SHRI GAJANAN SHIKSHAN SANSTHA'S
SHRI SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING
SHEGAON – 444203, DIST. BULDANA (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"

Ph : +918669638081 / 82
Fax : 091-7265-252346
Email: principal@ssgmce.ac.in, register@ssgmce.ac.in
Website- www.ssgmce.ac.in

1.2 Academic Flexibility

Cr. No.	Key Aspects	Assessment Indicators	Evidence
1.2.1	**Academic Flexibility**	*Number of Programmes in which Choice Based Credit System (CBCS)/ elective course system has been implemented*	University Notification regarding implementation of Elective courses
			Scheme of the Program
			Syllabus structure
			Elective Courses list

Shri Sant Gajanan Maharaj College of Engineering SHEGAON 444 203

Principal

SANT GADGE BABA
AMRAVATI UNIVERSITY
AMRAVATI - 444 602
(M.S.)

☎ : 2662206, 2662207, 2662208, 2662249, 2662358
Website : www.sgbau.ac.in
FAX NO. 0721-2662135, 2660949

This is to certify that CBCS system/Elective course system was implemented in the last completed academic year (2019-20) in various Departments of Sant Gadge Baba Amravati University, Amravati.

Place : Amravati

Date :- 28/4/21

Registrar

REGISTRAR
Sant Gadge Baba
Amravati University,
Amravati.

SANT GADGE BABA AMRAVATI UNIVERSITY GAZETTE

Official Publication of Sant Gadge Baba Amravati University

PART- TWO

(Extra-Ordinary)

Saturday, the 31st August, 2019

NOTIFICATION

No. 111 /2019 Date : 31/08/2019

Subject :- Implementation of new syllabi of Semester I & II of B.E./B.Text. E. /B.Tech. (Chem. Engg.)/ B.Tech.(Chem.Tech.) Polymer(Plastic) Tech. for the session 2019-2020 as per A.I.C.T.E. Model Curriculum.

It is notified for general information of all concerned that the authorities of the University have accepted to implement the new syllabi as per A.I.C.T.E. Model Curriculum of Semester I & II (Group A & B)of B.E./B.Text.E./ B.Tech.(Chem. Engg.)/ B.Tech. (Chem.Tech.) Polymer(Plastic)Tech. from the academic session 2019-2020 and onwards in phase wise manner as per **Appendix – A** :

Moreover, It is notified for general information of all concerned that the authorities of the University have accepted Induction Program as per A.I.C.T.E. Guidelines for Semester I as per **Appendix – B.**

Sd/-
(Dr.T.R.Deshmukh)
Registrar
Sant Gadge Baba Amravati University

Appendix – A

SANT GADGE BABA AMRAVATI UNIVERSITY GAZETTE

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Moreover, It is notified for general information of all concerned that the authorities of the University have accepted Induction Program as per A.I.C.T.E. Guidelines for Semester I as per **Appendix – B.**

Sd/-
(Dr.T.R.Deshmukh)
Registrar
Sant Gadge Baba Amravati University

Appendix – A

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			Total HOURS/WEEK	CREDITS	THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D			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	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

SEMESTER : FIFTH																
Sr. No.	Subject Code	Subject	TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
								Duration Of Paper (Hr.)	Max. Marks Theory Paper	Internal Marks	Total	Min. Passing Marks	Max. Marks		Total	Min. Passing Marks
													Int.	Ext.		
THEORY																
01	5ME01	Heat Transfer	3	--	--	3	3	3	80	20	100	40	--	--	--	--
02	5ME02	Metrology & Quality Control	3	--	--	3	3	3	80	20	100	40	--	--	--	--
03	5ME03	Kinematics of Machines	3	1	--	4	4	3	80	20	100	40	--	--	--	--
04	5ME04	Measurement Systems	3	--	--	3	3	3	80	20	100	40	--	--	--	--
05	5ME05	Open Elective – I (OE-I)	3	--	--	3	3	3	80	20	100	40	--	--	--	--
PRACTICALS / DRAWING / DESIGN																
06	5ME06	Heat Transfer- lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
07	5ME07	Metrology & Quality Control- lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
08	5ME08	Kinematics of Machines- lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
09	5ME09	Measurement Systems –lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
		Total	**15**	**1**	**8**	**24**	**20**	**--**	**--**	**--**	**500**	**--**	**--**	**--**	**200**	**--**
														Grand Total		**700**

Open Elective – I (For other Disciplines) : (i) Industrial Robotics & Automation (ii) Modern Manufacturing Techniques

An Orientation Program of 15 Hours duration / MOOCs on Advanced Courses line Machine learning, 3-D Printing, Virtual Reality, Supply Chain Management, Numerical Computation for Mechanical Engineers, Bio-mechanics, Fundamentals of nano-Engineering, Micro-Electro Mechanical Systems, Nano-to-Macro Transport Processes, Fundamentals of Photo Voltaics, Machine Tools etc. be offered during V semester.

