Unit-III: I/O organizatiion: accessing I/O devices,interrupts, direct memory access:bus arbitration. I/O hardware:processor bus and interfacing circuiuts,standard I/O interfaces: SCSI bus, backplane bus standard.

Unit-IV: Memory Unit: basic concepts,semiconductor RAM memories,internal organization, static & dynamic RAMs, ROMs. speed, size & cost considerations.Cache memories: performance considerations. Virtual memories, address translation,memory management requirements.

Unit-V: Arithmetic; number representation. design of fast adders,signed addition and subtraction. Multiplication of positive numbers, Boothsôalgorithm, Integer division.Floating-point numbers and related operations.

Unit-VI: Computer Peripherals: Input-output devices like video displays,video terminals, graphics input devices,printers.Online storage devices: magnetic disks,magnetic tape systems, CD-ROM systems. Communication devies: Modems.

TEXT-BOOK:

V.Carl Hamacher & S. Zaky ñ Computer Organizationò (4/e) McGraw-Hill(ISE).

REFERENCE BOOKS:

1. Stallings. W. ñ Computer Organization & Arcitectureò (5/e) (Pearson Education).
2. Tenanbaum A.S.ò Structured Computer Organizationò (5/e) (Pearson Education).
3. Hayes J.P. ñComputer Architecture & Organizationô(4/e) (McGraw-Hill).

7 EL05/7EP05/7EE05 PROFESSIONAL ELECTIVE - I
(3) COMPUTER METHODS IN POWER SYSTEM ANALYSIS

SECTION-A

Unit I : Representation of power systems for computerized analysis : Mathematical models of Synchronous generator for steady state and transient analysis . Transformer with tap changer, transmission line,phase shifter and loads.

Unit II : Topology of Electric Power Systems ï Network Graphs , Incidence matrices, fundamental loop and cutest matrices, primitive

impedance and admittance matrices, equilibrium equations of networks . Singular and Nonsingular transformation of network matrices .

Unit III : Formation of bus impedances and admittances matrices by algorithm ï Modification of bus impedance and admittance matrix to account for change in networks. Derivation of loop impedance matrix.

Three phase network elements ï transformation matrix ï incidance and network matrices for three phase l networks . Algorithm for formulation of 3 phase bus impedance matrix.

SECTION-B

Unit IV: Short circuit studies : Three phase networks , Symmetrical components. Thevenin's theorem and short circuit analysis using bus impedance matrix . Short circuit calculations for balanced three phase networks using bus impedance matrix.

Unit V: Load flow studies : formation of load flow problem ï Gauss Seidel method ï Newton Unit III Raphson method ï decoupled method, fast decoupled methods ï sparsity technique.

Unit VI : Stability studies of power system ï Development of mathematical model for multimachine system stability analysis ï Formation of equations and methods of solutions .Transient stability analysis including synchronous machines , system networks and loads . Solution of state equation by modified Euler method and Runge Kutta 4th order Approximation method.

TEXT BOOKS:

1) L.P.Singh : Advanced Power System Analysis and Dynamics, WEL.

2) Y.Wallach : Calculations and programs for Power System Network.

3) G.W.Stage and A.H.El-Abiad : Computer Methods in Power System Analysis, McGraw Hill.

REFERENCE BOOKS:

1) R.N.Dhar : Computer Aided Power System Operation and Analysis, TMC.

2) Computer Technniques in Power System Analysis, by M.A.PAi TMH 10th reprint 2011

7 EL05/7EP05/7EE05 PROFESSIONAL ELECTIVE - I

(4) ARTIFICIAL INTELLIGNCE

SECTION-A

UNIT I : Introduction

Biological Neurons and their artificial models, introduction to neural computing

Components of neuron, input and output weight, threshold,weight factors, transfer

Functions ,concepts of supervised and unsupervised learning.

UNIT II: Supervised Learning :

Single Layer network, perceptron, Linear Separability, Training algorithm and limitations .

Multilayer Network : Architecture of feed forward network ,learning rule, generalized

Delta rule,learning function . Back propagation algorithm.

UNIT III: Unsupervised Learning:

Introduction, Counter propagation networks, Kohonen's self organizing maps.

Hopfields networks.

SECTION-B

UNIT IV: Introduction:

Uncertainty in information,basic concepts of Fuzzy sets , operations on fuzzy sets , properties.

Fuzzy relations : operations,properties ,value assignments.

UNIT V : Membership Functions:

Features, fuzzification, membership value assignments, Fuzzy Rule based

Systems, Graphical technique of inference.

Defuzzification : Lambda-cuts for Fuzzy sets and Fuzzy relations , Defuzzification methods

UNITVI : Genetic Algorithm (GA):

Introduction to genetic algorithm,working principle,coding of variables, Fitness function. GA operators , similarities & differences between GAs and Traditional methods; Unconstrained and constrained optimization using Genetic Algorithm , real coded GA ,Advanced GA, global optimization using GA .

TEXT BOOKS :

1 J.M. Zurada : Introduction to Artificial Neural Network, Jaico Publishing House

2 Meherotra Kishan ,Mohan C.K, Ranka Sanjay : Elements Of Artificial Neural networks Penram Int Pub Mumbai.

3 D.E Goldberg ,Addision Genetic Algorithm in Search Optimization and Machine Learning Wesley Publication

4 Kalyanmoy Deb Optimization for Engineering Design Algorithms and Examples, Prentice Hall of India New Delhi

5. M.Kishan, Mohan C.K., Ranka Sanjay; Elements of Artificial Neural Networks, Penram Int. Publications.

REFRENCE BOOKS

1. G.J. Khir and T.A. Folger : Fuzzy sets , Uncertainity and Information PHI Publication

2. Koska Bart Neural Network & Fuzzy systems Prentice Hall of India Pvt Ltd , New Delhi

7 EL06/7EP06/7EE06 PROJECT & SEMINAR

7 EL07/7EP07/7EE07 ELECTRICAL POWER II - LAB

Any TEN experiments based on contents of 7EP03 ELECTRICAL POWER II

7 EL08/7EP08/7EE08 SWITCHGEAR & PROTECTION - LAB

Any TEN experiments based on contents of 7EP04 SWITCHGEAR & PROTECTION

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SEMESTER : EIGHT

8 EL 01 /8EP01/8EE01 POWER SYSTEM STABILITY

SECTION-A

Unit I : Basic Concepts

Meaning of stability, Steady state, Transient and Dynamic stability limits; Three Phase Synchronous Machine-circuit representation, voltage equation and Parkôs Transformation; Transient and Sub transient state analysis and Phasor diagrams, Voltage behind the transient and sub transient impedances, Parameters and Time Constants determination.

Unit II: Steady State Stability - I

Steady state stability limit-short transmission line, Two machines system, Medium and Long transmission line, Clarkeôs diagrams for system with and without loss, Effect of inertia, Conservative criterion, Synchronizing coefficients and Multi machine system.

Unit III: Steady State Stability – II

Saturation effect, Saturated reactance, Equivalent reactance and its graphical determination; Short circuit ratio, Governor action and automatic voltage regulator effects.

SECTION-B

Unit IV: Transient State Stability – I

Review of basics concepts, Transient state stability and equal area criterion, Swing equation and its point by point solution, Critical clearing angle and time.

Unit V: Transient State Stability – II

Type of faults, Grounding and high speed re-closing effects, Pre-calculated swing curves and their use, Faults clearing Time, Excitation and governing action effects, Stability improvement methods, Multi machine problem, Network analyzer, Digital Computer role.

Unit VI: Excitation System

Unit exciter and common bus system, Self and separate excitation, Exciter type of and their description, Exciter drives, Quick response excitation system, Voltage-current methods differential equations for obtaining voltage ï time curves, Exciter response from voltage time curves, Dispersion coefficient, Constant leakage Inductance, Eddy current effects on exciter response, Loaded exciter response, Exciter response improvement methods.

TEXT BOOKS

1 E W Kimbark- Power System Stability, Vol.1 and 3, Dover Publications Inc., New York.

2 Power System Stability & Control by Prabha Kundur, TMH 11th reprint 2011

3. S.B Crary- Power System Stability, Vol.1 and 3, Hohn Wiley and Sons, New York.

REFERENCE BOOKS:

1 L.P Singh ï Computer Aided Power System Operation and Dynamics, Wiley Eastern Ltd. New Delhi.

2 I.J.Nagrath and D.P.Khothari ï Modern Power System Analysis, Tata Mc-Graw Hill Publishing Company, New Delhi.

8 EL 02 /8EP02/8EE02 HIGH VOLTAGE ENGINEERING

SECTION-A

Unit I : Breakdown in Gases

Insulating materials Classification, Gases as insulating media, Ionization and decay process, Breakdown in gases, Townsendôs law, Streamer mechanism of spark pashanôs law, Corona discharge, Electronegative gases.

Unit II: Breakdown in Liquid and Solid Dielectrics
Breakdown in pure and commercial liquids, Sold dielectrics and composite dielectrics, High voltage bushings, Guarding, Shielding, Field plotting.

Unit III: Lightning and Switching Over Voltage and Protection
Lightning strokes to lines and towers; Mechanism, Characteristics and protection of transmission lines from lightning; Lightning arrestors, Insulation co-ordination of HV and EHV power system and substation.

SECTION-B

Unit IV: High Voltage and Current Generation, Generation of high d.c, a.c and impulse voltages, Standard impulse wave shapes, Switching surges, and High impulse generator.

Unit V: High Voltage and Current Measurement Peak voltage, Impulse voltage and High direct measurement methods, Non-destructive measurement and testing, High voltage dielectrics loss and capacitance measurement, Radio frequency and Partial discharge measurement.

Unit VI: High Voltage Testing and E.H.V.Lines Design.
Basic terminology, Testing ï Insulators, Bushings, Cables, Transformers, Surge diverters and Isolators; Electric shock and threshold current, Capacitance of long objects, Electromagnetic interference, E.H.V. line insulation design based upon transient over voltage.

TEXT BOOK :

1. M.S.Naidu and V.Kamraju ï High Voltage Engineering, Tata McGraw Hill Publishing, Company, New Delhi.

REFERENCE BOOKS-

1. E.Kuffer and W.S.Zaenglo- High Voltage Engineering, Pergamon Press,
2. Rokosh Das Begamudre- EHV AC. Transmission Engineering, Wiley Easter Ltd. New Delhi.
3. E.Kuffer and M.Abdullaha _High Voltage Engineering, Pergamon Press
4. M.S.Naidu and V.N.Maller- SF6 and Vaccum Insulation for High Voltage Application, Khanna Publications, Delhi.
5. Prof.D.V.Razeving (Translated from Russian by Dr.M.P.Chaurasia) ï High Voltage Engineering, Khanna Publications, Delhi.
6. An introducation to High Voltage Engineering by Subir Ray, Prentice ï Hall & India, Private Limited, New Delhi.

7. High Voltage Engineering by C.L. wadhawa New Age international (P) Ltd. Publications

8 EL 03 /8EP03/8EE03 DIGITAL SIGNAL PROCESSING

SECTION - A

UNIT-I : Introduction to DSP, Frequency domain description of signals & systems, Discrete time sequences systems, Linearity unit sample response, Convolution, Time invariant system, Stability criteria for discrete time systems, Solutions of linear difference equations.

UNIT-II : Introduction to Fourier transform of Discrete Time Signal and its properties, Inverse Fourier transform, DFT and its properties , Circular convolution, Linear convolution from DFT, FFT, decimation in time and frequency algorithm.

UNIT-III: Sampling of Bandpass signals-Representation of Bandpass signals, sampling of bandpass signals, discrete time processing of continuous time signal; Analog to digital conversion-sample and hold, quantization and coding, analysis of quantization errors, oversampling of A/D converter; Digital to Analog conversion-sample and hold, first order hold, linear interpolation with delay, oversampling of D/A converter

SECTION-B

UNIT-IV: Filter categories, Direct form I, Direct form II, Cascade and parallel structure for IIR and FIR Filter, Frequency sampling structures for F.I.R. filter, Steps in Filter Design, Design by Pole Zero Placements, FIR filter design by Windowing method, Rectangular, Triangular and Blackman window.

UNIT-V : Analog filter types, Butter worth, Elliptic filter, Specification and formulae to decide to filter order, Methods to convert analog filter into IIR digital, Mapping of differential, Impulse invariant, Bilinear, Matched Z transformation.

UNIT-VI: DSP Processors and applications- DSP Microprocessors architectures, fixed point, floating point precision, algorithm design, mathematical, structure and numerical constraints, DSP programming, filtering, data conversion; Real time processing consideration including interrupts

TEXT BOOKS:

1. Proakis & Monolakis D.G, óDigital Signal Processingô, PHI Publication
2. Oppenhavm & Scheffer, óDiscrete Time Processingô, John Wiley Publication

3. Digital Signal Processing, P Ramesh Babu,SCITECH Publications, Chennai, 4th edition,2010
4. Mitra S.K, "Digital Signal Processing", TMH Publication

8 EL 04 /8EP04/8EE04 PROFESSIONAL ELECTIVE - II
(1) ELECTRIC DRIVES & CONTROL

SECTION-A

UNIT I : Introduction to Electrical Drives: Concept, Classification and Advantages. Basic elements, Components of load torque, Torque equation, Equivalent values of drive parameters. Types of mechanical loads. Selection of motor and Controller, Classes of duty, Stability of an electrical drive. Comparison of AC and DC drives.

UNIT II: Starting and Braking of Electrical Drives: Solid-state starters, soft starting, Calculation of starting/acceleration/reversal time and energy loss during starting. Types, advantages, limitations and purposes/objectives of electrical braking, Braking of d c and induction motors.

UNIT III: DC Drive Control Basic machine equations, schewe of control, Single phase separately excited drives, singleï phase- series motor drives, power factor improvement, Three-phase separately excited drive, Closed loop control, PLL control, microcomputer control.

SECTION-B

Unit-IV: Ac drive control: Basic principle of operation, speed control of induction motor, stator voltage control, varible frequency control, Rotor resistance control, slip-power recovery scheme, Synchronus motor drive, Microprocessor controlled AC Drive.

UNIT V: Vector controlled Drive,Principle of Vector Control, Equivalent ckt. Direct v.c., Flux vector estimation, Indirect v.c., v.c. of line side pular rectifer exator flux oriented v.c., v.c. of current fed inventer drive & cycloconverter drive servorless control speed estimation controls ï EKF method

UNIT VI: Direct torque & adoptaive controlled Drive Torque Expression o& control strategy self tuning control MRAC sliding mode control self commissiong of drive, Study of electrical drives in rolling mills, paper mills, cement mills, sugar mills, textile mills, traction and machine tool applications.

REFERENCE BOOKS:

1. Power Electronics : (Converts, Application & Design) ï Mohan/ Undeland/ Rossing- John wiley

2. Power Electronics : M.D. Singh, K.B. Khan Chardalli ï TMH
3. Power Electronics : M.H. Rashid ï Pearson Education
4. B.K. Bose : Modern Power Electronics and AC Drive, Pearson Education
5 G. K. Dubey Fundamentals of Electrical Drives, , Narosa Publishing House,2005
6 . Electric Drives ï Concepts & Applications by V.Subrahamanyam, TMH 2nd edition 2010

8 EL 04 /8EP04/8EE04 PROFESSIONAL ELECTIVE - II
(2) POWER QUALITY

SECTION - A

Unit I: Introduction
Power Quality Definition, Need for Power Quality, Sensitive Loads, Nonlinear Loads, Interconnected Power System, Deregulation, Utilities, End Users, Lawyers,

Unit II: Power Quality Characteristics
Power Quality Theory, Types of power Quality Problems, Voltage Swells, Long-Duration Over voltages, Under voltages, Interruptions, Transients, Voltage Unbalance, Voltage Fluctuations, Harmonics, Electrical Noise, Sources of Power Quality Problems, Utility Side of the meter, End-User Side of the meter, Effects of Power Quality Problems, Power Quality Problem-Solving Procedures, Power Quality Solutions,

Unit III: Power Quality Standards
Power Quality Standards Organizations, Institute of Electrical & Electronics Engineers (IEEE), American National Standards Institute(ANSI), International Electrotechnical Commission(IEC Other International Standards Organizations, Purpose of Power Quality Standards, Types of Power Quality Standards, Voltage Sag (Dip) Standards, Transients of Surges, Voltage Unbalance, Voltage Fluctuation or Flicker Standards, Harmonics Standards, Transformer Overheating Standards, Natural Conductor Loading Standards, Static Electricity, Telephone Power Quality Standards, Grounding and Wiring Standards,
Sensitive Electronics Equipments Standards, Trends in Power Quality Standards.

SECTION-B

Unit IV: Power Quality Solutions
Reduce Effects on Sensitive Equipment, Reduce or Eliminate Cause, Reduce or Eliminate Transfer Medium, Install Power Conditioning Equipments, , Surge Suppressors, Noise Filters,

Isolation Transformers, Line-Voltage Regulators, Motor-Generator Sets, Magnetic Synthesizers, Static VAR Compensators (SVCs), Uninterruptible Power Supply (UPS), Solid-State Switches, Harmonics Solutions, Selection of Appropriate Power Conditioning Equipment, Grounding and Wiring Solutions

Unit V: Wiring and Grounding

Wiring Principles, Grounding Principles, Power System, Utility Power System Grounding,Telecommunication System Grounding, End-User Power System Grounding, Wiring and Grounding Problems, Ground Loops, Electromagnetic Interference (EMI) Noise, Loose Connections, Grounding for Lightning and Static Electricity, Attack of the Triplens, Solutions That Cause Problems, Wiring Solutions, Separation, Selection of Wire and Cables, Shielding, Grounding Solutions, Ground Rods, Ground Ring, Ground and Reference Signal Grids, Other Grounding Systems, Isolated Grounds, Multipoint Grounding, Separately Derived Source Grounding, Reference

Unit VI: Power Quality Measurement Tools & Power Quality Surveys

Kilowatt-Hour Meter, Multimeters, Average-responding versus True RMS Meters, Crest Factor and Bandwidth, Other Selection Considerations, Oscilloscopes, Disturbance Analyzers, Harmonics Analyzers, Purpose of a Power Quality Surveys (Checkup or Examination), Planning a power Quality Surveys.

TEXT BOOKS: -

1. Barry W. Kennedy: Power Quality Primer, McGraw-Hill
2. Electrical Power System quality by R.C.Dugan, M.F.McGranghan, S.Santoso, H.W.Beaty TMH 2nd edition 2011

REFERENCE BOOK: -

1. G.T. Heydt: Power Quality Stars in a circle Publication, Indiana, 1991.

8 EL 04 /8EP04/8EE04 PROFESSIONAL ELECTIVE - II
(3) EMBEDED SYSTEMS

Unit-I : Introduction: Embedded systems design, Embedded system architecture, Embedded systems model, An Overview of Programming Languages and Examples of Their Standards, Standards and Networking, Multiple Standards-Based Device Example: Digital Television (DTV).

Unit-II: Embedded Hardware Building Blocks and the Embedded Board, powering the hardware, Instruction Set Aarciteture (ISA) architecture model, internal processor design and its performance.

Unit-III: Memory: ROM, RAM and auxiliary memory, Memory Management of Extemal Memory , Performance of memory .I/ O : Managing Data: Serial vs. Parallel I/O , Interfacing the I/O Components ,I/O performance.Buses: arbitration, timing and performance.

Unit-IV: Device Drivers: Device Drivers for Interrupt-Handling, Memory Device Drivers, On-board Bus Device Drivers, Board I/O Driver. Embedded OS: Multitasking and Process Management, Memory Management ,.

Unit-V: Embedded OS : I/O and File System Management ,OS Standards: POSIX, OS Performance Guidelines. Middleware :meaning and examples. Application layer software: meanings and examples.

Unit-VI: Embedded system design & implementation: Defining the System-Creating the Architecture and Documenting the Design, Stages in creating an Embedded System Architecture. Implementing the Design. Quality Assurance and Testing of the Design.

TEXT BOOK:

Tammy Noergaard ñEmbedded Systems Architectureò Elsevier Newnes Publication.

REFERENCE BOOKS:

1. Rajkamal , ñEmbedded Systems, Architecture, Programming & Designò TMH.
2. Jane W. S. Liu óReal Time Systemsò, Pearson Education
3. Vahid & Givargis ñEmbedded System Designò John Wiley & Sons P Ltd.
4. Peter Marwedel ñEmbedded Systems Designò Springer, Netherland.

8 EL 04 /8EP04/8EE04 PROFESSIONAL ELECTIVE - II
(4) GENERALISED MACHINE THEORY

SECTION-A

Unit I : Elements of Generalized Theory: essentials of rotating machines, conventions, basic two pole machines, transformer with movable secondary transformer and speed voltage in armature, kions, primitive machine, leakage fluge, voltage and torque equations.

Unit II : Linear transformations in machines: invariance of power transformation from displaced brush axis, three-phase to two-phase transformation power invariance, transformation from rotating axes to stationary axes, impedance matrix, application of generalized theory, electrical torque, limitations of generalized theory.

Unit III: D.C.Machines: separately excited DC generators and motors formulation of mathematical model, steady state and transient analysis, Ward-Leonard system of speed control.
Steady state analysis of DC series, shunt and compound machine and their characteristics cross-field machines, metadyne transformer, metadyne generator.

SECTION-B

Unit IV: Poly-phase synchronous machine, three phase synchronous machine, steady state and transient analysis, phasor equations and phasor diagram, power angle characteristics, DWR synchronous machine generalized mathematical model, steady state analysis, phasor diagram.

Unit V: Induction Machine: Transformations, electrical performance, equation, steady state analysis, equivalent circuit, torque-slip characteristics.High torque cage motors- deep bar rotor and double cage rotor induction motors, steady stateanalysis, comparison between single cage and double cage motors.

Unit VI: Generalized theory of single-phase series motor, repulsion motor and scharge motor and steady state analysis.

TEXT BOOKS :

1. M.B.Say: Introduction to Unified Theory of Electrical Machine, ELBS.
2. SEELY: Electromechanical Energy Conversion

8 EL05/ 8EP05/8EE05 PROJECT & SEMINAR

8 EL06/ 8EP06/8EE06 DIGITAL SIGNAL PROCESSING - LAB

Any TEN experiments based on contents of
8 EL03/ 8EP03/8EE03 DIGITAL SIGNAL PROCESSING

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
ELECTRICAL ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER : SEVENTH

7 EE01/7EP01/7EL01 CONTROL SYSTEM - II

SECTION-A

Unit I : Compensation Techniques:
Introduction, Preliminary considerations of Classical Design, Lead Compensator, Lag Compensator, Lag- Lead Compensator, Cascade Compensation in time domain, Cascade compensation in Frequency domain, Feedback compensation in frequency domain .

Unit II : State Space Techniques I:
State, state space and state variables; SISO/MIMO linear systems state variable models - differential equations, Transfer Functions, Block Diagrams and State Diagrams (Signal Flow Graphs); Transfer functions decomposition - Phase variable forms, Canonical forms and Jordan canonical form; Transfer function - state model; Transfer matrix; State equations solution - State transition matrix (STM); STM Computation ï Laplace transformation, Canonical transformation and Cayley Hamilton theorem; Time response ï SISO Systems.

Unit III : State Space Techniques II:
Concept - controllability and observability; SISO/MIMO Linear systems -Gilbertôs method and Kalmanôs test; SISO controllable systems Design -state feedback.

SECTION-B

Unit IV Sampled Data Control Systems:
Representation, Z Transforms. review, Sampler and Hold - zero order hold; Sampling theorem; Z Transform analysis ï open loop and closed loop sampled data systems, Z Transfer functions, Difference equation solution and response; Z Transform Method,. Discrete Systems Response, Open and closed loop systems pulse transfer functions - Different sampler locations; Digital Controller - transfer function; Stability analysis - S and Z Domain relationship, Juryôs Test and Bi-Linear Transformation, Root and root locus method.

Unit V : Non-Linear System Analysis I :
Non-linear system behavior ï types and characteristics; Describing functions - typical non-linearity and their

characteristics; Stability analysis - Describing function method and Limit cycles; Limitations - describing function method.

Unit VI : Non-Linear System Analysis II

Linearization - Around operating point; Singular points ï Classification and Nature; Phase-plane method - non- linear systems analysis; Phase trajectories construction ï analytical method and graphical method by isocline method; Stability analysis - limit cycle; Limitations - phase-plane method.

TEXT BOOKS:

1. I.J. Nagrath and M. Gopal ï Control System Engineering,Wiley Eastern Limited, New Delhi.
2. K . Ogata - Modern Control Theory, Prentice Hall of India Pvt. Ltd. New Delhi.
3. Modern Control System, Richard Dorf, Robert Bishop, PEARSON education, 11th edition 2008

REFERENCE BOOKS:

1. Control Engineering, D.Ganesh Rao, k.Chennavenkatesh, 2010
2. D.Roy Choudhary, Modern Control Engineering,Prentice Hall of India Pvt Ltd. New Delhi.
3. R.C. Sukla ï Control Systems Dhanpat Rai & Co.Pvt Ltd.

7 EE02/7EP02/7EL02 POWER SYSTEM OPERATION & CONTROL

SECTION-A

Unit I : Economic Operation – Part I

Meaning of optimum scheduling, UCP and LSP; Input ï Output characteristics, Heat rate characteristic, Incremental fuel rate, Incremental fuel cost; Methods of obtaining incremental fuel costs; Conditions for incremental loading; Optimum scheduling of generation between different units (Only Two plant system without transmission loss).

Unit II : Economic Operation – Part II

Transmission loss as a function of plant generation; Calculation of loss co-efficient (Two plant system); Incremental transmission loss; Optimum scheduling of generation between different plants including transmission loss; Concept and significance of penalty factor; Automatic load dispatch: Operation and Functions.

Unit III : A. Generator Control Loops

Concept of real and reactive power; Effect of real and reactive power on system parameters; Philosophy of real and reactive power control; Basic generator control loops.

B. Automatic Voltage Regulator (AVR)

Functions of AVR; Types of Exciter; Brushless AVR loop: Exciter modeling, Generator modeling, Transfer function block diagram representation, Static performance, dynamic response, Stability compensation, Effect of generator loading.

SECTION-B

Unit IV : Automatic Load Frequency Control

Automatic generation control (AGC); Speed governing system; Transfer function modeling: Governor, Hydraulic valve actuator, Turbine, Generator, Load; Transfer function representation of an isolated generator; Static performance of speed governor; Closing of ALFC loop.

Unit V : Control Area

Meaning; Primary ALFC Loop: Static response, Dynamic response, physical interpretation of results; Secondary ALFC loop; Integral Control; Pool operation; Tie-line Modeling; Two area system ï Dynamic response; Tie-line bias control.

Unit VI : Steady-State Instabilities

Natural torsional oscillatory modes in power system; Natural mode of a single generator operating onto infinite bus; Effect of damper winding; Effect of changing excitation; Power system stabilizer; Introduction to modern control application.

TEXT BOOKS :-

1. O. L. Elgerd ï Electric Energy Systems Theory: An Introduction ï Second edition, McGraw-Hill Book Comp. N. Y. 1987.
2. Power System Operation & Control, N.V.Ramana, PEARSON education, 2010.
3. Power System Operation by R.Miller, J.H.Malinowski, TMH, 2nd reprint 200

REFERENCE BOOKS :

1. L. K. Kirchamayor ï Economic Operation of Power System- Wiley Estern Pvt. Ltd., New Delhi.
2. Hadi Saadat ï Power System Analysis ï WCB/McGraw-Hill International Edition 1999
3. I. J. Nagrath, D. P. Kothari ï Modern Power System Analysis ï Second edition, Tata Mc-Graw Hill Publishing Company, New Delhi 4.
   P. S. R. Murty ï Power System Operation and Control ï Tata Mc-Graw Hill Publishing Company, New Delhi.
5. Wood and Wollenberg ï Power Generation, Operation and Control ï Willey ï Inter Science Publication

7 EE03/7EP03/7EL03 ELECTRICAL POWER - II

SECTION-A

Unit I :: Symmetrical components
Definition and choice, Alpha operator, transformation matrices, sequence components, power invariance, line and phase sequence quantities relations, three phase delta/star transformer bank- sequence voltages and currents relationship; power system elements ï sequence impedance and sequence networks ; Various three phase transformer connections ï zero sequence rules; Unbalanced load system ï application.

Unit II : Symmetrical Fault Analysis
Transmission line transients, three phase symmetrical short circuit at alternator terminals, Power system fault calculations, short circuit MVA, Current limiting reactors, ring system and tie bar system, Circuit breaker rating calculation.

Unit III : Unsymmetrical Fault Analysis
L-G, L-L-G and L-L faults at unloaded generator terminals, Equivalent sequence network diagram, Fault impedance, Unsymmetrical faults through impedance, Power system faults-loaded and unloaded conditions.

SECTION-B

Unit IV : Overvoltages
Causes ï internal and external; Voltage surge, Basic insulation level, Protection ï earthing screen, overhead ground wire, lightning arresters.

Unit V: HVDC Transmission Basic principle, Transmission equipments, Comparison with AC links, Inverters ï reactive power requirement; Converters, DC links, Circuit breaking, ground return, Economic distance, modern developments.

Unit VI : Flexible AC Transmission Systems (FACTS)
FACTS concept, Elements, Controllers, Comparison with Conventional AC Transmission system.

TEXT BOOKS :-

1. Power System Engineering by D.P.Kothari, I.J.nagrath TMH 2nd edition, 9th reprint 2010
2. Power System Analysis, N.V.Ramana, PEARSON education, 2010
3. Power System Analysis, Arthur R. Bergen, Vijay Vittal,2nd Edition, 2009, PEARSON Education
4 Modern Power System Analysis by D.P.Kothari, I.J.nagrath TMH 3rd edition, 20th reprint 2010

5. Power System Analysis by Hadi Saadat TMH, 1st reprint 2004
6. Electrical Power System, by Syed A. Nasar TMH,Revised 1st edition 2011

REFERENCE BOOKS :-

1. S. Rao ï ñEHV A.C. and HVDC Transmission Engineering and Practiceò, Khanna Publishers, New Delhi.
2. Narain G. Hingorani and Lazlo Gyugyi ï ñUnerstanding FACTS: Concepts and Technology of Flexible AC Transmission Systems.
3. Yong Hua Song and Allan T. Johns - ñFlexible AC transmission Systems (FACTS), T and D reference bookò Westing house.

7 EE04/7EP04/7EL04 SWITCHGEAR & PROTECTION

SECTION-A

Unit I : Circuit Interruption
Circuit breaker control circuit, Fault clearing process, Auto-reclosure, Arc phenomenon- maintenance, properties and interruption theories; AC circuit breakers- current interruption, transient recovery voltage (TRV), rate of rise of TRV, factors affecting TRV, ratings; Inductive and Capacitive current interruptions, current chopping.

UnitII : A. Fuses Types, Constructional features, operation, Characteristics and Applications
B. Circuit Breaker (Part ï I)
Air break, Air blast, Bulk oil and minimum oil-types, constructional features, operationand application.

Unit III : Circuit Breaker (Part – II)
SF_6, Vaccum, Miniature, Earth leakage and Moulded Case ï types, Constructional features, operation and application; Testing, Instalation and Maintenance.

SECTION-B

UnitIV: A. RelayingPrinciple
Components, Essential features, Characteristics, Terminology, CTôs and PTôs, Relay classification.
B. ElectromagneticRelays
Overcurrent, Directional, Distance and Differential ï types, constructional features, operation, characteristics and application.

Unit V : Protection of Transmission Lines
Relaying schemes ï overcurrent, earth fault, directional, distance and differential; Parallel feeders and ring mains protection, Carrier current relaying, Overload and Power swing.

Unit VI : **A.** Other Power System Elements Protection Transformers, Motors, Generators and Buses.

B. Static Relaying

Basic concepts, equipments, comparators, Characteristics realization ï overcurrent, directional, differential and distance relay. Microprocessor based relay introduction.

TEXT BOOK:-

1. Sunil S. Rao ï ñSwitchgear and Protectionò Khanna Publications New Delhi

REFERENCE BOOKS: -

1 R. T. Lythall ï ñSwitchgear Handbookò J and P Newness Butterworth, London.

2 C. R. Mason ï ñThe Art and Science of Protective Relayingò

3 A. R. Van and C Warringtan ï ñProtective Relaying , Vol 1 and 2,ò Chapman Hall, London.

4 Geosonoviz ï ñHigh Voltage Circuit Breakersò

5 V. A. Slabikov ï ñGeneration Protection and Switchgearò CIT, Coimbatore.

6 Badri Ram and B. N. Vishwkarma ï ñPower System Protection and Switchgearò Tata Mc-Graw Hill Publishing Company Limited, New Delhi.

7 B. Ravindranath and M Chander ï ñPower System Protection and Switchgearò Wiley Eastern Ltd, New Delhi.

8. Handbook of switchgear by BHEL, TMH 6th reprint,2010

7 EE05/7EP05/7EL05 PROFESSIONAL ELECTIVE - I
(1) PROCESS CONTROL SYSTEMS

SECTION-A

Unit I : Electronics Instruments for Measurement of Electrical Parameters Advantages of Electronic Instruments, Electronic Voltmeters Electronic Multimeters, differential volt meter, Digital voltmeter, Q meter, vector impedance meter, vector voltmeter.

Unit II: **Signal Generation and Analysis**
Signal generators, Function generators. Wave analyzer Harmonic Distorsion Analysers, spectrum Analysis.

Unit III: **Signal Counting and Recording**
Decade counting Assembly, Binary counter, Decimal counter, Decade counter with digital disply, universal counter, Digital readot devices, storage type CRO, Servotype X-Y recorder.

SECTION-B

Unit IV : **Signal conditioning and Conversions.**
Frequency characteristics of various types of signals,active filters bandpass,low pass and high pass filters using opAmps. Various techniques od A/D and D/A conversions. Modulation and demodulation PCM techniques, phase locked loop.

Unit V: **Signal Processing**
Pulse times, triggered elayed sweeps, discrete pulse delay circuits, pulses equencing, analog multiplexers and demultiplexers, digital multiplexing sample and hold circuits, serial and parallel digital data conversion. Signal transmission, Analog and digital telemetry techniques, MODEM and UART, keyboard and character generators, tape recorder,

Unit VI : Introduction to Processor and Processor based Techniques. Introduction to PLC, PLC architecture, programming; ladder diagram and examples, micro controller based instrumentation

TEXT BOOKS: -

1. H.S. Kalsi ï Electronic Instrumentation, - Tata Mc-Graw Hill Publishing Company, New Delhi.
2. Cooper, Helfrick ï Electronic Instrumentation and Measurement Techniques, A Prentice Hall of India. New Delhi.

REFERENCE BOOKS: -

1. B.R. Gupta-Electronics and Instrumentation ï Wheeler Publishing.
2. Rangan, Sharma & Mani ï ñInstrumentation ï devices & Systems.ò Tata Mc-Graw Hill Publishing Company, New Delhi.
3. R.P. Jain-Digital Electronics, Tata Mc-Graw Hill Publishing Company, New Delhi.
4. Microprocessors and Digital Systems, by:D.V. Hall,Tata Mc-Graw Hill Publishing Company, New Delhi.
5. Shoen Beck- Electronic Communication, Prentice Hall of India. Pvt. Ltd. New Delhi.
6. B. Ram- fundamental of Microprocessors, Dhanpat Rai & Sons, New Delhi.
7. A.K. Sawhney ï Acourse in Electrical & Electronics Instrumentation, Dhanpat Rai & Sons, New Delhi.

7 EE05/7EP05/7EL05 PROFESSIONAL ELECTIVE - I
(2) COMPUTER ORGANISATION

Unit-I: Basic strucutre of computer: Hardware & software.Addressing methods. Program sequencing. concept of memory locations & address. Main memory operation. Instructions & instruction sequencing. Addressing modes. BasicI/O operations. Stacks. Queues & subroutines.

Unit-II: Processing Unit: fundamental concepts. execution of a comlete instruction. hardwired control, performance consideration. Microprogrammed control; microinstructions, microprogram sequencing, microinstruction prefetching, emulation.

Unit-III: I/O organizatiion: accessing I/O devices,interrupts, direct memory access:bus arbitration. I/O hardware:processor bus and interfacing circuiuts,standard I/O interfaces: SCSI bus, backplane bus standard.

Unit-IV: Memory Unit: basic concepts,semiconductor RAM memories,internal organization, static & dynamic RAMs, ROMs. speed, size & cost considerations.Cache memories: performance considerations. Virtual memories, address translation,memory management requirements.

Unit-V: Arithmetic; number representation. design of fast adders,signed addition and subtraction. Multiplication of positive numbers, Boothsôalgorithm, Integer division.Floating-point numbers and related operations.

Unit-VI: Computer Peripherals: Input-output devices like video displays,video terminals, graphics input devices,printers.Online storage devices: magnetic disks,magnetic tape systems, CD-ROM systems. Communication devies: Modems.

TEXT-BOOK:

V.Carl Hamacher & S. Zaky ñ Computer Organizationò (4/e) McGraw-Hill(ISE).

REFERENCES:

1. Stallings. W. ñ Computer Organization & Arcitectureò (5/e) (Pearson Education).
2. Tenanbaum A.S.ò Structured Computer Organizationò (5/e) (Pearson Education).
3. Hayes J.P. ñComputer Architecture & Organizationô(4/e) (McGraw-Hill).

7 EE05/7EP05/7EL05 PROFESSIONAL ELECTIVE - I

(3) COMPUTER METHODS IN POWER SYSTEM ANALYSIS

SECTION-A

Unit I : Representation of power systems for computerized analysis : Mathematical models of Synchronous generator for steady state and transient analysis . Transformer with tap changer, transmission line,phase shifter and loads.

Unit II : Topology of Electric Power Systems ï Network Graphs , Incidence matrices, fundamental loop and cutest matrices, primitive impedance and admittance matrices, equilibrium equations of networks . Singular and Nonsingular transformation of network matrices .

Unit III : Formation of bus impedances and admittances matrices by algorithm ï Modification of bus impedance and admittance matrix to account for change in networks. Derivation of loop impedance matrix.

Three phase network elements ï transformation matrix ï incidance and network matrices for three phase l networks . Algorithm for formulation of 3 phase bus impedance matrix.

SECTION-B

Unit IV: Short circuit studies : Three phase networks , Symmetrical components. Thevenin's theorem and short circuit analysis using bus impedance matrix . Short circuit calculations for balanced three phase networks using bus impedance matrix.

Unit V: Load flow studies : formation of load flow problem ï Gauss Seidel method ï Newton Unit III Raphson method ï decoupled method, fast decoupled methods ï sparsity technique.

Unit VI : Stability studies of power system ï Development of mathematical model for multimachine system stability analysis ï Formation of equations and methods of solutions .Transient stability analysis including synchronous machines , system networks and loads . Solution of state equation by modified Euler method and Runge Kutta 4th order Approximation method.

TEXT BOOKS:

1) L.P.Singh : Advanced Power System Analysis and Dynamics, WEL.
2) Y.Wallach : Calculations and programs for Power System Network.
3) G.W.Stage and A.H.El-Abiad : Computer Methods in Power System Analysis, McGraw Hill.

REFRENCE BOOKS:

1) R.N.Dhar : Computer Aided Power System Operation and Analysis, TMC.
2) Computer Technniques in Power System Analysis, by M.A.PAi TMH 10th reprint 2011

7 EE05/7EP05/7EL05 PROFESSIONAL ELECTIVE - I
(4) ARTIFICIAL INTELLIGNCE

SECTION-A

UNIT I : Introduction
Biological Neurons and their artificial models, introduction to neural computing
Components of neuron, input and output weight, threshold,weight factors, transfer
Functions ,concepts of supervised and unsupervised learning.

UNIT II: Supervised Learning :
Single Layer network, perceptron, Linear Separability, Training algorithm and limitations .
Multilayer Network : Architecture of feed forward network ,learning rule, generalized
Delta rule,learning function . Back propagation algorithm.

UNIT III: Unsupervised Learning:
Introduction, Counter propagation networks, Kohonenôs self organizing maps.
Hopfields networks.

SECTION-B

UNIT IV: Introduction:
Uncertainty in information,basic concepts of Fuzzy sets , operations on fuzzy sets , properties.
Fuzzy relations : operations,properties ,value assignments.

UNIT V : Membership Functions:
Features, fuzzification, membership value assignments, Fuzzy Rule based
Systems, Graphical technique of inference.
Defuzzification : Lambda-cuts for Fuzzy sets and Fuzzy relations , Defuzzification methods

UNITVI : Genetic Algorithm (GA):
Introduction to genetic algorithm,working principle,coding of variables, Fitness function. GA operators , similarities & differences between GAs and Traditional methods; Unconstrained and constrained optimization using Genetic Algorithm , real coded GA ,Advanced GA, global optimization using GA .

TEXT BOOKS

1 J.M. Zurada : Introduction to Artificial Neural Network, Jaico Publishing House

2 Meherotra Kishan ,Mohan C.K, Ranka Sanjay : Elements Of Artificial Neural networks Penram Int Pub Mumbai.
3 D.E Goldberg ,Addision Genetic Algorithm in Search Optimization and Machine Learning Wesley Publication
4 Kalyanmoy Deb Optimization for Engineering Design Algorithms and Examples, Prentice Hall of India New Delhi
5. M.Kishan, Mohan C.K., Ranka Sanjay; Elements of Artificial Neural Networks, Penram Int. Publications.

REFRENCE BOOKS

1. G.J. Khir and T.A. Folger : Fuzzy sets , Uncertainity and Information PHI Publication
2. Koska Bart Neural Network & Fuzzy systems Prentice Hall of India Pvt Ltd , New Delhi

7 EE06/7EP06/ 7EL06 PROJECT & SEMINAR

7 EE07/7EP07/ 7EL07 ELECTRICAL POWER II - LAB

Any TEN experiments based on contents of 7EE03 ELECTRICAL POWER II

7 EE08/7EP08/ 7EL08 SWITCHGEAR & PROTECTION - LAB

Any TEN experiments based on contents of 7EE04 SWITCHGEAR & PROTECTION

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SEMESTER : EIGHT
8EE 01/8EL01/8EP01 POWER SYSTEM STABILITY

SECTION - A

Unit I : Basic Concepts
Meaning of stability, Steady state, Transient and Dynamic stability limits; Three Phase Synchronous Machine-circuit representation, voltage equation and Parkôs Transformation; Transient and Sub transient state analysis and Phasor diagrams, Voltage behind the transient and sub transient impedances, Parameters and Time Constants determination.

Unit II: Steady State Stability - I
Steady state stability limit-short transmission line, Two machines system, Medium and Long transmission line, Clarkeôs diagrams for system with and without loss, Effect of inertia, Conservative criterion, Synchronizing coefficients and Multi machine system.

Unit III: Steady State Stability – II

Saturation effect, Saturated reactance, Equivalent reactance and its graphical determination; Short circuit ratio, Governor action and automatic voltage regulator effects.

SECTION-B

Unit IV: Transient State Stability – I

Review of basics concepts, Transient state stability and equal area criterion, Swing equation and its point by point solution, Critical clearing angle and time.

Unit V: Transient State Stability – II

Type of faults, Grounding and high speed re-closing effects, Pre-calculated swing curves and their use, Faults clearing Time, Excitation and governing action effects, Stability improvement methods, Multi machine problem, Network analyzer, Digital Computer role.

Unit VI: Excitation System

Unit exciter and common bus system, Self and separate excitation, Exciter type of and their description, Exciter drives, Quick response excitation system, Voltage-current methods differential equations for obtaining voltage ï time curves, Exciter response from voltage time curves, Dispersion coefficient, Constant leakage Inductance, Eddy current effects on exciter response, Loaded exciter response, Exciter response improvement methods.

TEXT BOOKS:

1 E W Kimbark- Power System Stability, Vol.1 and 3, Dover Publications Inc., New York.

2 Power System Stability & Control by Prabha Kundur, TMH 11th reprint 2011

3. S.B Crary- Power System Stability, Vol.1 and 3, Hohn Wiley and Sons, New York.

REFERENCE BOOKS:

1 L.P Singh ï Computer Aided Power System Operation and Dynamics, Wiley Eastern Ltd. New Delhi.

2 I.J.Nagrath and D.P.Khothari ï Modern Power System Analysis, Tata Mc-Graw Hill Publishing Company, New Delhi.

8EE 02/8EL02/8EP02 HIGH VOLTAGE ENGINEERING

SECTION-A

Unit I : Breakdown in Gases

Insulating materials Classification, Gases as insulating media, Ionization and decay process, Breakdown in gases, Townsendôs law, Streamer mechanism of spark pashanôs law, Corona discharge, Electronegative gases.

Unit II: Breakdown in Liquid and Solid Dielectrics

Breakdown in pure and commercial liquids, Sold dielectrics and composite dielectrics, High voltage bushings, Guarding, Shielding, Field plotting.

Unit III: Lightning and Switching Over Voltage and Protection

Lightning strokes to lines and towers; Mechanism, Characteristics and protection of transmission lines from lightning; Lightning arrestors, Insulation co-ordination of HV and EHV power system and substation.

SECTION-B

Unit IV: High Voltage and Current Generation, Generation of high d.c, a.c and impulse voltages, Standard impulse wave shapes, Switching surges, and High impulse generator.

Unit V: High Voltage and Current Measurement Peak voltage, Impulse voltage and High direct measurement methods, Non-destructive measurement and testing, High voltage dielectrics loss and capacitance measurement, Radio frequency and Partial discharge measurement.

Unit VI: High Voltage Testing and E.H.V.Lines Design.

Basic terminology, Testing ï Insulators, Bushings, Cables, Transformers, Surge diverters and Isolators; Electric shock and threshold current, Capacitance of long objects, Electromagnetic interference, E.H.V. line insulation design based upon transient over voltage.

TEXT BOOK :

1. M.S.Naidu and V.Kamraju ï High Voltage Engineering, Tata McGraw Hill Publishing, Company, New Delhi.

REFERENCE BOOKS-

1. E.Kuffer and W.S.Zaenglo- High Voltage Engineering, Pergamon Press,
2. Rokosh Das Begamudre- EHV AC. Transmission Engineering, Wiley Easter Ltd. New Delhi.
3. E.Kuffer and M.Abdullaha _High Voltage Engineering, Pergamon Press

4. M.S.Naidu and V.N.Maller- SF6 and Vaccum Insulation for High Voltage Application, Khanna Publications, Delhi.
5. Prof.D.V.Razeving (Translated from Russian by Dr.M.P.Chaurasia) ï High Voltage Engineering, Khanna Publications, Delhi.
6. An introducation to High Voltage Engineering by Subir Ray, Prentice ï Hall & India, Private Limited, New Delhi.
7. High Voltage Engineering by C.L. wadhawa New Age international (P) Ltd. Publications

8EE 03/8EL03/8EP03 DIGITAL SIGNAL PROCESSING

SECTION - A

UNIT-I : Introduction to DSP, Frequency domain description of signals & systems, Discrete time sequences systems, Linearity unit sample response, Convolution, Time invariant system, Stability criteria for discrete time systems, Solutions of linear difference equations.