Open Elective-I to be opted from the University's faculty of Engineering & Technology offered inter-disciplinary courses or MOOCs courses pertaining to the Engineering Profession.

SEMESTER : SIXTH

Sr. No.	Subject Code	Subject	TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
			Lecture	Tutorial	P/D			Duration Of Paper (Hr.)	Max. Marks Theory Paper	Internal Marks	Total	Min. Passing Marks	Max. Marks		Total	Min. Passing Marks
													Int.	Ext.		
THEORY																
01	6ME01	Design of Machine Elements	3	--	--	3	3	3	80	20	100	40	--	--	--	--
02	6ME02	Dynamics of Machines	3	1	--	4	4	3	80	20	100	40	--	--	--	--
03	6ME03	Control System Engineering	3	--	--	3	3	3	80	20	100	40	--	--	--	--
04	6ME04	Prof. Elective - I	3	--	--	3	3	3	80	20	100	40	--	--	--	--
05	6ME05	Open Elective - II	3	--	--	3	3	3	80	20	100	40	--	--	--	--
PRACTICALS / DRAWING / DESIGN																
06	6ME06	Design of Machine Elements- lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
07	6ME07	Dynamics of Machines- lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
08	6ME08	Prof. Elective - I - lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
09	6ME09	Research Skills - lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
		Total	**15**	**1**	**8**	**24**	**20**	--	--	--	**500**	--	--	--	**200**	--
															Grand Total	**700**

An Orientation Program of 15 Hours duration / MOOCs on Entrepreneurship Development to be offered during VI Semester.

6ME04: Prof. Elect. (I) : (i) Tool Engineering (ii) Non- Conventional Energy Sources (iii) Project Management (iv) Lean Manufacturing

6ME05: Open Elect. (II) [For other Disciplines] : (i) Renewable Energy Technologies (ii) Automobile Engineering & Electric Vehicles

Open Elective-II to be opted from the University's faculty of Engineering & Technology offered inter-disciplinary courses or MOOCs courses pertaining to the Engineering Profession.

SEMESTER : SEVENTH

Sr. No.	Subject Code	Subject	TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
								Duration Of Paper (Hr.)	Max. Marks Theory Paper	Internal Marks	Total	Min. Passing Marks	Max. Marks		Total	Min. Passing Marks
													Int.	Ext.		
THEORY																
01	7ME01	Mechatronics	3	--	--	3	3	3	80	20	100	40	--	--	--	--
02	7ME02	Productivity Techniques	3	--	--	3	3	3	80	20	100	40	--	--	--	--
03	7ME03	Industrial Management & Costing	3	--	--	3	3	3	80	20	100	40	--	--	--	--
04	7ME04	Energy Conversion - II	3	--	--	3	3	3	80	20	100	40	--	--	--	--
05	7ME05	Professional Elective- II	3	--	--	3	3	3	80	20	100	40	--	--	--	--
PRACTICALS / DRAWING / DESIGN																
06	7ME06	Mechatronics- lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
07	7ME07	Energy Conversion – II- lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
08	7ME08	Professional Elective- II – lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
09	7ME09	Technical Seminar & Project	--	--	8	8	4	--	--	--	--	--	50	--	50	25
		Total	**15**	**0**	**14**	**29**	**22**	**--**	**--**	**--**	**500**	**--**	**--**	**--**	**200**	**--**
														Grand Total		**700**

7ME05: Prof. Elect.-II : (i) Computer Integrated Manufacturing (ii) Automobile Engineering (iii) Design of Transmission Systems (iv) Computational Fluid Dynamics