UNIT-II : Introduction to Fourier transform of Discrete Time Signal and its properties, Inverse Fourier transform, DFT and its properties , Circular convolution, Linear convolution from DFT, FFT, decimation in time and frequency algorithm.

UNIT-III: Sampling of Bandpass signals-Representation of Bandpass signals, sampling of bandpass signals, discrete time processing of continuous time signal; Analog to digital conversion-sample and hold, quantization and coding, analysis of quantization errors, oversampling of A/D converter; Digital to Analog conversion-sample and hold, first order hold, linear interpolation with delay, oversampling of D/A converter

SECTION-B

UNIT-IV: Filter categories, Direct form I, Direct form II, Cascade and parallel structure for IIR and FIR Filter, Frequency sampling structures for F.I.R. filter, Steps in Filter Design, Design by Pole Zero Placements, FIR filter design by Windowing method, Rectangular, Triangular and Blackman window.

UNIT-V : Analog filter types, Butter worth, Elliptic filter, Specification and formulae to decide to filter order, Methods to convert analog filter into IIR digital, Mapping of differential, Impulse invariant, Bilinear, Matched Z transformation.

UNIT-VI: DSP Processors and applications- DSP Microprocessors architectures, fixed point, floating point precision, algorithm design, mathematical, structure and numerical constraints, DSP programming, filtering, data conversion; Real time processing consideration including interrupts

TEXT BOOKS:

1. Proakis & Monolakis D.G, óDigital Signal Processingô, PHI Publication
2. Oppenhavm & Scheffer, óDiscrete Time Processingô, John Wiley Publication
3. Digital Signal Processing, P Ramesh Babu,SCITECH Publications, Chennai, 4th edition,2010
4. Mitra S.K, óDigital Signal Processingô, TMH Publication

8EE 04/8EL04/8EP04 PROFESSIONAL ELECTIVE - II
(1) ELECTRIC DRIVES & CONTROL

SECTION-A

UNIT I : Introduction to Electrical Drives: Concept, Classification and Advantages. Basic elements, Components of load torque, Torque equation, Equivalent values of drive parameters. Types of mechanical loads. Selection of motor and Controller, Classes of duty, Stability of an electrical drive. Comparison of AC and DC drives.

UNIT II: Starting and Braking of Electrical Drives: Solid-state starters, soft starting, Calculation of starting/acceleration/reversal time and energy loss during starting. Types, advantages, limitations and purposes/objectives of electrical braking, Braking of d c and induction motors.

UNIT III: DC Drive Control Basic machine equations, schewe of control, Single phase separately excited drives, singleï phase- series motor drives, power factor improvement, Three-phase separately excited drive, Closed loop control, PLL control, microcomputer control.

SECTION-B

Unit-IV: Ac drive control: Basic principle of operation, speed control of induction motor, stator voltage control, varible frequency control, Rotor resistance control, slip-power recovery scheme, Synchronus motor drive, Microprocessor controlled AC Drive.

UNIT V: Vector controlled Drive,Principle of Vector Control, Equivalent ckt. Direct v.c., Flux vector estimation, Indirect v.c., v.c. of line side pular rectifer exator flux oriented v.c., v.c. of current fed inventer drive & cycloconverter drive servorless control speed estimation controls ï EKF method

UNIT VI: Direct torque & adoptaive controlled Drive Torque Expression o& control strategy self tuning control MRAC sliding mode control self commissiong of drive, Study of electrical drives in rolling mills, paper mills, cement mills, sugar mills, textile mills, traction and machine tool applications.

REFERENCE BOOKS:

1. Power Electronics : (Converts, Application & Design) ï Mohan/ Undeland/ Rossing- John wiley
2. Power Electronics : M.D. Singh, K.B. Khan Chardalli ï TMH
3. Power Electronics : M.H. Rashid ï Pearson Education
4. B.K. Bose : Modern Power Electronics and AC Drive, Pearson Education
5 G. K. Dubey Fundamentals of Electrical Drives, , Narosa Publishing House,2005
6 . Electric Drives ï Concepts & Applications by V.Subrahamanyam, TMH 2nd edition 2010

8EE 04/8EL04/8EP04 PROFESSIONAL ELECTIVE - II
(2) POWER QUALITY

SECTION - A

Unit I: Introduction

Power Quality Definition, Need for Power Quality, Sensitive Loads, Nonlinear Loads, Interconnected Power System, Deregulation, Utilities, End Users, Lawyers,

Unit II: Power Quality Characteristics

Power Quality Theory, Types of power Quality Problems, Voltage Swells, Long-Duration Over voltages, Under voltages, Interruptions, Transients, Voltage Unbalance, Voltage Fluctuations, Harmonics, Electrical Noise, Sources of Power Quality Problems, Utility Side of the meter, End-User Side of the meter, Effects of Power Quality Problems, Power Quality Problem-Solving Procedures, Power Quality Solutions,

Unit III: Power Quality Standards

Power Quality Standards Organizations, Institute of Electrical & Electronics Engineers (IEEE), American National Standards Institute(ANSI), International Electrotechnical Commission(IEC Other International Standards Organizations, Purpose of Power Quality Standards, Types of Power Quality Standards, Voltage Sag (Dip) Standards, Transients of Surges, Voltage Unbalance, Voltage Fluctuation or Flicker Standards, Harmonics Standards, Transformer Overheating Standards, Natural Conductor Loading Standards, Static Electricity, Telephone Power Quality Standards, Grounding and Wiring Standards,
Sensitive Electronics Equipments Standards, Trends in Power Quality Standards.

SECTION-B

Unit IV: Power Quality Solutions

Reduce Effects on Sensitive Equipment, Reduce or Eliminate Cause, Reduce or Eliminate Transfer Medium, Install Power Conditioning Equipments, , Surge Suppressors, Noise Filters, Isolation Transformers, Line-Voltage Regulators, Motor-Generator Sets, Magnetic Synthesizers, Static VAR Compensators (SVCs), Uninterruptible Power Supply (UPS), Solid-State Switches, Harmonics Solutions, Selection of Appropriate Power Conditioning Equipment, Grounding and Wiring Solutions

Unit V: Wiring and Grounding

Wiring Principles, Grounding Principles, Power System, Utility Power System Grounding,Telecommunication System Grounding, End-User Power System Grounding, Wiring and Grounding Problems, Ground Loops, Electromagnetic Interference (EMI) Noise, Loose Connections, Grounding for Lightning and Static Electricity, Attack of the Triplens, Solutions That Cause Problems, Wiring Solutions, Separation, Selection of Wire and Cables, Shielding, Grounding Solutions, Ground Rods, Ground Ring, Ground and Reference Signal Grids, Other Grounding Systems, Isolated Grounds, Multipoint Grounding, Separately Derived Source Grounding, Reference

Unit VI: Power Quality Measurement Tools & Power Quality Surveys

Kilowatt-Hour Meter, Multimeters, Average-responding versus True RMS Meters, Crest Factor and Bandwidth, Other Selection Considerations, Oscilloscopes, Disturbance Analyzers, Harmonics Analyzers, Purpose of a Power Quality Surveys (Checkup or Examination), Planning a power Quality Surveys.

TEXT BOOKS:-

1. Barry W. Kennedy: Power Quality Primer, McGraw-Hill
2. Electrical Power System quality by R.C.Dugan, M.F.McGranghan, S.Santoso, H.W.Beaty TMH 2nd edition 2011

REFERENCE BOOK: -

1. G.T. Heydt: Power Quality Stars in a circle Publication, Indiana, 1991.

8EE 04/8EL04/8EX04 (i) PROFESSIONAL ELECTIVE - II
(3) POWER SYSTEM MANAGEMENT

SECTION-A

UNIT-I : Principle and Practice of Management:

Basic Concepts- basic concepts of management-Role and importance of management in modern society, management as a profession

The Process of Management- The process of management; planning, organizing, directing, controlling, decision-making, leading etc.

Management Concepts- Managerial authority and responsibility-delegation and decentralization- Line and staff concepts-concepts in e-commerce etc.

UNIT-II : Marketing & Production/Operation Management:

Marketing Management- Introduction to Marketing, Marketing strategy, Consumer Behaviour, Marketing Research, Product/ Services Decisions, Pricing Products/Services, Distribution management, Advertising & Sales promotion etc.

Production/Operation Management- Introduction to Production Planning and Process, Issues in Material and Inventory Management, Quality control and Management (quality circle, ISO 9000 series, just-in-time, TQM.), Maintenance Management, Purchasing Decision.

UNIT-III : Project, Financial & Human Resource Management:

Project Report: Preparation of -Project Report, Profit and Loss statement, Balance Sheet.

Financial Management: Costing- Principles, types- operating, marginal, incremental, embedded etc, Budgeting & financial planning, Risk management etc.

Human Resource Management: Human resource planning-concepts & process, Job analysis & description- recruitment, selection process, Training & development, Employee welfare, issues related to management of trade union.

SECTION-B

UNIT-IV: Dimensions of Power System Restructuring

Power system Restructuring:: Introduction to Power Sector Reforms/Restructuring/ Deregulation ï issues, prospects and lessons to developing countries

Environmental dimensions in power sector: Pollution & Depletion of natural resources, Waste Management, environmental legislation, green power, strategies for environmental management in power sector.

Rural Electrification: Issues relating to revised definition of village electrification, issues in electrifying remaining villages, decentralized generation and distribution for rural electrification etc.

Power Sector Restructuring in India: History, Problems and status in India, Accelerated Power Development and Reform Programme (APDRP), Reforms in G,T, D sector, Electricity Act:2003- issues, Problems & prospects, Legal and regulatory

framework, Rural Electrification Programme, Environmental Pollution Programme.

UNIT-V: Management issues in Power Sector:

Financing of power sector:: Financial problems of SEBs, strategies - for financing capacity addition to generation, transmission and rural electrification, Risk management in power sector.

Human Resource development in power utilities: Change management, Training & Development, Culture of empowerment and accountability etc.

Transmission & Distribution Management: Transmission management under open access- transmission Pricing/Tariff, Congestion Management, Micro distribution models- private investors, Multi Licensee System, Distribution Management, Power Quality, Demand Side Management, Energy Metering, Accounting and Auditing, SCADA etc.

UNIT-VI: Marketing issues in Power Sector:

Issues of Power Tariff, Prices in Competitive Electricity Markets, Bidding strategy, Availability Based Tariff (ABT), Embedded and Spot pricing, Power Trading, Market Operations in Electric Power Systems, Marketing of energy and services in competitive electricity markets.

TEXT BOOKS:

1. Koontz H., OôDonnel C. and Whierich: Principle of Management, Tata McGraw Hill Publishing Co., Ltd., New Delhi
2. Muhlemann , Production Operation Management, Macmillan publication
3. Dencenzo & Robbins, Human Resource Management
4. Monappaa, Human Resource Management, Macmillan Publication
5. Ramaswamy & Namamkumari, Marketing Management Macmillan Publication
6. Philip Kotler, Marketing Management, PHI, New Delhi

REFERENCE BOOKS:

1. Economic Evaluation of Projects in the Electricity Supply Industry, by H. Khatib.
2. Fundamentals of Power System Economics, by Daniel S. Kirschen, Goran Strabac
3. Energy and Power Risk Management by Alexander Eydeland, KrzysztofmWolyniec
4. Power System Economics, by Steven Stoft

5. Market Operations in Electric Power Systems, by M. Shahidehpour, H. Yamin, Zuyi Li.
6. Electricity Economics, by Geoffrey Rothwell, Tomas Gomez
7. Modelling Prices in Competitive Electricity Markets (The Wiley Finance Series), by Derek W. Bunn.
8. A Shock to the System, by Timothy J. Brennan, Karen L. Palmer, Raymond J. Kopp, Alan J. Krupnick, Vito Stagliano, Dallas Burtraw.
9. Power pricing by Dolan & Siman, The free Press,1996
10. Customer Choice: Purchasing Energy In A Deregulated Market: by Albert Thumann
11. Indiaôs Power Sector Reforms Update, Paryas, Pune

8EE 04/8EL04/8EP04 PROFESSIONAL ELECTIVE - II
(4) GENERALISED MACHINE THEORY

SECTION-A

Unit I : Elements of Generalized Theory: essentials of rotating machines, conventions, basic two pole machines, transformer with movable secondary transformer and speed voltage in armature, kions, primitive machine, leakage fluge, voltage and torque equations.

Unit II : Linear transformations in machines: invariance of power transformation from displaced brush axis, three-phase to two-phase transformation power invariance, transformation from rotating axes to stationary axes, impedance matrix, application of generalized theory, electrical torque, limitations of generalized theory.

Unit III: D.C.Machines: separately excited DC generators and motors formulation of mathematical model, steady state and transient analysis, Ward-Leonard system of speed control.
Steady state analysis of DC series, shunt and compound machine and their characteristics cross-field machines, metadyne transformer, metadyne generator.

SECTION-B

Unit IV: Poly-phase synchronous machine, three phase synchronous machine, steady state and transient analysis, phasor equations and phasor diagram, power angle characteristics, DWR synchronous machine generalized mathematical model, steady state analysis, phasor diagram.

Unit V: Induction Machine: Transformations, electrical performance, equation, steady state analysis, equivalent circuit, torque-slip characteristics.High torque cage motors- deep bar rotor and

double cage rotor induction motors, steady stateanalysis, comparison between single cage and double cage motors.

Unit VI: Generalized theory of single-phase series motor, repulsion motor and scharge motor and steady state analysis.

TEXT BOOKS :

1. M.B.Say: Introduction to Unified Theory of Electrical Machine, ELBS.
2. SEELY: Electromechanical Energy Conversion

8EE 05/8EL05/8EP05 PROJECT & SEMINAR

8EE 06 DIGITAL SIGNAL PROCESSING LAB

Any TEN experiments based on contents of 8EP03 DIGITAL SIGNAL PROCESSING

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ARCHITECTURE
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER : SEVENTH

07AR01 ADVANCE CONSTRUCTION - I

Objective : The course will enable the learning in progression , starting from simple building elements, components, materials and construction techniques to develop strong sense of visualization.

Unit I: Analysis of different type of foundation as per load bearing capacity of soils, types of soil and building loading conditions. Caisson foundation its types and purposes. Combined foundation its purposes types.

Unit II: Earthquake resistant structure.

a) Introduction of earthquake, types of earthquake, origin and causes of earthquake.

b) Failure mechanism of structures due to earthquake. Analysis of earthquake affected load bearing masonary and framed structures

Unit III: a) Remedial measures in terms of planning , designing , materials and techniques for earthquake resistant structure.

b) Retrofitting of earthquake affected buildings.

Unit IV: a) General study of standardisation of building elements its uses for various construction.

b) Study of Modular co-ordination and its multipurpose functional application.

Unit V: Concept of curtain wall and structural glazing material and construction techniques, fixing details of various metal casements.

Unit VI: Architectural glass system.

Sessional work: Assignments, test, site visit and drawing on the above topics.

REFERENCE BOOKS:

1. S.C. Rangwala, Engineering Materials, Charotar Publishing House, Anand,1997
2. HUDCO - All you want to know about soil stabilized mud blocks, HUDCO Pub, New, Delhi, 1989.
3. W.B. Mckay Building Constrution, vol. 1,2,3, Longmans, U.K.1981.
4. Don A Watson, Construction Materials and Processes, McGraw Hill Co.,1972.

5. R. Chudley, Construction technology, Richard Clay (Chaucer Press) Ltd.,Suffolk,1978.
6. J.H.callender,Time saver standard for Architectural Design Data, McGraw-Hill,1994.

07AR02 ENVIRONMENTAL SERVICES – I

Objective: To impart knowledge of various aspects of city level water supply systems, drainage and solid waste disposal.

Unit I: Sources of water supply their types, water collection, water treatment, distribution of water from various sources.

Unit II: Rain water disposal and roof drain and rain water harvesting system.

Unit III: Water pollution and preventive measures.

Unit IV: Sewage treatment plant and its locational factor..

Unit V: Garbage disposal and recycling methods. Concept of recycling of solid and liquid waste in building. Vermicomposition, Biogas production.

Unit VI: Sewage disposal systems in unsewered location viz. septic tank, soak pit, acqua privy.

Sessional work: Assignments, test, site visit and drawings on the above topics.

REFERENCE BOOKS:

1. Manual of Water supply and treatment , second edition, CPHEEO, Ministry of Works and housing, New Delhi, 1977.
2. Manual of Sewerage and sewage treatment, CPHEEO Ministry of Works and housing, New Delhi, 1980.
3. S.C.Rangwala, water supply and sanitary Engineering,Charotar publishing House , Anand 1989.
4. Bureau of Indian Standards.
5. Pachauri, A.K., ñWater Supply and Sanitary Installations, Design, Construction and Maintenanceò, New Age International Ltd.
6. Manas Handbook of Plumbing, Manas Publishers

07AR03 PROFESSIONAL PRACTICE

Objective: The objective of the course is to expose the students to the present trends of architectural practice and valuation.

Unit I: Role of professional bodies such as The Indian Institute of Architects, working, byelaws, categories of membership, election procedure and code of conduct; The Architects Act of 1972 and the Council of Architecture.

Unit II: Professional responsibilities of the architect, copyrights, scale of charges, variation of charges, mode of payment, termination of services, specialized building services.

Unit III: Techniques of valuation, elements of valuation and factors affecting valuation. Methods, valuation of landed and building property, comparable cost of sale, purchase and mortgage.

Unit IV: Valuation for compensation on acquisition, compensation under central and state legislation, relevance of the Town Planning Act.

Unit V: Valuation for renewal or lease/extension of lease, standard rent, easement rights, dilapidation, insurance, estate development and advice on investment policy.

Unit VI: Arbitration, arbitrators, umpire and nature of arbitration.
Sessional work: Assignments, test, site visit and drawings on the above topics.

REFERENCE BOOKS:

1. Rangwala, S C , ñValuation of Real Propertiesò, Charotar Book Stall.
2. Piotrowski, A. and Williams, Julia, ñThe Discipline of Architectureò, University of Minnesota Press. 3. Eldred, G.W., ñThe Beginners Guide to Real Estate Investingò, John Wiley & Sons
4. Publications of COA, IIA Hand Book on Professional Practice, The Architects publishing Corporation of India, and Bombay 1987.

07AR04 : URBAN PLANNING

Objective: The objective of the course to develop the understanding of urban planning process through surveys, analysis, alternative planning strategies and urban planning issue.

Unit I: Need and study of Urban planning interrelationship between urban planning, urban design, urban landscape design and Architecture planning as a team work and role of urban planner in planning team. Hierarchical levels of planning.

Unit II: Planning during Medieval and renaissance period in western and Indian context.

Unit III: Evolution of modern planning concepts. Impact of industrial revolution on planning process. Planning theories developed by Patric Geddis, Ebenzer Howard, Lewis Mumford, C. L. Doxiadis, Patric Abercrombie.

Unit IV: Introduction to TPS, master plans, structure plan, regional plans, land use planning , Neighbourhood Planning, zoning.

Unit V: Recent trends in urban planning, New towns development, SEZ, JNNURM, Green cities, ISHDP, Urban renewal process.

Unit VI: National habitat and housing policy. Slum improvement scheme, ISHDP, DCR relevant to housing.
Sessional work: Assignments, test, site visit and drawings on the above topics.

REFERENCE BOOKS :

1. Gallion Arthur B & Eisna Simon, The Urban Pattern, City Planning and Housing.
2. C. L. Doxiadis, Ekistics, An introduction to the Science of Human Settlements, Hutchinson, London, 1968
3. John Ratchiffe, An Introduction to Town and Country Planning.
4. Gupta, V., ñEnergy and Habitat: Town Planning and Building Design for Energy Conservationò, Wiley Eastern.
5. Rangwala, S.C., ñTown Planningò, Charotar Publishing House.
6. Eleanor, S.M., ñBritish Town Planning and Urban Design: Principles and Policiesò, Longman.
7. Randall, A., ñCrossroads, Hamlet, Village, Town: Design Characteristics of Traditional Neighbourhoods, Old and Newò, American Planning Association.

07AR05 ARCHITECTURAL STRUCTURE-VI

Objective: Understanding of Basic Theory and principles of structural analysis and structural properties of elements.

Unit I : Design and detailing of simple G + 1 structure.

Unit II: Walls and chimneys subjected to kind pressure.

Unit III: Introduction to flat slabs, combined and eccentric footings selection criteria for above structures. (only Theory no Design)

Unit IV: Failure of structured
- a. Types of failure in various structure.
- b. Causes of failure.
- c. Evaluation of damage
- d. Non destructive testing techniques .
- e. Techniques to prevent collapse failure of structures.
- f. Repaired and rehabilitation of structures.

Unit V: Simple welded and riveted connection (without moments) only axial loads .

Unit VI: Design of simple tension and compression member of trusses.

Sessional work:

Visit to construction sites to study R.C.C. Structures and steel fabrication work and preparing report.

REFERENCE BOOKS:

1. P.C.Punmia, Strength of Materials and Theory of Structures; vol I, Laxmi Publications, Delhi 1994.
2. S.Ramanmurtham, Strength of Materials ï Dhanpatrai & Sons, Delhi 1990
3. W.A.Nash, Strength of Materials ï Schaums Series ï McGraw Hill Book Company, 1989
4. R.K.Bansal ï engineering Mechanics and Strength of Materials ï Lakshmi Publications, Delhi, 1990

07AR06 ARCHITECTURAL DESIGN STUDIO - VII

Objective: To enable the student to design the large scale housing and housing project in an urban environment with emphasis on advanced building services and systems, urban development regulations, building byelaws.

BASIC CONTENTS:

1) Introduction to the designing of multifunctional community housing project on an appropriate scale.
2) Importance of case studies, data collection, area analysis, evolution of plan forms, climatic oriented planning and design features, space utilization, building & site services, site analysis and site planning ,etc; in the Architectural design process.
3) Importance of culture, tradition, topography, climate and building bye laws in generating built form.
4) Planning and designing of large scale housing and building projects in an urban environment, advance building services, energy conservations, cost effective techniques and materials, building bye laws, housing schemes etc.
5) Architectural study tour relevant to design project.

Sessional work: One major design project and one time project with other task and assignments.

Viva Voce by external examiner at the end of Semester.

Suggested text books:

1. Ching, F.D.R.: Form, Space and Order, Van Nostrand Rheinhold, New York (1979).
2. Parmar V.S.: Design Fundamentals in Architecture, Somoiya Publications, Bombay (1973)

3. Scott: Design Fundamentals ,Edward d Mills- Planning the Architects Hand Book ï Bitterworth, London, 1985.
4. Watson,D (editor) Time ï saver standards for Architectural Design: Technical data for professional practice, McGraw-Hill, 2005.
5. Neufert,P; Architects Data; Blackwell Science, 2000.
6. Agkathidis, A, Hudert, M and Schiling, G., ñForm defining strategis: experimental architectural designò. Wasmuth, 2007.

07AR07 ADVANCE CONSTRUCTION STUDIO - I

Sessional work;

Assignments and drawing on the above topics given in the subject 07AR01 Advance construction ï I.

Viva Voce by external examiner at the end of Semester.

07AR08 URBAN PLANNING STUDIO

Sessional work;

Assignments and drawing on the above topics given in the subject 07AR04 Urban Planning.

Viva Voce by external examiner at the end of Semester.

SEMESTER: EIGHTH

08AR01 ARCHITECTURAL DESIGN - VIII

Objective : To expose students for designing of large scale urban design projects with emphasis on modern material, techniques , architectural styles advanced services, sustainable architecture, green architecture, climate responsive architecture etc.

Basic contents:

1) Introduction to urban design project planning and design consideration.
2) Importance of case studies, data collection, area analysis, evolution of plan forms, climatic oriented planning and design features, space utilization, building & site services, site analysis and site planning ,etc; in the Architectural design process.
3) Importance of culture, tradition, topography, climate and building bye laws in generating built form.
4) Major design project may include high rise/tall buildings viz. apartment and commercial mixed used complexes, five star Hotel, multifunctional complex, community centers, super specialty hospital, institutions etc.
5) Architectural study tour relevant to design project.

Sessional work:

One major design project and one time project with other task and assignments.

SUGGESTED TEXT BOOKS:

1. Ching, F.D.R.: Form, Space and Order, Van Nostrand Rheinhold, New York (1979).
2. Parmar V.S.: Design Fundamentals in Architecture, Somoiya Publications, Bombay (1973)
3. Scott: Design Fundamentals Edward d Mills- Planning the Architects Hand Book ï Bitterworth, London, 1985.
4. Watson,D (editor) Time ï saver standards for Architectural Design: Technical data for professional practice, McGraw-Hill, 2005.
5. Neufert,P; Architects Data; Blackwell Science, 2000.
6. Agkathidis, A, Hudert, M and Schiling, G., ñForm defining strategis: experimental architectural designò. Wasmuth, 2007.

08AR02 ADVANCE CONSTRUCTION - II

Objective: The course will enable the learning in progression , starting from simple building elements, components, materials and construction techniques to develop strong sense of visualization.

Unit I: General introduction to large span structures and high rise structures, planning features and its construction aspects. Chronological development of large span structural framework such as lamella, laminated portal frame , R.C.C. & steel portal frames.

Unit II: A) R.C.C. and steel space frame structures. B) Study of shell structures and its construction techniques from historical perspective. C) Shell structures such as Geodesic Schwedeler and Gitter Kuppel and its construction aspect.

Unit III: Constructions aspect consider in temporary structures which are in portable nature for various short terms events. Use of modular techniques and materials.

Unit IV: Ferrow cement techniques and its appropriate various uses for building construction elements.

Unit V: Introduction to prestressed concrete, principle and method of prestressing, advantages and disadvantages.

Unit VI: Types of elevators ï Electric, hydraulic, passenger, hospital, capsule, freight etc., details of lift shaft and other mechanism

escalators and conveyors. Parallel and criss cross escalators, horizontal belt conveyors , horizontal moving walkwayôs.

Sessional work:

Assignments, test, site visit and drawing on the above topics.

REFERENCE BOOKS:

1. S.C. Rangwala, Engineering Materials, Charotar Publishing House, Anand,1997
2. HUDCO - All you want to know about soil stabilized mud blocks, HUDCO Pub, New, Delhi, 1989.
3. W.B. Mckay Building Constrution, vol. 1,2,3, Longmans, U.K.1981.
4. Don A Watson, Construction Materials and Processes, McGraw Hill Co.,1972.
5. R. Chudley, Construction technology, Richard Clay (Chaucer Press) Ltd.,Suffolk,1978.
6. J.H.callender,Time saver standard for Architectural Design Data, McGraw-Hill,1994.

08AR03 ENVIRONMENTAL SERVICES – II

Objective: To expose the students specialized services in buildings.

Unit I: Natural and artificial ventilation system in buildings. Air conditioning methods equipments and ducting.

Unit II: Refuse disposal system in high-rise buildings, viz. ï refuse chute, purpose of service floor and other services.

Unit III: Lift , escalator, different type and use their lay out , lighting conductors, building automation system.

Unit IV: Energy construction, low energy systems, hybrid systems, integration and P. V. and wind system in the building, wind , solar and other non-conventional energy systems, solar thermal application for heating and cooling, electricity generation in building.

Unit V: Fire safety ï general provisions. Causes of fire in buildings, Fire protection standards ï safety regulation ï NBC ï planning consideration in building like non- combustible material, construction , stair cases and lift lobbies , fire escapes and A.C. system. Special features required for physically handicraft and elderly in building types.

Unit VI: Fire detectors and fighting installation. Type of detectors and usage. Alarm system, Fire fighting pumps , fire tank , dry and wet risers, automatic sprinkler, fire drill , refuge areas.

Sessional work:

Assignments, test, site visit and drawings on the above topics.

REFERENCE BOOKS:

1. Manual of Water supply and treatment , second edition, CPHEEO, Ministry of Works and housing, New Delhi, 1977.
2. Manual of Sewerage and sewage treatment, CPHEEO Ministry of Works and housing, New Delhi, 1980.
3. S.C.Rangwala, water supply and sanitary Engineering,Charotar publishing House , Anand 1989.
4. Bureau of Indian Standards.
5. Pachauri, A.K., ñWater Supply and Sanitary Installations, Design, Construction and Maintenanceò, New Age International Ltd.
6. Manas Handbook of Plumbing, Manas Publishers

08AR04 SUSTAINABLE ARCHITECTURE

Objective: To sensitize students about the importance and need for Sustainable Planning concept and appropriate Architectural design concept as an emerging thrust area.

UNIT-I: Introduction : Planning concept ï Environmental Impact Analysis ï Ecological foot prints ï Essential ingredients of sustainable development apart from social and economical ï environment , stake holder, participation , institutional mechanism.

UNIT-II: Development in Historical Context - Early settlement pattern ï Climate Responsive Planned Layouts ï orientation of Streets and Buildings, Creation of Habitable Environment , Early Planning Methods.

UNIT-III: Resource Efficiency ï Land , Water, Energy, Human Resource, Biodiversity ï Suitable practices at settlement, Campus and Building Level.

UNIT-IV: Sustainable Architecture ï Appropriate materials and construction ï review of their properties workability, Eco Friendly construction practices ï sustainable campuses and case studies..

UNIT-V: Sustainable Planning and Policies ï Awareness programme at National, International levels Rio de Jenero agenda ï Earth summits ï agenda involved ï their realization.

Sessional work: Assignments and test on the above topics.

REFERENCE BOOKS:

1. O.H.keonigsberger; T.G. Ingersoll and others; Manual of tropical housing and building- Part-I; Longmans,London-1980
2. M. Evans; Housing, climate and comfort; Architectural press London- 1980
3. B.G.Givoni; Man,climate,and architecture; Applied science, banking, Essex, 1982

4. N.K Bansal and others; Passive building design; Elsevier science-1994.
5. S.Drake; The third skin architecture,technology and environment;UNSWï press-2007.
6. Manik & Girish Komisva, IIPA, keeping Cities Clean and Green, Uppal Publishing House, 1997.
7. Beer, Environment Planning for Site Development.

08AR05 LANDSCAPE DESIGN

Objective: To enable students realize that architectural design could enhance and enrich built environment through a study and understanding of plants and vegetation historical achievements and techniques of application in the overall context of ecology.

UNIT-I: Introduction : Landscape Architecture. Understanding man and nature land and landscape. Relationship of architecture and Landscape Architecture.

UNIT-II: History of the art of garden design of India, China, Persia, Japan, Italy, France and England.

UNIT-III: Garden Design of the modern world.

UNIT-IV: Basic Principles of landscape design and element. Types of landscape elements and its various uses.

UNIT-V: Plant classification and nomenclature, plant identification. Characteristics of various types of plants and their suitability of landscaping, plant selection criteria, planting design and visual aspects of plant form.

UNIT-VI: Methodology and process of site analysis, data collection, compilation , Presentation and analysis techniques. Preparation, interpretation and evolution of landscape plans site planning.

Sessional work:
Assignments, tests, and tutorials on the above topics

REFERENCE BOOKS:

1. Sylvia Crowe Sheila Haywood, The Gardens of Mughal India , Vikas Publishing House, Pvt. Ltd, India, Delhi,1973.
2. Garrett Eckbo, The Art the Home Landscaping, McGraw-hill Book Co., London, 1956.
3. Testsuro Yoshida, Gardens of Japan, Jr. Marcus G. Sims, 1963.
4. Sir Banister Fletcher, A History of Architecture, University of London, The Antholone press, 1986.

5. Percy Brown, Indian Architecture (Islamic period), Taraporevala and Sons, Bombay, 1983tt

6. Satish Grover, The Architecture of India (Buddhist and Hindu Period), Vikas Publishing Housing Pvt. Ltd., New Delhi, 1981

7. Christopher Tadgelli, The History of Architecture in India from the Dawn of Civilization to the end of Raj, Longman group, U.K.Ltd., London, 1990

08AR06 PROFESSIONAL ELECTIVE – I (1) HOUSING

Objective: To sensitize students about the need for , demand and supply of housing in India, to expose the role or function of various housing agencies, the typologies of housing with basic environmental issues.

UNIT-I: Housing Issues ï Indian Context. Housing as Architecture ï basic need ï demand and supply of housing ï Housing Agencies and their role in housing development.

UNIT-II: Social factors influencing housing design, affordability , economic factors and influence of traditional housing and planning features.

UNIT-III: Housing surveys and standards. Sources of Data and information, methods and techniques of housing survey, housing standards etc.

UNIT-IV: Housing Design ï Traditional Patterns ï Row housing and cluster housing ï layout concepts ï use of open spaces ï utilities and common facilities.

UNIT-V: Case studies of housing schemes designed by eminent architects. High Rise Housing.

UNIT-VI: National habitat and housing policy slum improvement scheme, ISHDP, DCR relevant to housing.

Sessional work :
Assignment and case studies of above topics.

TEXT BOOKS :

1. Joseph de chiara and others ï Time Saver Standards for Housing and Residential Development McGraw-Hill Co., New York, 1995

2. Karnataka state Housing Board ï MANE ï Publication - 1980

08AR06 PROFESSIONAL ELECTIVE – I (2) ENVIRONMENTAL PLANNING

Objective: To Provide advanced knowledge on how all issues and concerns of environment can integrate to architectural design process.

UNIT-I: Introduction to the ideas, issues and concepts of sustainable Architecture, Global Environment , Principles of environmentally and ecologically supportive Architecture.

UNIT-II: Early Settlement Patter ï Climate Responsive Planned Layouts ï Orientation of streets and buildings. Creation of Habitable Environment, Early Planning Methods.

UNIT-III: Quality of Urban Environment and Living ï Past , Present and Future Trends role of Urban Design in Urban Environment, Planning for Quality Living in Urban Areas.

UNIT-IV: Conservation of Water, Land, Energy its methods. Environmental impact assessment.

UNIT-V: Solid & Liquid Waste from residential & Commercial Buildings ï Environmental significance ï Segregation and treatment of waste-degradation of environment due to wast .

UNIT-VI: Salient Features of environmental laws ï Rain Water Harvesting Techniques. Biological and Thermal Energy Options ï Biogas Production ï Liquid Waste, Recycling Methods & Practices.

Sessional work :
Assignment and case studies of above topics.

TEXT BOOK :

1. Gosling and Maitland ï Environmental Planning ï St. Martinôs Press, 1984

08AR06 PROFESSIONAL ELECTIVE – I (3) CONSTRUCTION MANAGEMENT

Objective: To establish and develop construction management skills network techniques, construction equipments and methods along with quality control in construction.

UNIT-I: Introduction to project management concepts ï background of management, purpose, goal and objectives. Traditional management system, Ganttôs approaches, load chart, progress chart, bar charts, merits and limitation schedule time estimates units.

UNIT-II: Project management, resources balancing, phasing of activities, programmes, scheduling project control, reviewing, updating and monitoring.

UNIT-III: Introduction to modern management concepts. Introduction to PERT and CPM network concepts, inter relationship , information, data sheets and development of network. CPM for management, CPM network analysis, identification of critical path floats computation result sheets.

UNIT-IV: PERT Network, introduction to the theory of probability and statistics, probabilistic aim estimates for the activities of PERT Network.

UNIT-V: Financial management. Introduction to two dimensional network analysis activity cost information. Cost time relationship, crashed estimates for the activities, project direct cost and indirect cost.

UNIT-VI: Construction quality control and inspection, significance of variability and estimation of risks , construction cost control, crashing of networks.

Sessional work :

Assignment and case studies of above topics.

TEXT BOOKS :

1. Dr. B. C. Punmiya and K. K. Khandelwal ï Project Planning and Control with PERT/CPM Laxmi Publications, New Delhi, 1987.
2. S. P. Mukhopadyay, Project Management for Architects and Civil Engineers, IIt, Kharagpur.
3. Ahuja H. N. ñConstruction Performance Control by Networksò, Wiley Inter science Publication.
4. Peurifoy, R. I. ñConstruction Planning Equipments and Methodsò McGraw Hill Book Co. Inc.
5. Srivastva, U. K. ñConstruction Planning Managementò Galgotia Publisher.

08AR07 ARCHITECTURAL DESIGN STUDIO - VIII

Sessional work:

Assignments and drawing on the above topics given in the subject 08AR01 Architectural Design Studio ï VIII.

Viva Voce by external examiner at the end of Semester.

08AR08 ADVANCE CONSTRUCTION STUDIO - II

Sessional work:

Assignments and drawing on the above topics given in the subject 08AR08 Advance construction Studio ï II.

Viva Voce by external examiner at the end of Semester.

08AR09 LANDSCAPE DESIGN STUDIO - II

Sessional work:

Assignments and Sketches, Case Studies of contemporary period, Landscape Proposals for Residential, Public , Institutional Buildings on the above topics given in the subject 08AR09 Landscape Design Studio ï II.

Viva Voce by external examiner at the end of Semester.

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SEMESTER : NINTH

09AR01 PRACTICAL TRAINING

Each candidate shall have to prepare a detail report along with necessary drawing, sketches, measurement, record, reading, observations, survey analysis, log sheets and modes, if necessary on the following siz aspects which are concerned with the poetical training. This report shall be submitted for the Viva-Voce examination duly certified by the Principal of the College.

1. Critical appraisal - of any building that he/she-ôor his/her employer has designed and executed. The building shall be used and the students may record the reactions of the users to support his/her appraisal in addition to photographs, drawing etc.

   Marks (Sessional)- 25

2. Site Supervision and Practice-A detail report of any major part of a small building that has been personally supervised by the candidate. It may include checking site measurement preparation of a bill, site instructions and checking of the executed work.

   Marks(Sessional)- 25

3. Field Observation - A report on architectural use of the site conditions. For example, Electric poles, Water tanks, slope of the site etc.

   Marks (Sessional)- 25

4. Log sheet and office certificate - A student shall fill the log sheets as a record of his every day work aid shall submit the same along with the certificate from his/her employer.

   Marks (Sessional)- 25

5. Working drawing and complete estimate of small project - A student shall submit all die working details prepared by him/her during his/heir practical training along with estimate of small project.

   Marks (Sessional)- 100

6. Viva-Voce Each candidate shall be individually interviewed and questioned on any of the sublet mentioned above by a Principal,

Head of Department of Architecture and Two external examiner appointed by the University.

Marks(Viva-Voce)-100
Total Marks - 300
Pass Marks - 150

SEMESTER: TENTH

10AR01 PROFESSIONAL ELECTIVE – II
(1) INDUSTRIAL ARCHITECTURE

Objective: To impart knowledge of planning and design features, materials and techniques useful in industrial structures.

UNIT -I : Meaning of industrial architecture, scope , context. Impact of industrial revolution ï origin in the context of Britain and the United States ï Impact of materials and technology.

UNIT-II : Automation techniques & its impact, circulation and area requirement, influence on design ï Internal & External Environment Control ï Precaution at site.

UNIT-III : Pioneers and Architects role in industrial design. Study of examples of pioneer to include Peter Behrens, Max Berg, Hans Poelzigôs and P. L. Nervi ï impact of expressionism and international style.

UNIT-IV : Responsibilities of architect in innovative corporate image, understanding industrial environments through Indian case studies.

UNIT-V : Zoning principle, Factories Act and Rules (1948) in India ï Role of Pollution Control Boards, organizing principles. Environmental Control & Waste Management.

Sessional work :
Assignments and drawing on the above topics given in the subject 10AR01 Climate Responsive Architecture .

10AR01 PROFESSIONAL ELECTIVE – II
(2) CLIMATE RESPONSIVE ARCHITECTURE

Objective: To sensitize students about the importance and need for Climate Responsive Architecture Design concept.

UNIT-I: Introduction to the ideas, issues and concepts of sustainable Architecture, related to types of climates. Global Environment & Principles of Environmentally and supportive Architecture.

UNIT-II: Non- conventional Energy Systems, Solar Thermal Application for heating and cooling.

UNIT-III: Low Energy design Hybrid Systems, Integration of PV and wind systems in the buildings.

UNIT-IV: Day Light principles , Glare amount of daylight, daylight factor, orientations and sizes of opening to achieve diffused lights.

UNIT-V: Application of Climatic Principles ï Evolution of Plan Form to minimize Heat Gain in Tropical Climates, Orientation of Building with respect to sun , wind, sizes of fenestration & its orientation, Use of evaporative cooling, ground coiling, cavity walls, topography , water bodies, vegetation. Landscape elements, cross ventilation system to achieve natural comfort level in indoor & outdoor spaces.

UNIT-VI: Planning and Design features to be considered with respect to various Climate.

Sessional work :
Assignments and drawing on the above topics given in the subject 10AR01 Climate Responsive Architecture .

10AR01 PROFESSIONAL ELECTIVE – II
(3) VERNACULAR ARCHITECTURE

Objective: To impart knowledge about various manmade and natural forces behind the evolution of traditional architecture.

UNIT -I : Approaches and Concepts to the study of vernacular architecture ï Aesthetics ï Anthropological ï Architectural ï Developmental ï Geographical ï Historical ï Spatial ï Folkloristic.

UNIT-II : Traditional Principles of Planning in Western & Northern India ï Primitive Forms, Symbolism, Colour, Folk Art etc. in the Architecture of the Deserts of Kutch and Gujrat State ï Wooden Houses & Mansions (Havelis) Gujrat & Rajsthan ï House boats (Dhugas) Kashmir ï Material of Construction & Construction details.

UNIT-III: Vernacular Architectural of South India ï Wooden Houses, Palaces & Theatres in Kerala, Palaces in Tamilnadu, Principles of Planning, Proportions, Elements, Beliefs & Culture, Material of construction and construction detail.

UNIT-IV : Western influences on Vernacular Architecture ï Colonial influence on the traditional House, Bangla & Bungalow, House typologies, settlement planning, Pondicherry & Cochin.

UNIT-V: Secular Architecture ï Medieval Period ï Citadels, Palaces, Towers, Gateways, Public Buildings etc. in the medieval towns of Jodhpur, Jaipur, Jaisalmer, Gwalior etc.

Sessional work;

Assignments and drawing on the above topics given in the subject 10AR01 Climate Responsive Architecture .

10AR02 ARCHITECTURAL PROJECT / THESIS

Objective: Develop any chosen architectural design project, emphasis being on integration of all technical, human & aesthetic aspect in the Architectural design solution.

The topic would be selected by students, subject to approval by the department. The topic selected may be a live design project or research oriented but essentially concluding in its application in architectural design project. The work progress evaluation would also be based on intermediate reviews of the study in presence of panel of teachers and experts from professional field.

The Viva-voce would be in the form of final Review on the basis of sessional submission in presence of two External Examiners. The H.O.D. Department of Architecture and studentôs teacher Guide would act as Internal Examiners.

The students would be required to explain and defend their study and design. The submission would consist of proper Presentation of Drawings, Thesis Report and Model.

The candidate shall carry out thesis considering the following aspect ï Research analysis and data collection, site selection & justification, user requirements & justification, climatic conditions, socio-economic problems, communication, Transportation, Landscape & Urban Planning.

10AR03 SEMINAR

Objective: Seminar is intended to evaluated the studentôs ability to explore in the field of architecture and make in depth investigation in the chosen area.

The students are expected to choose topics which are of special interest to them and prepare a Report and Drawings to show analysis of investigation. The Review of work would be done in presence of H.O.D. Department of Architecture, and nominated teacher guide, and other teachers.

The Viva-voce would be in the form of proper presentation of the Drawings, Information/ Data and Report. The Viva-voce would be in

presence of External Examiner. The H.O.D. Department of Architecture, and studentôs teacher Guide would act as internal examiners.

The Seminar topic can be related to any of the following subject ï Architectural theory , history, design determinates, design language , design evaluation, building types, urban planning and design, housing, interior design, landscape design, building technology and environmental sciences, professional practice and any other related field, accepted and approved by the Department.

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
INFORMATION TECHNOLOGY
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER : SEVENTH

7IT 01 DIGITAL SIGNAL PROCESSING

Unit I: Discrete ï Time Signals and Systems: Introduction to DSP, Advantages, basic elements of DSP system, sampling theorem, A/D, D/A conversion, quantization. Elementary discrete-time sequences. Discretetime systems: description, representation, classification (linear, time-invariant, static, casual, stable)

Unit II: Analysis of DTLTI systems: The convolution sum, properties of convolution, Analysis of causal LTI systems, stability of LTI systems, step response of LTI systems, difference equation, recursive & non recursive discrete-time systems, solution of difference equations, Impulse response of LTI recursive system. Correlation of discrete time signals.

Unit III: z- Transform and Analysis of LTI Systems: Definition of z-Transform, properties, rational z-Transforms, evaluation of the inverse z- Transforms, analysis of linear time invariant systems in z-domain, transient and steadystate responses, causality, stability, pole-zero cancellation, the Schur-Cohn stability test

Unit IV: Fourier Transforms, the DFT and FFT: Definition & properties of Fourier transform, relation with ztransform. Finite duration sequences and the discrete Fourier transform(DFT), properties, circular convolution, Fast algorithms for the computation of DFT: radix-2 and radix-4 FFT algorithms

Unit V: Design of Digital Filters: Classification of filters: LP, HP, BP, FIR and IIR filters, filter specifications. Design of FIR filters using Windows and by Frequency sampling methods. Design of IIR filters from Analog filters using approximation of derivatives, Impulse invariant transformation, Bilinear transformation and Matched z-Transformation, Commonly used Analog filters and IIR Filter design example

Unit VI: Realization of Discrete-Time systems: Structures for realization of Discrete-Time systems, realization of FIR systems: Direct Form, Cascade Form, Frequency sampling and Lattice structures. Realization of IIR filters: Direct Form, Signal flow graph and Transposed structures, Cascade form, Lattice and Lattice-ladder. Realization for IIR systems.

TEXT BOOK :

J G Prokis and D G Manolokis, ñDigital Signal Processing: Principles Algorithms and Applications (Pearson Education)

REFERENCE BOOKS:

1. S.Salivahanan, A Vallavaraj,C Gnanapriya ñDigital Signal Processingò (TaTa McGraw Hill)
1. S K Mitra: ñDigital Signal Processing: A Computer-Based Approachò (TaTa McGraw Hill)
2. E C Ifeacthor and B W Jervis ñDigital Signal Processing A Practical Approachò (Pearson Education)
3. A V Oppenheim, R W Schafer with J R Buck ñDiscrete Time Signal Processingò(PHI)

7IT02 OBJECT ORIENTED ANALYSIS AND DESIGN

UNIT-I: Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, Software Development Life Cycle.