SEMESTER : EIGHT																
Sr. No.	**Subject Code**	**Subject**	**TEACHING SCHEME**					**EXAMINATION SCHEME**								
			HOURS / WEEK					**THEORY**					**PRACTICAL**			
								Duration Of Paper (Hr.)	**Max. Marks Theory Paper**	**Internal Marks**	**Total**	**Min. Passing Marks**	**Max. Marks**		**Total**	**Min. Passing Marks**
													Int.	**Ext.**		
THEORY																
01	8ME01	Operation Research Techniques	3	--		3	3	3	80	20	100	40	--	--	--	--
02	8ME02	I.C. Engines	3	--		3	3	3	80	20	100	40	--	--	--	--
03	8ME03	Professional Elective-III	3	--		3	3	3	80	20	100	40	--	--	--	--
04	8ME04	Professional Elective- IV	3	--		3	3	3	80	20	100	40	--	--	--	--
PRACTICALS / DRAWING / DESIGN																
05	8ME05	I.C. Engines- lab.	--	--	2	2	1	--	--	-- --	--	--	25	25	50	25
06	8ME06	Prof. Elective-IV –lab.	--	--	2	2	1	--	--	-- --	--	--	25	25	50	25
07	8ME07	Project	--	--	12	12	6						75	75	150	75
		Total	**12**	**--**	**16**	**28**	**20**	**--**	**--**	**--**	**400**	**--**	**--**	**--**	**250**	**--**
															Grand Total	**650**

8ME03 Prof. Elect. –III : (i) Energy Conservation & Management (ii) Production Planning & Control (iii) Product Design &Development (iv) Artificial Intelligence

8ME04 : Prof. Elect. IV: (i) Refrigeration & Air Conditioning (ii) Finite Element Analysis (iii) Robotics & Industrial Applications (iv) Rapid Prototyping

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

SEMESTER : FIFTH																
Sr. No.	Subject Code	Subject	TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK			Total HOURS/WEEK	CREDITS	THEORY					PRACTICAL			
			Lecture	Tutorial	P/D			Duration Of Paper (Hr.)	Max. Marks Theory Paper	Internal Marks	Total	Min. Passing Marks	Max. Marks Int.	Max. Marks Ext.	Total	Min. Passing Marks
THEORY																
01	5ETC01	Microcontroller	4	--	--	4	4	3	80	20	100	40	--	--	--	--
02	5ETC02	Control System	3	--	--	3	3	3	80	20	100	40	--	--	--	--
03	5ETC03	Digital Signal Processing	3	--	--	3	3	3	80	20	100	40	--	--	--	--
04	5ETC04	Professional Elective –I (PE-I)	3	--	--	3	3	3	80	20	100	40	--	--	--	--
05	5ETC05	Open Elective – I (OE-I)	3	--	--	3	3	3	80	20	100	40	--	--	--	--
PRACTICALS / DRAWING / DESIGN																
06	5ETC06	Microcontroller Lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25
07	5ETC07	Digital Signal Processing Lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25
08	5ETC08	Power Electronics Lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25
09	5ETC09	Electronic lab based on Instrumentation	--	--	2	2	1	--	--	--	--	--	25	25	50	25
		Total	**16**	**0**	**8**	**24**	**20**	**--**	**--**	**--**	**500**	**--**	**--**	**--**	**200**	**--**
														Total	**700**	

5ETC04: PE (I) : (i) Power Electronics (ii) Fiber Optic Communication (iii) Speech and Audio Processing

5ETC05: OE (I) : (i) Sensors and Transducers (ii) Data Structure (iii) Introduction to Java

A student will be eligible to get Under Graduate degree with Honors or additional Minor Engineering, if he/she completes an additional 20 credits relevant to the UG program.
The detail of which is as follows:

Course Name	Semester	Credit
MOOCs Course-I	V	04
MOOCs Course-II	VI	04
MOOCs Course-III	VII	04
MOOCs Course-IV	VIII	04
Internship	V to VIII Sem	02
Industrial Visit	V to VIII Sem	02
	Total	20

Note: The student needs to submit

1. **MOOCs Course passing certificate of each semester**
2. **Completion & Evaluation Certificate of Internship**
3. **Industrial Visit certificate.**

Note: Only One MOOCs course per semester shall be considered.

SEMESTER : SIXTH

Sr. No.	Subject Code	Subject	TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK			Total HOURS/WEEK	CREDITS	THEORY					PRACTICAL			
			Lecture	Tutorial	P/D			Duration Of Paper (Hr.)	Max. Marks Theory Paper	Internal Marks	Total	Min. Passing Marks	Max. Marks		Total	Min. Passing Marks
													Int.	Ext.		
THEORY																
01	6ETC01	Communication Network	3	--	--	3	3	3	80	20	100	40	--	--	--	--
02	6ETC02	Computer Architecture	4	--	--	4	4	3	80	20	100	40	--	--	--	--
03	6ETC03	Professional Elective -II (PE-II)	3	--	--	3	3	3	80	20	100	40	--	--	--	--
04	6ETC04	Open Elective - II (OE-II)	3	--	--	3	3	3	80	20	100	40	--	--	--	--
05	6ETC05	Economics for Engineers (HS)	3	--	--	3	3	3	80	20	100	40	--	--	--	--
PRACTICALS / DRAWING / DESIGN																
06	6ETC06	Communication Network Lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25
07	6ETC07	Electronic Circuit Design Lab (Hardware + Software)	--	--	2	2	1	--	--	--	--	--	25	25	50	25
08	6ETC08	Python Programming Lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25
09	6ETC09	Mini Project	--	--	2	2	1	--	--	--	--	--	50	--	50	25
		Total	**16**	**0**	**8**	**24**	**20**	--	--	--	**500**	--	--	--	**200**	**--**
														Total	**700**	