UNIT-II: Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams.

UNIT-III: Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages, Instances, Object Diagram

UNIT-IV: Basic Behavioral Modeling-I: Interactions, Use cases, Use case Diagrams, Interaction diagrams, Activity Diagrams.

UNIT-V: Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

UNIT-VI: Architectural Modeling: Component, Deployment, Collaborations, Component diagrams and Deployment diagrams.

TEXT BOOK:

1. Grady Booch, James Rumbaugh, Ivar Jacobson : The Unified Modeling Language User Guide, Pearson Education.

REFERENCE BOOKS:

1. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY-Dreamtech India Pvt. Ltd.
2. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
3. Pascal Roques: Modeling Software Systems Using UML2, WILEY-Dreamtech India Pvt. Ltd.
4. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.

5. Mark Priestley: Practical Object-Oriented Design with UML,TATA McGrawHill
6. Appling UML and Patterns: An introduction to Object ï Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

7IT03 WEB TECHNOLOGY

Unit –I : Web Essentials: The internet, Basic Internet Protocols, The World Wide Web, HTTP Request Massage, HTTP Response Massage, Web Clients, Web Servers, **Markup Languages: XHTML 1.0,** Basics of XHTML, Fundamentals HTML Elements, Relative URLs, Lists, Tables, Frames, Forms, Defining XHTMLôs abstract syntax: XML, Creating HTML Documents.

Unit – II: Style Sheets: Introduction to Cascading Style Sheets, CSS Features, CSS Core Syntax, Style Sheets and HTML, Style Rule Cascading and Inheritance, Text Properties, CSS Box Model, Normal Flow Box Layout, Beyond the Normal Flow

Unit –III: Client-Side Programing: Introduction to Java Script™ Language, JavaScript in Perspective, Basic Syntax, Variables and Data types, Statements, Operators, Literals, Functions, Objects, Arrays, Built-in Objects, JavaScript Debuggers, **Host Objects:** Introduction to the Document object Model, Intrinsic Event Handling, Modifying Element Style, The Document Tree, DOM Event Handling, Accommodation Noncompliant Browsers, Additional Properties of Window

Unit-IV: Server-Side Programming : Java Servlets Servlet Architecture Overview, Servlet Generating Dynamic Content, Servlet Life Cycle, Parameter Data, Sessions, Cookies, URl Rewriting, Other Servlet Capabilities, Data Storage, Servlet and Concurrency,

Unit-V: Representing Web Data: XML Documents and Vocabularies, XML versions and XML Declaration, XML Namespaces, JavaScript And XML:Ajax , Dom-Based XML Processing, Event-Oriented parsing: SAX, Transforming XML Documents, Selecting XML Data : XPath, Template-Based Transformation: XSLT, Displaying XML Documents in Browsers, Introduction to Java Server Pages, JSP and Servlets, Running JSP Applications, Basic JSP, JavaBeans Classes and JSP, Tag Libraries and Files,

Unit-VI: Web Services: Web Service Concepts, Writing a Java Web Service, Writing a Java Web Service Client, Describing Web Services: WSDL, Representing Data Types :XML Schema, Communicating Object Data :SOAP,

TEXT BOOK:

1. Web technologies by Jeffrey C. Jackson (Pearson)

REFERENCE BOOKS:

1. The Web Warrior guide to Web Programming by Xue Bai, Micheal Ekedahl, Don Gosselin (CENGAGE Learning)
2. Internet Protocols by Subrata Goswami (Springer India)
3. Dietel and Dietel: WWW: How to Program, (LPE)
4. Dustin R Callaway: Inside Servlets (LPE)

7 IT 04 REAL TIME & EMBEDDED SYSTEMS

UNIT I: Introduction to embedded systems, Processor in the system, Hardware units required in the exemplary cases, Software embedded into a system. Final Machine implement able software for a product, Software in Processor specific assembly language and high level language, Device drivers device management using an operating systems, Software design for scheduling multiple tasks and devices using RTOS, Embedded SoC and in VLSI circuits.

UNIT II: Structural units of the processor, Allocation of memory to program segment and blocks, memory map of the system, Memory blocks for different data sets and structures, serial communication using I2C, CAN and advanced I/O buses between the networked multiple devices, Device drivers, Virtual Devices, Device drivers for parallel port, serial and timing devices, Context and periods for context switching, deadline and interrupt latency.

UNIT III: Software programming in assembly language and C, Use of data structures, Queues, Stacks, Lists and Trees, Function pointers, Function queues and ISR queues, Queues for implementing protocol for a network, Queuing of functions on interrupts, Use of FIFO queues, Stacks, Lists and Ordered Lists, Embedded programming

UNIT IV: Modeling process, Use of dataflow & control data flow graphs, Programming model for event controlled or response time constraint, Real time programs, Inter process Communication and Synchronization, Multiple processes in an application, Sharing data by multiple tasks, use of finite states machine model & Petri net Model, Process, Tasks, Threads.

UNIT V: Use of Semaphores for a task or for Critical section of code, Mutex & P & V, Priority inversion problems & deadlock situations IPC issues, Use of Semaphore flags or Mutex as resource key, use of message queues, mailboxes, pipes, virtual sockets, RPCs.

UNIT VI: Introduction to RTOS, OS Services, RTOS Services, Schedule management for multiple tasks in Real Time, Handling of interrupt source call, RTOS task scheduling models, Cooperative Round Robin Scheduling using a Circular Queue of ready tasks and using and Ordered list as per precedence constraints, Cycling scheduling in Time Sharing, Preemptive scheduling, Critical section service by preemptive scheduler, fixed Real Time scheduling, Precedence assignment in Scheduling algorithms. Performance metrics, IEEE Standard POSIX 1003.1B, fifteen-pointó strategy for Synchronization, Embedded Linux Kernel.

PRACTICALS : Minimum 12 experiments based on above syllabus.

TEXT BOOK:

1. Rajkamal Embedded Systems, Architecture, Programming & Design, TMH.

REFERENCE BOOKS:

1. Real Time Systems, Jane W. S. Liu, Pearson Education
2. Embedded System Design, A Unified Hardware/Software Introduction, Frank Vahid, Tony Givargis, John Wiley & Sons P Ltd

PROFESSIONAL ELECTIVE - I

7IT05 (1) DISTRIBUTED DATABASE MANAGEMENT SYSTEM

UNIT-I: Introduction to DDBS: Introduction, Promises of DDBs, Problem areas. Overview of Relational DBMS: RDBMS concept, Normalization, Integrity Rules. Review of Computer Networks: Data Communication Concepts, Types of Network, Protocol Standard. (8)

UNIT-II: Distributed DBMS architecture: DBMS standardization, Architectural Models, Distributed DBMS arch. Distributed Database Design: Alternative Design Strategies, Distributed Design issues, Fragmentation, Allocation Semantic Data Control: View Management, Data Security, Semantic Integrity Control. (8)

UNIT-III: Overview of Query Processing: Problem & objectives of Query Processing, Characteristics of Query processors, Layers of Query processing. (9)

UNIT-IV: Distributed Transaction management and Concurrency control: Definition, Properties and types of Transaction. Distributed Concurrency control: Serilizability, Taxonomy, Locking based concurrency control algorithms, Deadlock management. (9)

UNIT-V: Distributed DBMS reliability: Reliability concepts and measures, Failures and Fault tolerance in distributed systems, Failures in DDBMS, Local reliability protocols, dealing with site failures. (8)

UNIT-VI: Distributed Object Database Management Systems: Fundamental, Design and Architectural issues of ODBMS, Current issues: Data Delivery Alternatives, Dataware housing. World wide web, Mobile databases. (8)

TEXT BOOKS :

1. M. Tamer Oizsu and Patrick Valdurlez : Principles of Distributed Database Systems, 2nd ed. (Text Book) Person Education, LPE.
2. Ceri and Palgetti : Distributed Database System-(Reference Book) TMH.

PRFESSIONAL ELECTIVE - I

7IT05 (2) MODELING & SIMULATION

UNIT I: System Models and System Studies

Basic concepts of systems ,System Environment , system modeling ,Types of Models, Principles used in modeling, Corporate models, Types of System Study-analysis, design and postulation of systems.

UNIT II: Basic Concepts and continuous systems

Monte Carlo Method ,Numerical Computation Technique for Continuous Models, & Discrete Models, Distributed log models, Cobweb Models , Analog and hybrid computers CSMP III.

UNIT III: System dynamics, probability concepts and basic principles of discrete simulation Growth and decay models system dynamics diagrams examples. Discrete Probability functions , Continuous Probability functions , Measures of Probability functions , Numerical on evaluation of Continuous Probability functions, Continuous Uniformly Distributed Randam Numbers ,Computer Generation of Random number .

UNIT IV: Simulation of Queueing System and PERT Network

Simulation of Queueing systems: Rudiments of queueing theory, simulation of a single server queue, Simulation of a two-server queue, simulation of more general queues.

Simulation of a PERT Network: Network model of a project, Analysis of an activity network, critical path computation, and uncertainties in activity durations, simulation of an activity network.

UNITV: Simulation of Inventory Control & Forecasting Design and Evaluation of Simulation Experiments

Inventory Control and Forecasting: Elements of inventory theory, More complex inventory models, Simulation example-1, Generation of Poisson and Erlang variates, Simulation example-2, Forecasting and regression analysis.

Design and Evaluation of Simulation Experiments: Length of simulation runs, variance reduction techniques,Experimental layout, validation, summary an conclusions.

UNITVI: Simulation Languages and Introduction to GPSS
Different special purpose languages used for continuous and discrete systems and comparison-factors affecting the selection of discrete system simulation language-comparison of GPSS and SIMSCRIPT. A detailed study of GPSS with examples.

TEXT BOOKS:

1. Groffrey Gordon ñSystem Simulationò, IInd Edition, PHI Pvt. Ltd.,New Delhi-1987.
2. Narsingh Deo, ñSystem Simulation with Digital Computersò PHI Pvt.Ltd., New Delhi.

REFERENCE BOOKS:

1. Shannon R.E., ñSystem Simulation: The Art of Scienceò Prentice Hall, Englewood Cliffs, NY, 1975.
2. Hugh J. Watson, John H. Blackstone, Jr., ñComputer SimulationòIInd Edition, John Wiley & Sons.

PRFESSIONAL ELECTIVE - I

7IT05 (3) ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

Unit-I: **Introduction to Artificial Intelligence:** The AI Problems, The Underlying Assumption, What is an AI Technique; **Problems, Problem Spaces, and Search,** Production Systems, Problem Characteristics , Production System Characteristics, Issues in the Design of Search Programs

Unit-II: **Heuristic Search Techniques:** Generate-and-Test, Hill Climbing, Best-first Search, A* Algorithm, Problem Reduction, AND-OR Graphs, The AO* Algorithm, Constraint Satisfaction, Means-ends Analysis,

Unit–III: **Knowledge Representation Issues:** Representations and Mappings, Approaches to Knowledge Representation, Issues in Knowledge Representation, The Frame Problem, **Predicate Logic:** Representing Simple Facts in Logic,
Representing Instance and *ISA* Relationships, Computable Functions and Predicates, Resolution, Natural Deduction **Representing Knowledge Using Rules,** Procedural Versus Declarative Knowledge, Logic Programming Forward Versus Backward Reasoning , Matching, Control Knowledge.

Unit –IV: **Symbolic Reasoning Under Uncertainty** Introduction to Nonmonotonic Reasoning , Logics for Nonmonotonic Reasoning, Implementation Issues, Augmenting a Problem-solver,

Implementation: Depth-first Search, Implementation: Breadth-first Search, **Statistical Reasoning** Probability and Bayesô Theorem, Certainty Factors and Rule-based Systems, Bayesian Networks, Semantic Nets, Frames.

Unit-V: **Understanding** What is Understanding?, Understanding as Constraint Satisfaction, **Natural Language Processing,** Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Statistical Natural Language Processing, Spell Checking, **Common Sense** Qualitative Physics, Common Sense Ontologies.

Unit-VI: **Expert Systems** Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition, **Fuzzy Logic Systems:** Introduction, Crisp Sets, Fuzzy Sets, Some Fuzzy Terminology, Fuzzy Logic Control, **Genetic Algorithms:** Significance of the Genetic Operators, Termination Parameters, Evolving Neural Networks.

TEXT BOOK:

Artificial Intelligence ï Elaine Rich, Kevin Knight, Nair (Third Edition) [Mc Graw Hill]

REFERENCE BOOKS.:

1. Introduction to Artificial Intelligence and expert system ï Dan W. Patterson
2. Expert System- Peter Jackson (Third Edition)
3. Introduction to Artificial Intelligence ï Rajendra Akerkar

PRFESSIONAL ELECTIVE - I

7IT05 (4) MULTIMEDIA TECHNOLOGIES

UNIT I: Multimedia Authoring and Data Representations: Introduction, Components of Multimedia, Hypermedia and Multimedia, Overview of Multimedia Software Tools, Multimedia Authoring and Tools: Multimedia Authoring, VRML. Graphics and Image Data Representations: Graphics/Image Data Types, 1-Bit Images, 8-Bit Gray-Level, Images, Image Data Types, Popular File, Formats, GIF, JPEG, PNG, TIFF, EXIF, Graphics Animation Files, PS and PDF, Windows WMF, Windows BMP, Macintosh PAINT and PICT, X Windows PPM.

UNIT II: Color in Image and Video: Color Science, Color Models in Images, and Color Models in Video.Fundamental Concepts in Video: Types of Video Signals, Component Video, Composite Video, S-Video, Analog Video, NTSC Video, PAL Video, SECAM Video, Digital Video, Chroma Sub sampling , CCIR Standards for Digital Video, High Definition TV.

UNIT III: Basics of Digital Audio: Digitization of Sound, Digitization, Nyquist Theorem, Signal-to-Noise Ratio (SNR), Signal-to-Quantization-Noise Ratio (SQNR), MIDI: Musical Instrument Digital Interface, Hardware Aspects of MIDI, Structure of MIDI Messages, General MIDI, MIDI-to-WAV Conversion, Quantization and Transmission of Audio, Coding of Audio, Pulse Code Modulation, Differential Coding of Audio, Lossless Predictive Coding, DPCM, DM, ADPCM.

UNIT IV: Multimedia Data Compression: Lossless Compression Algorithms: Basics of Information Theory, Run-Length Coding, Variable-Length Coding (VLC), Dictionary-Based Coding, Arithmetic Coding, Lossless Image Compression. The JPEG Standard.

UNIT V: Basic Video Compression Techniques: Introduction, Video Compression Based on Motion Compensation, Search for Motion Vectors, H.261, Intra-Frame (I-Frame) Coding, Inter-Frame (P-Frame) Predictive Coding, Quantization in H.261, H.261 Encoder and Decoder, H.261 Video Bitstream Syntax, MPEG-1, Motion Compensation in MPEG-1 , Major Differences from H.261

UNIT VI: Basic Audio Compression Techniques: ADPCM, Vocoders, Phase Insensitivity, Channel Vocoder, Formant Vocoder, Linear Predictive Coding, CELP. MPEG Audio Compression: Psychoacoustics, Equal-Loudness Relations, Frequency Masking, Temporal Masking, MPEG Audio, MPEG Layers, MPEG Audio Strategy, MPEG Audio Compression Algorithm, MPEG-2 AAC (Advanced Audio Coding).

TEXT BOOK:

Ze-Nian, Li, Mark S. Drew ñFundamentals of Multimediaò (Pearson Education)

REFERENCE BOOKS :

1. Rajan Parekh ñPrinciples of Multimediaò (Tata McGraw-Hill)
2. S.J.Gibbs & D.C.Tsichritzis ñMultimedia Programmingò, Addison Wesley 1995
3. P.W.Agnew & A.S.Kellerman ñDistributed Multimediaò, , Addison-Wesley 1996
4. C.A.Poynton, ñA Technical Introduction to Digital Videoò Wiley 1996
5. F.Fluckiger, ñUnderstanding Networked Multimediaò, Prentice-Hall 1995

7IT06 DIGITAL SIGNAL PROCESSING - LAB:

Minimum 8 experiments based on the syllabus of 7IT01.

7IT07 WEB TECHNOLOGY - LAB:

Minimum 8 experiments based on the syllabus of 7IT03.

7IT08 REAL TIME EMBEDDED SYSTEMS - LAB:

Minimum 8 experiments based on the syllabus of 7IT04.

7IT08 REAL TIME & EMBEDDED SYSTEMS

UNIT I: Introduction to embedded systems, Processor in the system, Hardware units required in the exemplary cases, Software embedded into a system. Final Machine implement able software for a product, Software in Processor specific assembly language and high level language, Device drivers device management using an operating systems, Software design for scheduling multiple tasks and devices using RTOS, Embedded SoC and in VLSI circuits.

UNIT II: Structural units of the processor, Allocation of memory to program segment and blocks, memory map of the system, Memory blocks for different data sets and structures, serial communication using I2C, CAN and advanced I/O buses between the networked multiple devices, Device drivers, Virtual Devices, Device drivers for parallel port, serial and timing devices, Context and periods for context switching, deadline and interrupt latency.

UNIT III: Software programming in assembly language and C, Use of data structures, Queues, Stacks, Lists and Trees, Function pointers, Function queues and ISR queues, Queues for implementing protocol for a network, Queuing of functions on interrupts, Use of FIFO queues, Stacks, Lists and Ordered Lists, Embedded programming

UNIT IV: Modeling process, Use of dataflow & control data flow graphs, Programming model for event controlled or response time constraint, Real time programs, Inter process Communication and Synchronization, Multiple processes in an application, Sharing data by multiple tasks, use of finite states machine model & Petri net Model, Process, Tasks, Threads.

UNIT V: Use of Semaphores for a task or for Critical section of code, Mutex & P & V, Priority inversion problems & deadlock situations IPC issues, Use of Semaphore flags or Mutex as resource key, use of message queues, mailboxes, pipes, virtual sockets, RPCs.

UNIT VI: Introduction to RTOS, OS Services, RTOS Services, Schedule management for multiple tasks in Real Time, Handling of interrupt source call, RTOS task scheduling models, Cooperative Round Robin Scheduling using a Circular Queue of ready tasks and

using and Ordered list as per precedence constraints, Cycling scheduling in Time Sharing, Preemptive scheduling, Critical section service by preemptive scheduler, fixed Real Time scheduling, Precedence assignment in Scheduling algorithms. Performance metrics, IEEE Standard POSIX 1003.1B, fifteen-pointó strategy for Synchronization, Embedded Linux Kernel.

PRACTICALS : Minimum 12 experiments based on above syllabus.

TEXT BOOK:

1. Rajkamal Embedded Systems, Architecture, Programming & Design, TMH.

REFERENCE BOOKS:

1. Real Time Systems, Jane W. S. Liu, Pearson Education
2. Embedded System Design, A Unified Hardware/Software Introduction, Frank Vahid, Tony Givargis, John Wiley & Sons P Ltd

7IT09 PROJECT AND SEMINAR:

Seminar should be preferably based on the proposed project to be covered in final year. The semester should be conducted in seventh semester and evaluated. Each candidate shall submit a seminar report, deliver the seminar and face the viva-voce. The distribution of internal 50 marks shall be as follows.

1.	Seminar report preparation and submission :-	10 marks
2.	Seminar delivery/ presentation:-	20 marks
3.	Seminar viva-voce:-	10 marks
4.	Attendance in all seminar session:-	10 marks

SEMESTER: EIGHT

8IT01 DIGITAL AND WIRELESS COMMUNICATION

Unit I: Information Theory: Elements of digital communication system, ,Unit of information, Entropy, Rate of information, Joint entropy, Conditional entropy, Mutual information ,Channel Capacity ,Shenonanõs Thorem, Shenonan and Hartely Theorem, coding efficiency, Shananon-Fano coding Theorem.

Unit II: Error controlling and coding: Methods of controlling error, linear block codes, matrix description of linear block codes, error detection and error correction capabilities of linear block codes, single error correcting Hamming codes, Cyclic codes, syndromes calculation, error detection, Introduction to Convolution codes

Unit III: Spread Spectrum Sign**a**l**s**: Model of spread spectrum communication system, direct sequence spread spectrum signals, generation of PN sequences, frequency hopping spread spectrum (slow frequency and high frequency hopping), comparison, basic principles of TDMA, FDMA, CDMA.

Unit IV: Cellular Telephone Concepts: Introduction, mobile telephone service, cellular telephone architecture, frequency reuse, cell splitting, sectoring, segmentation and dualization, cellular system topology, roaming and handoffs.

Unit V : GSM & CDMA Technologies : Introduction to GSM, GSM Network Architecture, Protocol Architecture, GSM Channels, Frame structure for GSM, Authentication & Security in GSM, Introduction to CDMA, Architecture of CDMA System, IS-95 CDMA Forward & Reverse channel, Soft handoff.

Unit VI: Wireless network technology: IEEE 802.11WLAN technology, ETSI HIPERLAN Technology, IEEE 802.15 WPAN Technology, IEEE 802.16 WMAN Technology, Mobile Ad hoc Network (MANETs), Mobile IP and Mobility Management, Mobile TCP, Wireless Sensor Networks, RFID Technology, Security Requirements for Wireless Network

TEXT BOOKS:-

1. K.S.Shanmugam: Digital & Analog Communication Systems, Wiley
2. T.L.Singal Wireless communications Mc Graw Hill.

REFERENCE BOOKS:-.

1. R.P. Singh,S.D. Sapre:Communication System Mc Graw Hill.
2. William Stallings : ñWireless Communication and Networksò, Pearson Education Asia .
3. J.G.Proakis: Digital Communication, Mc Graw Hill.
4. P. Ramakrishna Rao: Digital Communication, Mc Graw Hill.
5. Wayne Tomasi : Advanced Electronics Communication Systems, Pearson.
6. Theodore S. Rappaport, ñWireless Communications- Principles and Practice, Pearson.

8IT02 NETWORK ADMINISTRATION AND SECURITY

UNIT I: Introduction to network security, passive and active attacks, authentication, integrity, access control, The model of internetwork security, internet standards: the internet society and RFC publications (Request for comments.)

UNIT II: Cryptography: Encryption principles and various algorithms, standardization process, key distribution, public key cryptography and message authentication, digital signature.

UNIT III: Network security applications: Kerberos, X.509 directory authentication services, e-mail security PGP (Pretty Good Privacy) operational description. MIME (Multipurpose Internet Mail Extensions), S MIME (Security/Multipurpose internet mail extensions) functionality.

UNIT IV: IP Security: Overview, IP security architecture, Authentication header, Web Security: Web security requirements, secure socket layer SSL, Transport layer security TLS, Secure electronic transactions TES.

UNIT V: Network Management Security: Basic concepts of SNMP, Network management architecture and protocol architectures, proxies, services, SNMPv1 authentication service, access policy and proxy service, SNMPv2 architecture, message processing and user security model, view based access control.

UNIT VI: System Security: Intruders, Intrusion technologies, password protection, password selection strategies, Intrusion detection, viruses and related threats: Nature of viruses, types, micro viruses and various antivirus approaches. Firewall: Characteristics, types of fire walls, Firewall configuration, Trusted systems, data access control, the concept of the trusted systems.

TEXT BOOKS :

Network Security Essentials - William Stallings (Pearson Edu. Asia)

REFERENCE BOOKS :

1. Security for Telecommunication and Network management by Moshe Rozenbit (PHI)
2. Internet Security Protocols - Protecting IP Traffic, by Uyless Black (Pearson Edu. Asia)

8IT03 SOFTWARE ENGINEERING

UNIT I: Evolving role of Software. Software crises & myths. Software engineering. Software process & process models : Linear sequential, prototyping, RAD, Evolutionary Product & Process. Project management concepts : People, Product, Process, Project. WSHH principle, critical practice.

UNIT II: Measures, Metrics & Indicators. Metrics in process & project domains-software measurment, Metrics for software quality, small organization. Software projects Planning : Scope, resources, estimation, decomposition technique, Tools. Software risks : identification, risk projection,refinement & RMMM plan.

UNIT III: Project Scheduling : Concepts. Peoples Efforts. Task set, Task network. Scheduling. EV analysis, Project Plan. Software quality concepts. SQ Assurance, Software reviews, technical reviews, software reliability, ISO 900 L, SQA Plan. SCM process. Version control. SCM standard.

UNIT IV: System engineering : Hierarchy, Business Process & Product engineering : Overviews. Requirement engineering, System

modeling. Requirement analysis. Analysis principles. Software prototyping. Specification. Design Process. Design Principles & Concepts. Effective modular design. Design model & documentation.

UNIT V: Software architecture, Data Design, Architectural styles, Requirement mapping. Transform & Transaction mappings. User-interface design : Golden Rule. UTD, Task analysis & modeling, ID activities, Tools, design evaluation. Component level design : Structure programming, Comparison of design notation.

UNIT VI: Software testing fundamentals ; test case design, Whitebox testing. Basis path, control structure-, Blackbox-Testing, & for specialized environments. Strategic approach to S/W testing. Unit testing, integration testing, validation testing, system testing. Debugging. Technical metrics for software.

TEXT BOOK :

Pressman Roger. S. : Software Engineering, A Practitioner's Approach TMH.

REFERENCE BOOKS :

1. Somerville : Software Engineering (Addison-Wesley) (5/e)
2. Fairly R. : Software Engineering (McGraw Hill)
3. Davis A. : Principles of Software Development (McGraw Hill)
4. Shooman, M.L. : Software Engineering (McGraw-Hill)

8IT04 PROFESSIONAL ELECTIVE - II

(1) DATA WAREHOUSING AND DATA MINING

UNIT I: Introduction, Data mining, Data mining functions, classification and major issues. Data Preprocessing : Data cleaning, data integration and transformation, data reduction, discretisation & concept hierarchy generation. (10 hours)

UNIT II: Data mining primitives : Data mining primitives, data mining query language. Concept description : concept description, data generalization, Analytical characterization, mining class comparison. (8)

UNIT III: Application and trends in data mining : data mining applications, data mining systems and research prototypes, additional themes on data mining, trends in data mining (8)

UNIT IV: Data ware house and OLAP Technology for data mining : What is data ware house, multidimensional data model, data ware house architecture, data ware house implementation. (8)

UNIT V: Data Stagiing : overview, plan effectively, dimension table staging, fact table loads and ware house operations, data quality and cleansing, miscellaneous issues. (8)

UNIT VI: Building end user applications : role of end user application, application specification, end user application development, maintaining and growing data ware house : manage the exisiting data ware house environment, prepare for growth and evaluation. (8)

TEXT BOOKS :

1. J. Han and M.Kamber : Data Mining Concepts and Techniques, Elsevier Pub. Indian Reprint, 2004.
2. R. Kimball : The Data Ware House Life Cycle Tool Kit, Wiley Press,John Wiley and Sons (ASIA) Pvt. Ltd.

REFERENCE BOOKS :

1. Berson : Data Ware Housing, Data Mining and OLAP, Tata McGraw Hill.
2. Arun K. Pujari : Data Mining Techniques, University Press (Orient Longman)

8IT04 PROFESSIONAL ELECTIVE - II
(2) WEB COMMERCE

UNIT-I: Basic web commerce concepts, electronic commerce environments,electronic marketplace technologies , commerce modes:overview, EDI, electronic commerce with www-internet,commerce net advocacy.

UNIT-II: Approach to safe E-commerce: overview , secure transport protocol and transaction, SEPP, SET, certificate for authentication, security on web server and enterprise network.

UNIT-III: Electronic cash and Electronic payment scheme:Internet monetary payment and security requirements; Payment & purchase order process, Online Electronic cash.

UNIT-IV: Internet/Intranet Security issues and solutions: Needs for computer security, security strategies, Encryption. MasterCard/ visa secure Electronic Transaction: Introduction requirements and concepts, payment processing.

UNIT-V: Secure E-mail Technologies:Introduction, means of distribution, models for message handling, How does Email work? MIME, S/ MIME, moss comparisons of security methods, MIME and Related facilities for EDI over the internet

UNIT-VI: Internet & web site Establishment:Internet Resources for commerce: introduction, Web server Technologies, internet tools Relevant to commerce, internet applications for commerce, internet Access and Architecture,Internet searching.

TEXT BOOK :

Daniel Minoli & Emma Minoli : Web Commerce Technology Hand Book

REFERENCE BOOKS :

1. David Whiteley : E Commerce (TMH)
2. Kalakota Whinston ï frontiers of e Commerce (Pearson education)

8IT04 PROFESSIONAL ELECTIVE - II
(3) CLOUD COMPUTING

UNIT I: **Introduction:** Cloud Computing Defined, the SPI Framework for Cloud Computing: Relevant Technologies in Cloud Computing, the Cloud Services Delivery Model, Cloud Deployment Models, Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Barriers to Cloud Computing Adoption in the Enterprise.

UNIT II: **Infrastructure Security:** The Network Level: Ensuring Data Confidentiality and Integrity, Ensuring Proper Access Control, The Host Level: SaaS and PaaS Host Security, IaaS Host Security, Virtual Server Security, The Application Level: SaaS Application Security, PaaS Application Security, IaaS Application Security, **Data Security and Storage:** Provider Data and Its Security.

UNIT III: **Identity and Access Management:** Need of IAM , IAM challenge and definition, IAM Architecture and Practice, **Security Management in the Cloud:** Security Management in the Cloud, Availability Management, SaaS, PaaS, IaaS Availability Management, Access control.

UNIT IV: **Privacy:** Key Privacy Concerns in the Cloud?, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, International Laws and Regulations.

UNIT V: **Audit and Compliance:** Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Illustrative Control Objectives for Cloud Computing, Incremental CSP-Specific Control Objectives, Additional Key Management Control Objectives, Control Considerations for CSP Users, Regulatory/External Compliance.

UNIT VI: **The Impact of Cloud Computing on the Role of Corporate IT**: Why Cloud Computing Will Be Popular with Business Units, Potential Threats of Using CSPs, A Case Study Illustrating Potential Changes in the IT Profession Caused by Cloud Computing, Governance Factors to Consider When Using Cloud Computing.

TEXT BOOK:

1. Tim Mather, Subra Kumaraswamy, and Shahed Latif, Cloud Security and Privacy, OõReilly.

REFERENCES:

1. George Reese, Cloud Application Architectures, OõReilly.
2. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing

8IT04 PROFESSIONAL ELECTIVE - II
(4) NEURAL NETWORK AND FUZZY LOGIC

UNIT-I: **Fundamental of Neural Network:** Basic concepts of Neural Network, Human Brain, Model of artificial neurons, Neural Network architecture, Characteristics of Neural Network, Learning methods, Taxonomy of Neural Network architecture, Early Neural Network architecture. (08 Hrs)

UNIT II: **Backpropogation Networks:** Architecture of a Back propagation Network, The Perceptron Model, The solution, Single Layer Artificial Neural Network, Model for Multiayer Perceptron, Back propagation learning, Input Layer, Hidden Layer and Output Layer Computation, Calculation of error, Training of Neural Network, Method of Seepest Descent, Effect of Learning rate, Adding a momentum Term, Backpropogation Algorithm. (08Hrs)

UNIT III: **Associative Memory:-** Autocorrelation, Hetro-correlation, Multiple training encoding strategy, Exponential BAM, Associate memory for Real coded pattern pairs, Character recognition application, (08 Hrs)

UNIT IV: **Adaptive Resonance Theory:-** Cluster structure, Vector quantization, classical ART network, simplifier ART architecture, ART1: architecture, special features and algorithm, ART2: architecture, special features and algorithm, character recognition using ART1. (08 Hrs)

UNIT-V: **Fuzzy Set Theory:** Fuzzy verses Crisp, Crisp sets, Operations and Properties of Crisp Sets, Partition and Covering, Fuzzy sets, Membership Function, Basic Fuzzy Set Operation, Properties of Fuzzy Sets, Crisp Relations, Cartesian product, other relations, Operations on Relations, Fuzzy Relations, Fuzzy Cartesian Product, Operations on Fuzzy Relations. (08Hrs)

UNIT VI: **Fuzzy Systems:** Crisp logic, Laws of Propositional logic, Inference in Propositional logic, Predicate logic, Interpretations of Predicate Logic Formula, Inference in Predicate Logic, Fuzzy logic, Fuzzy Quantifiers and Inference, Fuzzy rule based system, Defuzzification methods, applications. (08 Hrs)

TEXT BOOK :

S. Rajesekaran, G. A. Vijayalakshmi Pai: ñNeural Network, Fuzzy logic, and Genetic algorithms Synthesis and Applicationsò PHI.

REFERENCE BOOKS:

1. S. Hykin: ñ Neural Networksò Pearson Education.
2. Jang,Sun and Mezutani: ñ Neuro Fuzzy and Soft Computingò .
3. Zurada: ñ Artificial Neural Neworksò.
4. N.P.Pahey: ñArtificial Intelligence and Intelligent Systemsò, Oxford University Press.

8IT05 NETWORK ADMINISTRATION AND SECURITY - LAB:
Minimum 8 experiments based on the syllabus of 8IT02.

8IT06 SOFTWARE ENGINEERING - LAB:
Minimum 8 experiments based on the syllabus of 8IT03.

8IT07 COMPUTER LAB-V (CONTENT MANAGEMENT SYSTEM):
Practicals based on Content Management Systems:
A list of sample practicals can be as under:

1. To Study Content Management System.
2. To Study Different Types of Content Management System.
3. Installation of Content Management System framework.
4. Installation of Different Tool on Content Management System framework.
5. To Study WAMP Server and there installation.
6. To creating & Configuring Menus in Joomla
7. To installing & Configuring Templates in Joomla.
8. To design advance templates & CSS Tricks
9. To Customise XML Templates in Joomla

8IT08 PROJECT AND SEMINAR:
The project shall be evaluated in three phases based on the progress of the project work.
Phase I: - Problem, Definition and Design
Phase II: - Problem Implementation and Testing
Phase III: - Project demonstration & report submission.
Each phase shall be internally evaluated for 25 marks.

The external evaluation of the project shall be based on demonstration of the project and viva-voce

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
BIOMEDICAL ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER : SEVENTH

7 BM01 BIO SIGNAL PROCESSING

UNIT I : Discrete-time Signals and Systems:-
Characterization, classification and time-domain representation of discrete-time signals, Typical sequences and their representation, Classification of sequences, Basic operations on sequences, Discrete-time systems.

UNIT II : The discrete-time Fourier transform (DTFT):-
The discrete Fourier Transform (DFT), Computation of the DFT. Theory of Z-Transform Mathematical derivation of the unilateral z-transform, Properties of the z-transform, the inverse z-transform, The bilateral z-transform, Power series, Region of convergence (ROC) and its impedance.

UNITIII : Neurological Signal Processing:-
The brain and its potentials, The electrophysiological origin of brain waves, The EEG signal and its characteristics, EEG analysis, Linear prediction theory, The autoregressive (AR) method, Recursive estimation of AR parameters, Spectral error measure, Adaptive segmentation, Transient detection and elimination ï the case of epileptic patients, Overall performance.

UNIT IV: Cardiological Signal Processing:-
Basic electrocardiography, ECG data acquisition, ECG lead system, ECG parameters and their estimation, the use of multiscale analysis for parameters estimation of ECG waveforms, Arrhythmia analysis monitoring, Long-term continuous ECG is recording.

UNIT V: ECG Data Reduction Techniques:-
Direct data compression techniques, Direct ECG data compression techniques, Transformation compression technique, other data compression techniques, The PRD index.

UNIT VI: Data compression techniques:-
ECG acquisition and transmission. Data reduction algorithms. Turning point. AZTEC, CORTES and the KL transform.

TEXT BOOKS :-

1. Biomedical Signal Processing, Principles and Techniques by D.C.Reddy, Tata McGraw Hill, 2005.
2. Biomedical signal processing. Vol-I, Time frequency analysis. Cohen A. CRC press.

3. Biomedical signal processing. Akay M. Academic Press.D.C.Reddy,òBiomedical Signal Processing ï Principles and Techniquesò, TMH

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REFERENCE BOOKS :

1. Wills J. Tompkins, ñBiomedical digital signal processingò, PrenticeHall of India Pvt. Ltd.
2. Digital biosignal processing. Weitkunat R, Elsevier.

7 BM02 ARTIFICIAL ORGANS & REHABILITATION ENGINEERING

UNIT I : Introduction to artificial organs: Biomaterials used in artificial organs and prostheses, inflammation, rejection, correction.Rheological properties of blood, blood viscosity variation: effect of shear rate, hematocrit, and temperature and protein contents. Casson equation, flow properties of blood through the blood vessels, problems associated with extracorporeal blood low**:**Substitutive medicine, outlook for organ replacement, design consideration, evaluation process.

UNIT II: Audiometry: air conduction, bone conduction, masking, functional diagram of an audiometer. Hearing aids: different types,receiver amplifiers. Opthalmoscope, retinoscope,I.A.B.P principle and application.
Rehabilitation Engineering: Impairments, disabilities and handicaps, Measurement and assessment. Characterizing engineering concepts in sensory and motor rehabilitation. Engineering concept in communication disorders. Rehabs for locomotion, visual, speech & hearing. Artificial limb and hands.

UNITIII : ARTIFICIAL HEART AND CIRCULATORY ASSIST DEVICES:
Engineering design, Engg design of artificial heart and circulatory assist devices, blood interfacing implants ï introduction, total artificial hearts & ventricular assist devices,vascular prostheses, Non-blood interfacing implants for soft tissues- sutures and allied augmentation devices,percutaneous and skin implants, maxillofacial implants, eye and ear implants.

UNIT IV: CARDIAC VALVE PROSTHESES: Mechanical valves, tissue valves, current types of prostheses, tissue versus mechanical, engineering concerns and hemodynamic assessment of prosthetic heart valves, implications for thrombus deposition, durability, current trends in valve design, vascular grafts-history, synthetic grafts, regional patency, thrombosis, neointimal hyperplasia, graft infections.

UNIT V: ARTIFICIAL KIDNEY: Functions of the kidneys, kidney disease, renal failure, renal transplantation, artificial kidney, dialyzers,

membranes for haemodialysis, haemodialysis machine, peritoneal dialysis equipment-therapy format, fluid and solute removal.

ARTIFICIAL BLOOD: Artificial oxygen carriers, flurocarbons, hemoglobin for oxygen carrying plasma expanders, hemoglobin based artificial blood.

UNITVI: **ARTIFICIAL LUNGS:** liver Gas exchange systems, Cardiopulmonary bypass (heart-lung machine)-principle block diagram and working, artificial lung versus natural lung. Liver functions, hepatic failure, liver support systems, general replacement of functions.

ARTIFICIAL PANCREAS: Structure and functions of pancreas, endocrine pancreas and insulin secretion, diabetes, insulin, insulin therapy, insulin administration systems. Tracheal replacement devices, laryngeal replacement devices, Artificial esophagus Artificial Skin: Vital functions of skin, current treatment of massive skin loss, design principles for permanent skin replacement.

TEXT BOOKS:

1. Biomedical Engineering Handbook-Volume 1, 2nd Edition ï by J.D.Bronzino, CRC
2. Biomedical Engineering Handbook-Volume 2 (2nd Edition) - byJ.D.Bronzino, CRC

REFERECNE BOOKS:

1. Hand book of Biomedical Engineering. Bronzino. Joseph
2. Hand book of Biomedical Instrumentation. R.S.Khandpur
3. Artificial Organs. Erie.D.Blom, Howard.B.Rotham.
4. Biomedical Engineering Principles (Volume ï II). David O. Cooney.,Marcel Dekker Inc.

7BM03 MEDICAL EXPERT SYSTEMS

UNIT–I: General issues and overview of AI, AI Techniques, AL problems, AI Techniques, importance and areas of AI, problem solving state space search-DLF, BFS Production system, problem haracteristics.

Heuristic Search Techniques: Generate and Test, Hill Climbing, Best First Search, Problem reduction, Constraint satisfaction-Cryptarithmetic and problems.

UNIT-II: Knowledge representation & mapping, approaches to knowledge to representation, issues in knowledge representation, Representing simple facts in logic, representing instance and relationships, Resolution and natural deduction Representing knowledge using rules, Procedural v/s Declarative knowledge,

Logic programming, Forward v/s Backward chaining, Matching & control knowledge.

UNIT III: AI programming language: Prolog- objects, relationships, facts, rules and variables, Prolog: Syntax and data structures, representing objects & relationships by using ñtreesò and ñlistsò, use of cut, I/O of characters and structures.

UNIT-IV: Symbolic reasoning under uncertainty: Introduction to monotonic reasoning, Logics for Nonmonotonic reasoning, implementation issues, implementation: DFS & BFS. Architecture of the expert system ï problem selection ï formalization -implementation ï evaluation.

UNIT–V: Slot and filler structures: Semantic nets, frames, conceptual dependency, scripts, CYC Natural languages and NLP, Syntactic processing parsing techniques, semantic analysis case grammar, augmented transition net, discourse & pragmatic processing, translation.

UNIT-VI: Definition and characteristics of Expert System, representing and using domain knowledge, Expert system shells Knowledge Engineering, knowledge acquisition, expert system life cycle & expert system tools, MYCIN & DENDRAL examples of expert system

TEXT BOOKS:

1. Introduction to AI & Expert System ï D. W. Patterson, Prentice hall of India
2. Principles of Artificial Intelligence& Expert Systems Development ï David W.Rolston, Tata McGraw Hill

REFERECNE BOOKS:

1. Artificial Intelligence ï Elaine Rich, McGraw Hill
2. Principles of Artificial Intelligence ï Nils J. Nilsson, Springer Verlag
3. Introduction to Artificial Intelligence ï Charnaik & McDermott, Addison Wesley

7 BM 04 HOSPITAL ENGINEERING & MANAGEMENT

UNIT I: **Classification of hospital & architecture:** General hospital, specialized hospital, primary health care ï their role and functions. Aspects of hospital services ï inpatient, outpatient and mergency. Location and environment of hospital.

UNIT II: **Hierarchy of medical and paramedical staff & their functions and responsibilities:-** Modern Hospital Architecture- space in a

hospital building, design of ward, intensive care units, air conditioning, plumbing & sanitation, gas supply, waste disposal, cleaning, dietary, sterilizing, laundry, storage and operation theatre systems, Radiology, Central labs, Blood banks, OPD, Causality, etc.

UNITIII: Electrical power systems in hospitals: Safety of electrical systems, Protective systems ï interference of patientôs protection grounding. Design of sub stations, breakers, Surge protectors, EMI filters, voltage stabilizers, generator sets and UPS. Uninterrupted power supply for ICU and computerized monitoring units. Specification & estimation for hospital wiring.

UNITIV: Air conditioning & gas supply systems:
Air conditioning and refrigeration systems for small and large areas. Air changes, filtering and sterility. Deodorizations, disinfection, Dehumidification and cryogenic systems. Centralized supply of air, oxygen, nitrous oxide & vacuum -Principle of production of liquid oxygen. Management lifts fire fighting equipments.

UNITV: Hospital engineering & Management:
Definition of biomedical Engineering, clinical engineering & hospital engineering. Importance of BME department ï servicing and maintenance, testing, acceptance &maintenance protocols, Computerized preventive maintenance planning, MROs. Training of men for medical equipments preventive and periodical maintenance procedures. Preparation of estimates, specifications, tender details etc. Importance of ISO 9000 Certificates ï Obtaining ISO certificates in hospitals. Proposed protocols.

UNITVI: Hospital Information system: Role of database in HIS. Need of Networking in HIS. Overview of Networking, topologies and its configuration. Structuring medical records to carry out functions like admissions, discharges, treatment history etc. Computerization in pharmacy & billing. Automated clinical laboratory systems & radiology information system.

REFERENCE BOOKS:

1. Harold E. Smalley, ñHospital Management Engineering ï A guide to the improvement of hospital management systemò, PHI.
2. C. A. Caceras ,òClinical Engineeringò
3. L. C. Redstone ,òHospital and Health Care Facilitiesò Ward ,òAnesthetic Equipmentsò. IS, ñISO Certification detailsò
4. Bhaumick and Bhattachary,ò EHV Substation equipmentsò
5. Alexander Kusko,ò Emergency and Standby Power Systemsò

6. Balagune Swamy ,òReliability Engineeringò
7. Anantha Narayanan ,òBasic Refrigeration and Air Conditioningò

PROFESSIONAL ELECTIVE-I

7 BM 05 (1) TISSUE ENGINEERING

UNIT I : Introduction:
Basic definition, Structural and organization of tissues: Epithelial, connective; vascularity and angiogenesis, basic wound healing, cell migration, current scope of development and use in therapeutic and in-vitro testing.

UNIT II : Cell culture:
Different cell types, progenitor cells and cell differentiations, different kind of matrix, cell-cell interaction. Aspect of cell culture: cell expansion, cell transfer, cell storage and cell characterization, Bioreactors.

UNITIII: Molecular biology aspects:
Cell signaling molecules, growth factors, hormone and growth factor signaling, growth factor delivery in tissue engineering, cell attachment: differential cell adhesion, receptor-ligand binding, and Cell surface markers.

UNIT IV: Scaffold and transplant:
Engineering biomaterials for tissue engineering, Degradable materials (collagen, silk and polylactic acid), porosity, mechanical strength, 3-D architecture and cell incorporation.

UNIT V: Engineering tissues for replacing bone, cartilage, tendons, ligaments, skin and liver. Basic transplant immunology stems cells: introduction, hepatopoiesis.

UNIT VI: Case study and regulatory issues:
Case study of multiple approaches: cell transplantation for liver, musculoskeletal, cardiovascular, neural, visceral tissue engineering. Ethical, FDA and regulatory issues of tissue engineering.

TEXT / REFERENCE BOOKS:

1. Principles of tissue engineering, Robert. P.Lanza, Robert Langer & William L..
2. The Biomedical Engineering ï Handbook, Joseph D. Bronzino,
3. Introduction to Biomedical Engg. , Endarle, Blanchard & Bronzino,Academic
4. Tissue Engineering, B. Palsson, J.A. Hubbell, R.Plonsey & J.D.Bronzino

PROFESSIONAL ELECTIVE-I

7 BM0 5 (2) BIO-INFORMATICS

UNIT I : Introduction to genomics:
Information flow in biology, DNA sequence data, experimental approach to genome sequence data genome information resources.