6ETC03: PE (II) : (i) CMOS Design (ii) Satellite Communication (iii) Adaptive Signal Processing

6ETC04: OE (II) : (i) Introduction to Python Programming (ii) Data Base Management System
(iii) Renewable Energy Sources (Solar & Electric Vehicles)

SEMESTER : SEVENTH

Sr. No.	Subject Code	Subject	TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK			Total HOURS/WEEK	CREDITS	THEORY					PRACTICAL			
			Lecture	Tutorial	P/D			Duration Of Paper (Hr.)	Max. Marks Theory Paper	Internal Marks	Total	Min. Passing Marks	Max. Marks		Total	Min. Passing Marks
													Int.	Ext.		
THEORY																
01	7ETC01	Microwave Theory and Techniques	3	--	--	3	3	3	80	20	100	40	--	--	--	--
02	7ETC02	Digital Image and Video Processing	3	--	--	3	3	3	80	20	100	40	--	--	--	--
03	7ETC03	Project Management and Entrepreneurship	3	--	--	3	3	3	80	20	100	40	--	--	--	--
04	7ETC04	Professional Elective - III (PE-III)	3	--	--	3	3	3	80	20	100	40	--	--	--	--
05	7ETC05	Prof. Elective- IV (PE-IV)	3	--	--	3	3	3	80	20	100	40	--	--	--	--
PRACTICALS / DRAWING / DESIGN																
06	7ETC06	Microwave Theory and Techniques Lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25
07	7ETC07	Digital Image and Video Processing Lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25
08	7ETC08	Project Management and Entrepreneurship Lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25
09	7ETC09	** Project Stage I (Seminar)	--	--	8	8	4	--	--	--	--	--	100	--	100	50
		Total	**15**	**0**	**14**	**29**	**22**	**--**	**--**	**--**	**500**	**--**	**--**	**--**	**250**	**--**
														Total	**750**	

7ETC04: PE(III) : (i) High Speed Electronics (ii) Mobile Communication and Networks (iii) Mixed Signal Design

7ETC05: PE(IV) : (i) Introduction to MEMS (ii)Error Correcting Codes(iii) Antenna and Propagation

Note: ** Seminar based on Final year Major Project

SEMESTER : EIGHT

Sr. No.	Subject Code	Subject	TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK			Total HOURS/WEEK	CREDITS	THEORY					PRACTICAL			
			Lecture	Tutorial	P/D			Duration Of Paper (Hr.)	Max. Marks Theory Paper	Internal Marks	Total	Min. Passing Marks	Max. Marks		Total	Min. Passing Marks
													Int.	Ext.		
THEORY																
01	8ETC01	Embedded Systems	3	--		3	3	3	80	20	100	40	--	--	--	--
02	8ETC02	Cryptography & Network security	3	--		3	3	3	80	20	100	40	--	--	--	--
03	8ETC03	Prof. Elective-V (PE-V)	3	--		3	3	3	80	20	100	40	--	--	--	--
04	8ETC04	Prof. Elective-VI (PE-VI)	3	--		3	3	3	80	20	100	40	--	--	--	--
PRACTICALS / DRAWING / DESIGN																
05	8ETC05	Embedded Systems- Lab	--	--	2	2	1	--	--	-- --	--	--	25	25	50	25
06	8ETC06	Cryptography & Network security Lab	--	--	2	2	1	--	--	-- --	--	--	25	25	50	25
07	8ETC07	Project stage -II	--	--	12	12	6	--	--	--	--	--	100	100	200	100
		Total	**12**	**--**	**16**	**28**	**20**	**--**	**--**	**--**	**400**	**--**	**--**	**--**	**300**	--
														Total	**700**	

8ETC03 : PE-V: (i) Nano Electronics (ii) Wireless Sensor Networks (iii) Wavelets (iv) Bio-medical Electronics

8ETC04 : PE-VI: (i) 5G-6G Mobile Communication (ii)Information Theory & Coding (iii) Scientific Computing