UNIT II : Functional proteomics:
Protein sequence and structural data, protein information resources and secondary data bases. NBFR-PIR, SWISSPROT

UNITIII : Introduction to Genomic data and Data Organization:
Sequence Data Banks ï Introduction to sequence date banks ï , Signal peptide data bank, Nucleic acid sequence data bank ï GenBank, EMBL nucleotide sequence data bank, and AIDS virus sequence data bank. RRNA data bank, structural data Bank

UNIT IV: Computation genomics:
Internet basics, biological data analysis and application, sequence and data bases, NCBI model, file format, Perl programming, bioperl, introduction and overview of human genomic project.

UNIT V: Sequence alignment and data base search:
Protein primary sequence analysis, DNA sequence analysis, pair wise sequence alignment, FASTA algorithm, BLAST, multiple sequence alignment, DATA base searching using BLAST and FASTA.

UNIT VI: Structural data bases:
Small molecules data bases, protein information resources, protein data bank, genebank, swissport, enterz..

TEXT / REFERENCE BOOKS:

1. Introduction to bioinformatics, Atwood, Pearson education.
2. Introduction to bioinformatics, Arther M.Lesk-OUP
3. Bioinformatics sequences and genome analysis, David W.Mount,2nd. Edn. CBS publishers.
4. Introduction to bioinformatics computer skills, Cynthia Gibas and Per Jambeck, 2001 SPD.

7BM 06 BIOMEDICAL SIGNAL PROCESSING -LAB:-

List of Practicals :

1. Sine wave generation using C.
2. Designing an FIR filter using MATLAB and DSP Kit.
3. Designing an IIR filter using MATLAB and DSP Kit.
4. Fourier analysis of periodic signal.

5. Time frequency domain properties of different windows using MATLAB.
6. Implementation of the Double-Precision Complex FFT for ECG signal.
7. Design of Notch filter for elimination of 50Hz from ECG signal.
8. EMG processing using MATLAB ï Rectification and Signal Averaging.

7BM07 MEDICAL EXPERT SYSTEMS - LAB

Practicals : Minimum eight practicals based on syllabus

7 BM08 HOSPITAL ENGINEERING & MANAGEMENT - LAB

Laboratory Work:-

Minimum 8 Case Study based on syllabus to be conducted in Hospitals

7BM09 PROJECT AND SEMINAR

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SEMESTER- EIGHTH

8 BM01 PROFESSIONAL ETHICS AND VALUES

UNIT I : Science, Technology and Engineering as knowledge and as Social and Professional Activities Effects of Technological Growth: Rapid Technological growth and depletion of resources, Reports of the Club of Rome.

UNIT II : Limits of growth: sustainable development. Energy Crisis: Renewable Energy Resources. Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics. Appropriate Technology Movement of Schumacher; later developments. Technology and developing notions. Problems of Technology transfer, Technology assessment impact analysis. Human Operator in Engineering projects and industries. Problems of man, machine, interaction, Impact of assembly line and automation. Human centered Technology.

UNIT III: Ethics of Profession:
Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies.

UNIT IV: Profession and Human Values:
Values Crisis in contemporary society. Nature of values: Value Spectrum of a good life.

UNIT V: Psychological values: Integrated personality; mental health. Societal values: The modern search for a good society, justice,

democracy,secularism, rule of law, values in Indian Constitution.Aesthetic values: Perception and enjoyment of beauty,simplicity, clarity.

UNIT VI: Moral and ethical values:
Nature of moral judgements; canons of ethics; ethics of virtue;ethics of duty; ethics of responsibility.

Reference Books:

1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994 (2nd Ed)
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall,Englewood Cliffs, New Jersey 1991.
3. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

8BM02 BIO MEDICAL IMAGING SYSTEMS

UNIT I : Digital image fundamentals: Image digitization, sampling and quantization, neighbour of pixels, connectivity, relations, equivalence and transitive closure, distance measures, arithmetic / logic operations, discrete transform, fast Fourier transform,2-D Fourier transform, inverse Fourier transform.

UNIT II : Image enhancement fundamentals: Spatial domain method, frequency domain method, contrast enhancement, histogram processing, image smoothing, image averaging, asking, image sharpening, removing of blur caused by uniform linear motion, enhancement in the frequency domain ï low pass, high pass, mean and band-pass filtering.

UNITIII : Image restoration fundamentals: Degradation model, discrete formulation, algebraic approach to restoration ï unconstrained & constrained.

UNIT IV: Image compression and segmentation fundamentals: Fidelity criteria, image compression models, loss and lossless compression technique.

UNIT V : Image segmentation: point detection, line detection, edge detection, edge linking and boundary detection.

UNIT VI: Algorithms used in medical image processing: Brief of reconstruction techniques ï algebraic, simultaneous iterative and simultaneous algebraic. Reconstruction algorithm for parallel projections, fan beam projection and back projection. Introduction to various approaches of pattern recognition.

Text books:

1. Digital image processing by Gonzalez and Woods, 2nd ed., Pearson
2. Digital image processing and analysis by Chanda & Majumdar, PHI
3. Fundamental of digital image processing by Jain, PHI
4. Pattern recognition by Tou and Gonzalez

PROFESSIONAL ELECTIVE-II
8BM03 (1) BIO-INSPIRED ALGORITHM

Unit I: Introduction to Biologically inspired Algorithms: Artificial neural network , Evolutionary computation , Social systems , Artificial Immune systems.

Unit II: Neural Network Methodologies: A taxonomy of NNs, the multilayer perceptron , training MLP , Practical issues in training MLP , Radial basis function network , Self organizing Maps , Implementation of a SOM

Unit III: Evolutionary Methodologies: Genetic algorithm , canonical GA , Example of GA , Extending the canonical GA , Schema and building blocks , Differential Evolution , DE Algorithm , Genetic programming , More Complex GP architectures , Combining EA and MLP methodologies .

Unit IV: Grammatical Evolution : Biological analogy , Mapping process , mapping example , mutation and crossover in GE , recent development in GE , Search engine, meta ï grammars , ð GE , applications and alternative.

Unit V: Particle Swarm model : PSO algorithm , constriction coefficient Ver , Parameter setting for PSO , Discrete PSO , comparing PSO and the GA , MLP swarm hybrids , grammatical swarm.

Unit VI: Ant colony models: Ant ï foraging models , Ant- foraging algorithm , Ant inspired classification algorithms
Artificial Immune Systems: Overview of natural immune systems , Innate Vs Adaptive Immunity , Component of the Immune systems , Designing artificial Immune algorithm, Negative selection algorithm , Clonal Expansion and selection algorithm.

TEXT BOOKS:

1. Handbook of Bioinspired Algorithms and Applications Stephan Olariu, Hardcover
2. Hanbook of Bioinspired Algorithms and Applications, Stephan Olariu and Albert Zomaya, Chapman and Hall, 2006
3. Biologically inspired algorithms for financial modelling ,Anthony Brabazon, Michael OôNeill

PROFESSIONAL ELECTIVE -II

8BM03 (2) BIOFLUIDS & DYNAMICS

UNIT I : Fluids and non-fluids, continuum coordinate systems, force and moments, stress at a point, rate of strain, properties of fluids, classification of fluids.

UNIT II: Different types of fluid flows, laminar and turbulent flow, transition from laminar to turbulent flow, laminar flow-annulus, laminar flow between parallel plates, measurement of viscosity.

UNIT III: Development of boundary layer, estimates of boundary layer thickness, boundary layer equation, nature of turbulence, smooth and rough surface, boundary layer separation.

UNIT IV: Friction loss in flow in a tube, velocity distribution of aortic system, waveform of pressure and velocity in aorta,

UNIT V: Wave reflections and impedance in arterial segments, blood flow in veins and blood flow in capillaries.

UNITVI: Control theory and system analysis, mechanical analysis of circulatory systems, basic concept of myocardial mechanics, index of contractibility, fluid dynamics of aortic and mitral valves.

TEXT BOOKS :

1. K.L.Kumar, ñEngineering fluid mechanicsò, Eurasia Publishing House (P) Ltd., New Delhi, 1998. (UNITS I, II & III)
2. D.H.Bergel, ñCardiovascular fluid dynamicsò- Vol. I, Academic press, London & New York, 1972. (UNITS IV, V)

8 BM 04 BIO MEDICAL EMBEDDED SYSTEMS DESIGN

UNIT I : MCS 51 Microcontroller family

Introduction to MCS family, Comparison of microprocessor and microcontroller, Features, Architecture, functional pin description, SFRs, various resources of MCS-51 Hardware Review: Study of Port structure, Interrupt structure, Timer/ Counter, Serial port.

UNIT II : 8051 Assembly Language Programming

Addressing modes, Instruction set, Assembly Language Programming, CPU timings, 8051A as a Boolean Processor,Power Saving Options, 8051 I/O expansion using 8255, Typical MCS51 based system, Multiprocessor Communication in MCS-51, interfacing problems

UNITIII : Embedded Systems:

Basic concepts, requirements, categories, design challenges Embedded operating system ï Types , Hardware architecture,

Software architecture, application software, communication software, process of generating executable image,development/ testing tools

UNIT IV: Embedded System Development

The development process, requirements engineering, design, implementation, integration and testing, packaging, configuration management, management of development projects

UNIT V : The execution environment

Memory organization, system space, code space, data space, unpopulated memory space, i/o space, system start up,interrupt response cycle, Functions Calls & Stack Frames,run time environment.

UNIT VI: Architecture of Kernel, Tasks and Task Scheduler – Task States, Content Switching, Scheduling Algorithms, Rate Monotonic Analysis, Task management Function Calls. Interrupt Service Routines, Semaphores, mutex, mailboxes,message queues, event registers, pipes, signals, timers,memory management, Priority Inversion Problem Design methodologies and design flows, case studies- fetal heart rate monitor, versatile drop foot stimulator, myoelectric arm, telemonitoring system

TEXT BOOKS:

1. The 8051 microcontrollers-Kenneth J Ayala
2. Rajkamal, Embedded systems-architecture, programming and design,Tata McGraw Hill
3. Frank Vahid,Toney Givargi-Embedded System Design: A unified Hardware /Software Introduction John Wiley publication
4. David E. Simon -An Embedded Software Primer Pearson Education

REFERENCE BOOKS:

1. Muhammad A Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education
2. Sriram Iyer and Pankaj Gupta, Embedded Real-time systems programming, Tata McGraw Hill
3. Embedded Microcomputer Systems- Real time Interfacing ï Valvano
4. Arnold S. Berger, *An introduction to Processes, Tools and Techniques*, CMP books, 2005.
5. Dr.K.V.K.K.Prasad, *Embedded Real time Systems*, Dreamtech Press,2003.
6. Wayne wolf , ñComputers as Components: Principles of Embedded Computer systems designò, Morgan Kaufmann Publishers,2000

8BM 05 BIO MEDICAL IMAGING SYSTEMS - LAB

[Students are required to perform at least Eight experiments]

1. Maximum distance algorithm
2. Image enhancement ï Histogram
3. Image smoothing
4. Image sharpening
5. Algorithm for low pass filter, high pass filter, median filter
6. Point detection
7. Line detection
8. Edge detection

8 MB 06 BIO MEDICAL EMBEDDED SYSTEM DESIGN - LAB

Term work:

Minimum 10 experiments on MCS 51

List of Experiments

1. Interfacing with 8085 microprocessor and 8051 microcontroller
   a) Traffic light controller
   b) 7-segment display
   c) Analog to Digital Converter
   d) Matrix keyboard
   e) LCD display
   f) Digital to Analog Converter
   g) Stepper motor
   h) DC- motor
2. Interfacing of matrix sensors to PIC microcontroller
   a) Heart rate monitor
   b) ECG sensor
   c) Carbon dioxide and oxygen sensors
   d) Ion selective sensors
   e) Analog interfacing of rabbit core modules
   f) OP 7200 LCD display controller

8 BM 07 PROJECT AND SEMINAR

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Two Year Post Graduate Degree Course in M.E. Electrical (Electrical Power System) Full Time Semester Pattern ... Credit Grade System

Appendix – A

Sr. No.	Subject Code	Subject	TEACHING SCHEME HOURS / WEEK Lecture	Tutorial	P/D	TOTAL HOURS/WEEK	CREDITS	EXAMINATION SCHEME THEORY DURATION OF PAPER (Hr.)	MAX.MARKS THEORY PAPER	MAX.MARKS COLLEGE ASSESMENT	TOTAL		PRACTICAL MAX.MARKS EXTERNAL	INTERNAL	TOTAL	MIN.PASSING MARKS
SEMESTER : I																
THEORY																
01	EP2101	Advanced Control Systems	4	-	-	4	4	3	80	20	100	40	-	-	-	-
02	EP2102	Computer Aided Power System Analysis	4	-	-	4	4	3	80	20	100	40	-	-	-	-
03	EP2103	Digital Signal Processing & Applications	4	-	-	4	4	3	80	20	100	40	-	-	-	-
04	EP2104	Advanced Electric Drives	4	-	-	4	4	3	80	20	100	40	-	-	-	-
05	EP2105	Digital Protection of Power Systems	4	-	-	4	4	3	80	20	100	40				
06	EP2106	Power Systems – Lab - I	-	-	4	4	2	-	-	-	-	-	50	50	100	50
		Total	20	-	4	24	22				500				100	
														TOTAL	600	
THEORY		**SEMESTER : II**														
01	EP2201	Power System Dynamics & Control	4	-	-	4	4	3	80	20	100	40	-	-	-	-
02	EP2202	Electrical Machines : Analysis & Control	4	-	-	4	4	3	80	20	100	40	-	-	-	-
03	EP2203	Power Quality Improvement Techniques	4	-	-	4	4	3	80	20	100	40	-	-	-	-
04	EP2204	HVDC Transmission	4	-	-	4	4	3	80	20	100	40	-	-	-	-
05	EP2205	Application of Power Electronics to Power Systems	4	-	-	4	4	3	80	20	100	40	-	-	-	-
06	EP2206	Power Systems – Lab - II	-	-	4	4	2	-	-	-	-	-	50	50	100	50
		TOTAL	12	3	14	29	24				500				100	
														TOTAL	600	

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Sr. No.	Subject Code	Subject	TEACHING SCHEME: HOURS / WEEK Lecture	Tutorial	P/D	TOTAL HOURS/WEEK	CREDITS	EXAMINATION SCHEME: THEORY DURATION OF PAPER (Hr.)	MAX.MARKS THEORY PAPER	MAX.MARKS COLLEGE ASSESMENT	TOTAL		PRACTICAL MAX.MARKS EXTERNAL	INTERNAL	TOTAL	MIN.PASSING MARKS
SEMESTER : III																
THEORY																
01	EP2231	Seminar & Dissertation														
		Total	15	5	7	27	24						-	-	-	-
														TOTAL	650	
SEMESTER : IV																
01	EP2241	Seminar & Dissertation														
		TOTAL	12	3	14	29	24						-	-	-	-
														TOTAL	650	

Semester III :

Seminar to be delivered on the work completed during third Semester. 50 Internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertation guide & subject expert appoioted by the Principal of the College/ Head of University Department. REmaining 50 Intrnal marks will be given by the Guide based on performance.

Dissertation : Titlel of the dissertation work to be submitted to the University on or before 15th of September (for regular examination) and 15th of February (for Supplementary examination)

Semester IV :

Seminar to be delivered on the work completed during third Semester. 50 Internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertation guide & subject expert appoioted by the Principal of the College/ Head of University Department. Remaining 50 Intrnal marks will be given by the Guide based on performance.

Note : Thesis of dissertation work must be submitted to the University on or before 30th April (for regular exam.) and 30th of September (for Supplementary examination). Thsis of dissertation work be submitted with late fee to the University upto 31st May (for regular exam.) and 31st of December (for Supplementary examination). The late fee shall be charged in case of Examination form.

NOTES : 1. Student should fill the examination form in the beginning of IIIrd Semester jointly for III and IV Semester.
2. Single marksheet for III & IV Semester will be given to the student.

ELIGIBILITY CRITERIA : The Eligibility Criteria for admission to the degree of Master of Engineering (Full Time) Electrical Engineering (Electrical Power System) shall be passed the degree examination of Bachelor of Engineering /Bachelor of Technology

In the branches mentioned in the following table against the respective Course :

TABLE

Sr.No.	Name of Exam	B.E. /B.Tech. of this University of any other Statutory University
1.	M.E. /M.Tech.	Electrical Engg., Electrical (Electronics &Power), Electrical & Electronics Engg., Industrial Electronics Engg., Electronics &Telecommunication Engg., Electronics Engg., Instrumentation Engg. Biomedical Engg.

IND CamScanner App

M.B.A. Exam. 2014
(Semester Pattern)

Prospectus No. 2014156

संत गाडगेबाबा अमरावती विद्यापीठ
SANT GADGE BABA AMRAVATI UNIVERSITY

अभ्यासक्रमिका
वाणिज्य विद्याशाखा
(FACULTY OF COMMERCE)

PROSPECTUS

OF

MASTER OF BUSINESS ADMINISTRATION

(Semester Pattern Two Year Degree Course)

Semester - I & III Exam. Winter-2014

Semester - II & IV Exam. Summer - 2015

2014

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Prospectus No.2014156
M.B.A.(Semester Pattern)

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SANT GADGE BABA AMRAVATI UNIVERSITY

SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

(1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects, papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.

(2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc. refer the University OrdinanceBooklet the various conditions/ provisions pertaining to examinations as prescribed in the following Ordinances-

Ordinance No. 1	:	Enrolment of Students.
Ordinance No.2	:	Admission of Students
Ordinance No. 4	:	National Cadet Corps
Ordinance No. 6	:	Examination in General (relevant extracts)
Ordinance No. 18/2001	:	An Ordinance to provide grace marks for passing in a Head of passing and Inprovement of Division (Higher Class) and getting Distinction in the subject and condonation of defficiency of marks in a subject in all the faculties prescribed by the Statute NO.18, Ordinance 2001.
Ordinance No.9	:	Conduct of Examinations (Relevant extracts)
Ordinance No.10	:	Providing for Exemptions and Compartments

Ordinance No. 19	:	Admission Candidates to Degrees
Ordinance No.109	:	Recording of a change of name of a University Student in the records of the University
Ordinance No. 6/2008	:	For improvement of Division
Ordinance No.19/2001	:	An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Dineshkumar Joshi
Registrar
Sant Gadge Baba Amravati University

PATTERN OF QUESTION PAPER ON THE UNIT SYSTEM

The Pattern of question paper as per unit system will be broadly based on the following pattern.

(1) Syllabus has been divided into units equal to the number of question to be answered in the paper. On each unit there will be a question either a long answer type or a short answer type.

(2) Number of question will be in accordance with the unit prescribed in the syllabi for each paper i.e. there will be one question on each unit.

(3) For every question long answer type or short answer type there will be an alternative choice from the same unit. However, there will be no internal choice in a question.

(4) Division of marks between long answer and short answer type question will be in the ratio of 40 and 60.

(5) Each short answer type question shall contain 4 to 8 short sub question with no internal choice.

NATURE OF QUESTION PAPER FOR M.B.A. SEMESTER I, II, III & IV EXAMINATIONS

1. The question paper shall have three sections, viz. A.B. and C
2. Section "A" shall have one question of conceptional nature carrying 14 marks. The question shall have internal option.
3. Section "B" shall have three questions, divided into two parts each, of which one part shall be of conceptional nature and the other part shall be of applied nature. Each part shall have 7 marks. Each question shall have internal option.
4. Section 'C' shall consist of case study/ problems carrying 14 marks, divided into two or more subquestion.

NORMS FOR THEORY PAPERS & DISSERTATION

1. For all theory papers 3 periods per week in all a minimum of 45 periods per subject per semester.
2. a) For dissertation work there shall be a batch of maximum 6 students per quide teacher.
   b) For one batch of 6 students three periods per week shall be the workload alloted for guidance of the dissertation.
3. There shall be minimum 5 students for every additional specialization at M.B.A. II level.

DIRECTION

No.: 26 / 2011 Date : 25/5/ 2011

Subject : Examinations Leading to the Degree of Master of Business Administration (M.B.A) (Semester Pattern-Two Year Course) Direction 2011.

Whereas, Ordinance No.12 of 1985 and Regulation No. 42 of 2003 relating to the Examinations Leading to the Degree of Master of Business Administration (M.B.A) (Bi-Annual pattern-Two Year Course) is in existence in the University.

AND

Whereas, the Academic Council has accepted the new syllabi and revise scheme of examination for Master of Business Administration Semester-I,II,III & IV along with Credit Based Performance and Assessment System in its meeting held on 30/3/2011 vide item No. 24(5) B) R-1

AND

Whereas, the Academic Council in its meeting held on 30/3/ 2011 has resolved to refer the matter to the Ordinance Committee for amending the respective Ordinance/Regulation.

AND

Whereas, the revised scheme of examinations, eligibility criteria and other provisions for Semester-I&II of M.B.A. is to be implemented from the academic session 2011-2012 .

AND

Whereas, the new syllabi of M.B.A. Semester-I&II is to be made available from the academic session 2011-2012 .

AND

Whereas the matter for changing the scheme of examination and other provisions is required to be regulated by the Regulation/ Ordinance is time consuming process.

AND

Whereas, it is necessary to provide the Schemes of examinations along with other details with eligibility criteria for the purpose of admissions to the M.B.A. Semester-I&II course for the session 2011-2012.

Now, therefore, I, Dr. M.K.Khedkar, Vice Chancellor of Sant Gadge Baba Amravati University, Amravati in exercise of the powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act., 1994, do hereby direct as under-

1. This Direction may be called "Examinations Leading to the Degree of Master of Business Administration (Two Year Course – Semester Pattern), Direction 2011".
2. This direction shall come into force from –
   i) the academic session 2011-2012 for Semesters I & II of M.B.A.Part-I, and
   ii) the academic session 2012-2013 for Semesters III & IV of M.B.A.Part-II.
3. There shall be four semester examinations leading to the Degree of Master of Business Administration namely-
   i) MBA Part-I consists of Semester-I & II examinations, and;
   ii) MBA Part-II consists of Semester-III & IV examinations.
4. The students who have passed any bachelor degree with 50% for open category and 45% for Reserved Categories are eligible for admission in MBA and as decided by admission authority i.e. Directorate of Technical Education, Mumbai.
5. The examinations shall be held at such places and on such dates as may be appointed by the Board of Examination.
6. The fee for the Examination shall be as prescribed by the competent authority from time to time.
7. (i) The scope of the subjects shall be as indicated in the Syllabus.
   (ii) The medium of Instruction and examination shall be English.
8. The Schemes of teaching and examinations for MBA course, computation of SGPA & CGPA and illustrative example for results in Grade Point System shall be as provided under Appendix/Appendices appended with the direction.
9. The system of evaluation will be as follows:
   Theory, internal marks, dissertation, viva, will be evaluated in terms of marks. Then marks will be converted into a grade and later a grade point average. Results will be declared for each semester and the final examination will give total grade and grade point average.
10. A total of 128 credits have to be taken by the students to complete the programme.

11. The computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) of an examinee of *post graduate course* shall be as given below :-
    The marks will be given in all examinations which will include internal assessment marks and the total marks for each Theory shall be converted into Grades as shown in Table.
    SGPA shall be calculated based on Grade Points corresponding to Grade and the Credits allotted to respective Theory shown in the scheme for respective semester.
    SGPA shall be computed for I, II, III, & IV Semester and CGPA shall be computed only in IV Semester based on SGPAs of I, II, III, & IV Semester. :-

$$SGPA = \frac{C1 \times G1 + C2 \times G2 + ... + CnxGn}{C1 + C2 + ... + Cn}$$

Where C1 = Credit of individual Subject

G1= Corresponding Grade Point obtained in the respective Subject

$$CGPA = \frac{(SGPA)I \times (Cr)I + (SGPA)II \times (Cr)II + (SGPA)III \times (Cr)III + (SGPA)IV \times (Cr)IV}{(Cr)I + (Cr)II + (Cr)III + (Cr)IV}$$

Where (SGPA) I,II,III,IV = SGPA of I, II, III, IV Semester
(Cr) I,II,III,IV = Total Credits for I, II, III, IV Semester

Table No. 1
Table of Grade, Percentage of Marks and Grade Points for MBA Examination

Grade	Range of Marks obtained out of 100 or equivalent fraction	Grade Points
A+	90-100	10
A	80-89	9
B+	70-79	8
B	60-69	7
C+	55-59	6
C	50-54	5
D	Below 50	Fail
Z	Absent in Examination	—

Table No. 2
Table of Grade, Percentage of Marks and Grade Points for MBA Examination

Grade Points	Final Grade
9.00 - 10	A+
8.00 - 8.99	A
7.00 – 7.99	B+
6.00 – 6.99	B
5.50 – 5.99	C+
5.00 – 5.49	C
Below 5.00	D (Fail)
Z	Absent in Examination

12. No person shall be admitted to an examination under this Direction, if he/she has already passed the same examination, or an equivalent examination of any other Statutory University.

13. As soon as possible after the examinations the Board of Examinations shall publish a list of successful examinees. The results of final MBA examinations shall be classified as said before and merit list shall be notified as per Ordinance No.6.

14. The provisions of ordinance No.18 of 2001 to provide grace marks for passing in a head of passing and improvement of division (Higher Class) and getting Distinction in the subjects and condonation of deficiency of marks in a subject shall apply to the examinations under this Direction.

15. (A) Minimum No. of students offering additional specialization per subject be 5.

(B) The student offering additional specialization shall have to appear for all theory papers and submit dissertation in the subject.

(C) The student will have to seek admission as a regular student & will have to pay tuition fee Rs.16000/- as well as admission fee as prescribed by the institution.

(D) A student desirous of pursuing a course in additional specialization after completion of his regular MBA course from this university may do so by getting duly admitted to this course in the beginning of the session within the prescribed time limit for admission given by the university. In such case the student shall opt for any one specialization group and shall be required to take examination for only 6 subjects of that specialization.

16. In Order to pass at the Semester I,II,III & IV Examinations an examinee shall obtain not less than 50% marks in each paper and at least 50% of the aggregate marks in all the theory papers taken together as given in appendices A,B,C & D.

17. (I) An examinee getting D grade in internal assessment will be allowed to improve his/her Grade by taking additional assignment and submitting them to the teacher.

(II) An examinee getting D grade in Dissertation will be allowed to improve his/her Grade by submitting a fresh Dissertation.

(III) For improving his/her grade as in (I) and (II) above will have to pay an additional fee of Rs.500/-

Scheme of examination for Internal Assessment Marks for Sem I, Sem II, Sem III and Sem IV

For all theory papers (Excluding Internal Assessment Papers) there shall be 70 marks for each university examinations paper & 30 marks for internal assessment. The Division of internal assessment marks i.e. 30 Marks will be as follows.

2	Class room tests	20
2	Home Assignments/ Projects/Seminar	10
	Total Marks for internal Assessment	**30**

1st Class test should be based on any two units whereas 2nd class test should be based on remaining three units. Pattern of question paper will be like university examination paper (Text and Application).

The minimum passing for internal assessment shall be 15 marks i.e.50% of the total internal marks. Papers of subject code M.B.A.108 and M.B.A. 208, shall be internally assessed. The assessment shall be based on assignment to be submitted by the candidates. The minimum number of assignments/tests, shall be 5 per paper of 20 marks each. The assessment of these papers

will be shown by the grade. The students getting 'D' grade fails in the paper.

Scheme of Examination of Dissertation

Assessment of papers M.B.A. 307 & M.B.A.407 i.e. Dissertation shall be done by internal and external examiners out of 100 marks distributed as 65 marks for dissertation and 35 marks for viva voce . The viva shall be conducted both by internal and external examiners

** Marks obtained in internal assessment papers will be converted in grades as per Table No. 1

The student getting 'D' grade will be declared as 'Fail' in the Dissertation.

17. A student appearing for M.B.A.Semester III & IV Examination will have to pay an additional fee of Rs.500/- for Dissertation in addition to usual Examination fees.

19. Examinees successful at the Semester-I, II & III Examination shall be entitled to receive a Certificate signed by the Registrar, and those successful at the Semester-IV Examination shall on payment of the prescribed fees, receive a Degree in the prescribed form signed by the Vice-Chancellor.

Appendix-A

Master of Business Administration Course

Semester- I

Subject Code	Name of Subject	Hrs/ Week	Credits	Examination Scheme						
				Duration of Exam Hours	External Max. Marks	External Min. Pass Marks	Internal Max. Marks	Internal Min. Pass Marks	Total Max Mark	Min. Agg. Mark
MBA/101	Principles And Practice of Management	3	4	3	70	35	30	15	100	350
MBA/102	Managerial Economics	3	4	3	70	35	30	15	100	
MBA/103	Managerial Skill Development	3	4	3	70	35	30	15	100	
MBA/104	Accounting for Managers	3	4	3	70	35	30	15	100	
MBA/105	Organisation Behaviour and Effectiveness	3	4	3	70	35	30	15	100	
MBA/106	Business Ethics	3	4	3	70	35	30	15	100	
MBA/107	Management Information System	3	4	3	70	35	30	15	100	
MBA/108	Quantitative Methods	3	4	—	—	—	Internal Assessment Paper			
Total		**24**	**32**						**700**	**350**

Appendix-B

Master of Business Administration Course

Semester- II

Subject Code	Name of Subject	Hrs/ Week	Credits	Examination Scheme						
				Duration of Exam Hours	External Max. Marks	External Min. Pass Marks	Internal Max. Marks	Internal Min. Pass Marks	Total Max Mark	Min. Agg. Mark
MBA/201	Business Environment	3	4	3	70	35	30	15	100	350
MBA/202	Research Methodology	3	4	3	70	35	30	15	100	
MBA/203	Human Resources Management	3	4	3	70	35	30	15	100	
MBA/204	Financial Management	3	4	3	70	35	30	15	100	
MBA/205	Marketing Management	3	4	3	70	35	30	15	100	
MBA/206	Production and Operations Management	3	4	3	70	35	30	15	100	
MBA/207	Logistics Management	3	4	3	70	35	30	15	100	
MBA/208	Management Science	3	4	—	—	—	Internal Assessment Paper			
Total		**24**	**32**						**700**	**350**

Appendix-C
Semester- III

Subject Code	Name of Subject	Hrs/ Week	Credits	Examination Scheme						
				Duration of Exam Hours	External		Internal		Total Max Mark	Min. Agg. Mark
					Max. Marks	Min. Pass Marks	Max. Marks	Min. Pass Marks		
MBA/301	Business Law	3	4	3	70	35	30	15	100	
MBA/ 3101/F	Indian Financial System	3	4	3	70	35	30	15	100	
MBA/ 3102/F	Banking System	3	4	3	70	35	30	15	100	
MBA/ 3103/F	Working Capital Management	3	4	3	70	35	30	15	100	
MBA/ 3104/F	International Financial Management	3	4	3	70	35	30	15	100	
MBA/ 3105/F	Investment Science	3	4	3	70	35	30	15	100	
MBA/ 3106/F	Risk Management	3	4	3	70	35	30	15	100	
MBA/ 3201/M	International Business Strategy	3	4	3	70	35	30	15	100	
MBA/ 3202/M	Sales & Distribution Management	3	4	3	70	35	30	15	100	
MBA/ 3203/M	Consumer Behavior	3	4	3	70	35	30	15	100	
MBA/ 3204/M	Advertising Management	3	4	3	70	35	30	15	100	
MBA/ 3205/M	Brand Management	3	4	3	70	35	30	15	100	
MBA/ 3206/M	Agriculture Marketing	3	4	3	70	35	30	15	100	
MBA/ 3301/H	Management of Industrial Relations	3	4	3	70	35	30	15	100	350
MBA/ 3302/H	Human Relations & Legal Framework	3	4	3	70	35	30	15	100	
MBA/ 3303/H	Compensation Management	3	4	3	70	35	30	15	100	
MBA/ 3304/H	Human Resource Development	3	4	3	70	35	30	15	100	
MBA/ 3305/H	Management of Training & Development	3	4	3	70	35	30	15	100	
MBA/ 3306/H	Performance Management	3	4	3	70	35	30	15	100	
MBA/ 3401/P	Purchasing And Materials Management	3	4	3	70	35	30	15	100	
MBA/ 3402/P	Production Planning And Control	3	4	3	70	35	30	15	100	
MBA/ 3403/P	Ergonomics	3	4	3	70	35	30	15	100	
MBA/ 3404/P	World Class Manufacturing	3	4	3	70	35	30	15	100	
MBA/ 3405/P	Principles and Practices of Safety Management	3	4	3	70	35	30	15	100	
MBA/ 3406/P	Costing for Production	3	4	3	70	35	30	15	100	
MBA/307	**Dissertation**	3	4	—	—	—	**Internal Assessment**			
	Total	24	32						700	350

Appendix-D
Semester- IV

Subject Code	Name of Subject	Hrs/ Week	Credits	Examination Scheme						
				Duration of Exam Hours	External		Internal		Total Max Mark	Min. Agg. Mark
					Max. Marks	Min. Pass Marks	Max. Marks	Min. Pass Marks		
MBA/401	Strategic Management	3	4	3	70	35	30	15	100	
MBA/ 4101/CGF	Financial Decision Analysis	3	4	3	70	35	30	15	100	
MBA/ 4102/CGF	Security Analysis And Portfolio Management	3	4	3	70	35	30	15	100	
MBA/ 4103/CGF	Financial Derivatives	3	4	3	70	35	30	15	100	
MBA/ 4104/CGF	Management Of Financial Services	3	4	3	70	35	30	15	100	
MBA/ 4105/CGF	Foreign Exchange Market	3	4	3	70	35	30	15	100	
MBA/ 4106/CGF	Insurance Management	3	4	3	70	35	30	15	100	
MBA/ 4201/SM	Sales & Promotion Management	3	4	3	70	35	30	15	100	
MBA/ 4202/SM	Marketing Of Services	3	4	3	70	35	30	15	100	
MBA/ 4203/SM	Marketing Of Social Services	3	4	3	70	35	30	15	100	
MBA/ 4204/SM	Retail Marketing	3	4	3	70	35	30	15	100	
MBA/ 4205/SM	Rural Marketing	3	4	3	70	35	30	15	100	
MBA/ 4206/SM	International Marketing	3	4	3	70	35	30	15	100	
MBA/ 4401/OB	Human Behavior At Work Place	3	4	3	70	35	30	15	100	350
MBA/ 4402/OB	Organization Development	3	4	3	70	35	30	15	100	
MBA/ 4403/OB	Management Of Group Process	3	4	3	70	35	30	15	100	
MBA/ 4404/OB	Corporate Leadership Management	3	4	3	70	35	30	15	100	
MBA/ 4405/OB	Knowledge Management	3	4	3	70	35	30	15	100	
MBA/ 4406/OB	International HRM	3	4	3	70	35	30	15	100	
MBA/ 4401/OM	Service Operations Management	3	4	3	70	35	30	15	100	
MBA/ 4402/OM	Applied Operations Research	3	4	3	70	35	30	15	100	
MBA/ 4403/OM	Transportation Management	3	4	3	70	35	30	15	100	
MBA/ 4404/OM	Total Quality Management	3	4	3	70	35	30	15	100	
MBA/ 4405/OM	Industrial Health And Disaster Management	3	4	3	70	35	30	15	100	
MBA/ 4406/OM	Project Management	3	4	3	70	35	30	15	100	
MBA/407	**Dissertation**	3	4	3	—	—	**Internal Assessment**			
	Total	24	32						700	350

Specialization:-

A candidate can offer any one specialization from amongst the available electives for Sem III given in Appendix 'C' for Semester -III.

A candidate can offer any one specialization from amongst the available electives for Sem IV given in Appendix 'D' for Semester -IV.

The Specialization Codes and Titles are tabulated below

Sr. No.	Semester	Specialization Code	Title of pecialization
1	III	F	Financial Management
2		M	Marketing Management
3		H	Human Resource Management
4		P	Production Management
5	IV	CGF	Corporate & Global Finance
6		SM	Services Marketing
7		OB	Organizational Behavior
8		OM	Operations Management

Sd/-

Amravati.
Date:24/5/2011

(Dr. M.K.Khedkar)
Vice-Chancellor

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DIRECTION

No. 24/2012 Date : 6/6/2012

Subject : **Corrigendum to Direction No. 26 of 2011 in respect of Examinations leading to the Degree of Master of Business Administration (M.B.A.) (Bi-Annual pattern) (Two year course) .**

Whereas, Direction No. 26 of 2011 in respect of Examinations leading to the Degree of Master of Business Administration (M.B.A.) (Bi-Annual pattern) (Two year course) is in existence in the University.

AND

Whereas, the Academic Council in its meeting held on 5/5/2012 vide Item No.74 (A) has resolved to accept the revised tables

providing grade, percentage of marks and grade points and class/division for M.B.A. examinations.

AND

Whereas, the Academic Council in its meeting held on 5/5/2012 vide Item No.74 (B) has resolved to accept the corrections in subject code of MBA/307, MBA/4401/OB, 4402/OB, 4403/OB, 4404/OB, 4405/OB, MBA/4406/OB, and MBA/407, in the scheme of examinations of M.B.A. Semester-III & IV respectively.

AND

Whereas, the Academic Council in its meeting held on 5/5/2012 has resolved to refer the matter to the Ordinance Committee to make amendments in the respective Ordinance/Regulation.

AND

Whereas, the revised scheme for providing Grade and Grade points is to be implemented from the academic session 2011-2012.

AND

Whereas, the revised scheme of examinations for M.B.A. Semester-III & IV is to be implemented from the academic session 2012-13.

AND

Whereas, Hon'ble Vice Chancellor has accepted the scheme of examination and syllabi of additional electives namely Pharmaceutical Management, Sports Management, and Health Care Management of Semester-III & IV of M.B.A. course on behalf of Faculty of Commerce and Academic Council under sub section (7) of section 14 of the Maharashtra Universities Act.1994 as recommended by the Board of Studies in Business Management, which is to be implemented from the academic session 2012-2013.

AND

Whereas, the matter for changing the scheme of examinations is required to be regulated by the Regulation, and making amendment in respective Regulation is time consuming process.

AND

Whereas, the scheme of examination along with syllabi of M.B.A. Semester-III&IV is to be made available for the academic session 2012-2013.

Now, therefore, I, Dr. M.K. Khedkar , Vice-Chancellor, Sant Gadge Baba Amravati University, Amravati in exercise of the powers conferred upon me under sub section (8) of section 14 of the Maharashtra Universities Act,1994, do hereby direct as under-

1) This Direction may be called "Corrigendum to Direction No. 26 of 2011 in respect of Examinations leading to the Degree of Master of Business Administration (M.B.A.) (Bi-Annual pattern) (Two year course)".

2) This direction shall come into force from the date of its issuance.

3) The following corrections be made in Direction No. 26 of 2011 for rectifying the Direction which are to be implemented from the academic session 2011-12 as follows-

"The present tables i.e. Table No.1 and Table No.2 appearing under Para 11 of Direction No. 26 of 2011 be substituted by the tables as given in **Appendix-A.**

4) The following new optional subjects along with scheme of teaching, credit, and examination be added under the subject code MBA/3406/P in the scheme of examination of M.B.A. Semester-III under the Appendix-C which was appended with the Direction No. 26 of 2011, which is to be implemented from the examination of Winter-2012.

Subject Code	Name of Subject	Hrs/ Week	Credits	Examination Scheme					
				Duration of Exam Hours	External		Internal		Total Max Marks
					Max. Marks	Min. Pass Marks	Max. Marks	Min. Pass Marks	
MBA/ 3501/ PH	Brand Promotion & Marketing in Pharmaceutical Industry	3	4	3	70	35	30	15	100
MBA/ 3502/PH	Customer Behaviour in Pharmaceutical Industry	3	4	3	70	35	30	15	100
MBA/ 3503 /PH	Production Management in Pharmaceutical Industry	3	4	3	70	35	30	15	100
MBA/ 3504/PH	Material Management in Pharmaceutical Industry	3	4	3	70	35	30	15	100
MBA/ 3505/PH	Sales & Distribution Management in Pharmaceutical Industry	3	4	3	70	35	30	15	100
MBA/ 3506/PH	Pharmaceutical Regulatory Environment	3	4	3	70	35	30	15	100
MBA/ 3601/SP	Fundamentals of Management of Sports	3	4	3	70	35	30	15	100
MBA/ 3602/SP	Human Resource Management for Sports	3	4	3	70	35	30	15	100
MBA/ 3603/SP	Sports Marketing	3	4	3	70	35	30	15	100
MBA/ 3604/SP	Financial Management And Economics for Sports	3	4	3	70	35	30	15	100
MBA/ 3605/SP	Sports Facilities Management	3	4	3	70	35	30	15	100
MBA/ 3606/SP	Sports Media Management	3	4	3	70	35	30	15	100

5) The subject code of MBA/307 in the scheme of examination of M.B.A. Semester –III under the Appendix-C which was appended with the Direction No. 26 of 2011 be substituted by the word & figure MBA/308.

6) The subject code MBA/4401/OB, 4402/OB, 4403/OB, 4404/OB, 4405/OB, MBA/4406/OB in the scheme of examination of M.B.A. Semester-IV under the Appendix-D which was appended with the Direction No. 26 of 2011 be substituted by the words & figures MBA/4301/OB, 4302/OB, 4303/OB, 4304/ OB, 4305/OB, MBA/4306/OB respectively.

7) The following new optional subjects along with scheme of teaching, credit, and examination be added under the subject code MBA/4406/OM in the scheme of examination of M.B.A. Semester-IV under the Appendix-D which was appended with the Direction No. 26 of 2011, which is to be implemented from the examination of Summer-2013.

Subject Code	Name of Subject	Hrs/ Week	Credits	Examination Scheme					
				Duration of Exam Hours	External		Internal		Total Max Marks
					Max. Marks	Min. Pass Marks	Max. Marks	Min. Pass Marks	
MBA/ 4501/HC	Health Care Management & Administration	3	4	3	70	35	30	15	100
MBA/ 4502/HC	Human Resource Management for Health Care	3	4	3	70	35	30	15	100
MBA/ 4503 /HC	Management of Clinical Services	3	4	3	70	35	30	15	100
MBA/ 4504/HC	Economics of Health Care Management	3	4	3	70	35	30	15	100
MBA/ 4505/HC	Information Technology in Health Care	3	4	3	70	35	30	15	100
MBA/ 4506/HC	Hospital Support Services	3	4	3	70	35	30	15	100

8) The subject code of MBA/407 in the scheme of examination of M.B.A. Semester –IV under the Appendix-D which was appended with the Direction No. 26 of 2011 be substituted by the word & figure MBA/408.

Sd/-

Amravati. (Dr.M.K.Khedkar)

Dated: 5/6/2012 Vice-Chancellor

Appendix-A

Table No.1
Table of Grade, Percentage of marks and Grade points for M.B.A.Examinations

Grade	Range of Marks obtained out of 100 or equivalent fraction	Grade Points
AA	90-100	10
AB	80-89	9
BB	70-79	8
BC	60-69	7
CC	55-59	6
CD	50-54	5
FF	Below 50	0
ZZ	Absent in Examination	

Table No.2
Table of Grade Points for SGPA and CGPA for M.B.A.Examinations

Grade Points	Final Grade
9 - 10	AA
8 - 8.99	AB
7 - 7.99	BB
6 - 6.99	BC
5.5 - 5.99	CC
5 - 5.49	CD
0 - 4.99	FF
Absent in Examination	ZZ

Table No.3
Table of Equivalence of Class/Division to CGPA

Sr. No.	CGPA	Class/Division
1.	7.5 or more than 7.5	First Class with Distinction
2.	6.00 or more but less than or equal to 7.49	First Class
3.	5.50 or more but less than or equal to 5.99	Higher Second Class
4.	5.00 or more but less than or equal to 5.49	Second Class

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DIRECTION

No. 37/2012 Date : 8/11/2012

Subject : **Corrigendum to Direction No. 26 of 2011& 24 of 2012 in respect of Examinations leading to the Degree of Master of Business Administration (M.B.A.) (Semester pattern-Two year course) .**

Whereas, Direction No. 26 of 2011 & 24 of 2012 in respect of Examinations leading to the Degree of Master of Business Administration (M.B.A.) (Semester pattern-Two year course) is in existence in the University.

AND

Whereas, the Academic Council in its meeting held on 28/8/2012 vide Item No.91 has resolved to accept the paper titles to be revised under the Appendix-C & D of the papers MBA/3201/M, MBA/3206/M,MBA/4201/SM, MBA/4203/SM, MBA/4206/SM and MBA/4302/OB in the scheme of Examinations of M.B.A. Semester-III & IV respectively.

AND

Whereas, the Academic Council in its meeting held on 28/8/2012 has resolved to refer the matter to the Ordinance Committee to make amendments in the respective Ordinance/Regulation.

AND

Whereas, the matter for changing the scheme of examinations is required to be regulated by the Regulation, and making amendment in respective Regulation is time consuming process.

AND

Whereas, the revised titles in the scheme of examinations of Semester-III & IV of M.B.A. is to be implemented from the academic session 2012-13.

Now, therefore, I, Dr. M.K. Khedkar , Vice-Chancellor, Sant Gadge Baba Amravati University, Amravati in exercise of the

powers conferred upon me under sub section (8) of section 14 of the Maharashtra Universities Act,1994, do hereby direct as under-

1) This Direction may be called "Corrigendum to Direction No. 26 of 2011 & 24 of 2012 in respect of Examinations leading to the Degree of Master of Business Administration (M.B.A.) (Semester pattern) (Two year course) Direction 2012".

2) This direction shall come into force from the date of its issuance.

3) The following corrections be made in scheme of examination under the Appendix-C & D appended with the Direction No. 26 of 2011 & 24 of 2012 for rectifying the Direction which are to be implemented from the academic session 2012-13 for M.B.A. Semester-III & IV as follows-

i) the paper title "International Business Strategy" appearing against the paper Code No.MBA/3201/M be substituted by the paper title "International Marketing Strategy"

ii) the paper title "Agriculture Marketing" appearing against the paper Code No.MBA/3206/M be substituted by the paper title "Agro Business Marketing"

iii) the paper title "Sales and Promotion Management" appearing against the paper Code No.MBA/4201/SM be substituted by the paper title "Sales Promotion Management "

iv) the paper title "Marketing of Social Services" appearing against the paper Code No.MBA/4203/SM be substituted by the paper title "Marketing for Non-Profit Organisations and Social Services "

v) the paper title "International Marketing" appearing against the paper Code No.MBA/4206/SM be substituted by the paper title "International Marketing Environment"

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PRINCIPAL
Shri Sant Gajanan Maharaj
College of Engineering,Shegaon

vi) the paper title "Organization Development" appearing against the paper Code No.MBA/4302/OB be substituted by the paper title "Organizational Development and Intervention Strategies"

Sd/-

Amravati.
Dated: 7/11/2012

(Dr.M.K.Khedkar)
Vice-Chancellor