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

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

SEMESTER - SEVENTH

Appendix - E

			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	7KS01	Digital Signal Processing	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	7KS02	Computer Networks	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	7KS03	Design & Analysis of Algorithms	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	7KS04	Object Oriented Analysis & Design	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	7KS05	Professional Elective I*	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	7KS06	Digital Signal Processing Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	7KS07	Design & Analysis of Algorithms Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	7KS08	Object Oriented Analysis & Design Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	7KS09	Project & Seminar	_	_	2	2	4	_	_	_	_	_	_	50	50	25
		TOTAL	20	_	8	28	27				500				200	
														TOTAL	700	

Professional Elective I* (i) Computer Graphics (ii) Multimedia Technologies (iii) Web Engineering (iv) Human Computer Interface

Semester :EIGHTH																
THEORY																
01	8KS01	Artificial Intelligence	3	_	_	3	3	3	80	20	100	40	_	_	_	_
02	8KS02	Embedded Systems	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	8KS03	Software Engineering	3	_	_	3	3	3	80	20	100	40	_	_	_	_
04	8KS04	Professional Elective II*	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8KS05	Artificial Intelligence -Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
06	8KS06	Embedded Systems -Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	8KS07	Project & Seminar			6	6	12						75	75	150	75
		TOTAL	13	_	10	23	27				400				250	
														TOTAL	650	

Professional Elective II* (i)Distributed Computing (ii) Mobile Computing (iii) Soft Computing (iv) Network Security

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

SANT GADGE BABA AMRAVATI UNIVERSITY GAZETTE

Official Publication of Sant Gadge Baba Amravati University

PART- TWO

(Extra-Ordinary)

Saturday, the 31st August, 2019

NOTIFICATION

No. 111 /2019 Date : 31/08/2019

Subject :- Implementation of new syllabi of Semester I & II of B.E./B.Text. E. /B.Tech. (Chem. Engg.)/ B.Tech.(Chem.Tech.) Polymer(Plastic) Tech. for the session 2019-2020 as per A.I.C.T.E. Model Curriculum.

It is notified for general information of all concerned that the authorities of the University have accepted to implement the new syllabi as per A.I.C.T.E. Model Curriculum of Semester I & II (Group A & B)of B.E./B.Text.E./ B.Tech.(Chem. Engg.)/ B.Tech. (Chem.Tech.) Polymer(Plastic)Tech. from the academic session 2019-2020 and onwards in phase wise manner as per **Appendix – A** :

Moreover, It is notified for general information of all concerned that the authorities of the University have accepted Induction Program as per A.I.C.T.E. Guidelines for Semester I as per **Appendix – B.**

Sd/-
(Dr.T.R.Deshmukh)
Registrar
Sant Gadge Baba Amravati University

Appendix – A

Reference Books:

1. Stephen D. Umans, ñFitzgerald and Kingsleyôs Electric Machineryò, 7th Edition, McGraw Hill Publication, 2020.
2. M. G. Say, ñPerformance and design of AC machinesò, CBS Publishers, 2002.
3. P. S. Bimbhra, ñElectrical Machineryò, Khanna Publishers, 2011.
4. C L Dawes, ñA Course in Electrical Engineering (Volume -2)ò, McGraw Hill Publication.

5EP04 Professional Elective-I SIGNALS AND SYSTEMS

Course Outcomes :

After completing this course student will be able to

1. Demonstrate knowledge of continuous-time and discrete-time signals and systems.
2. Analyze the continuous-time systems using continuous Time Fourier transform.
3. Explain the concept of sampling, Sampling Theorem, aliasing and the Nyquist rate.
4. Analyze DT systems & their realization using Z-transforms.
5. Analyze the discrete time systems using DTFT and DFT

Unit I: Introduction to Signals and Systems: Classification of Signals Classification of Systems, Systems Modeling Some Ideal Signals, Energy and Power Signals Frequency Response, Discrimination of Continuous-Time Signals Topological Models, Analysis of Continuous-Time Systems Properties of Elementary Signals Linear Convolution Integral, Response of Continuous-Time Systems

Unit II: Fourier Transform Properties of Fourier Transform, Tables of Fourier Transform Pairs Fourier Transform of Periodic Signals, Ideal Low-Pass Filter Frequency-Domain Analysis of Systems Fourier analysis of Sampled Signals

Unit III: Analysis of LTI Discrete-Time Systems: Time Domain and Frequency Domain, Properties of Discrete-Time Sequences Linear Convolution, Discrete-Time System Response.

Unit IV: Sampling: Representation of continuous time signals by its samples, reconstruction of a signal from its samples, aliasing, discrete time processing of continuous time signals, sampling of discrete time signals

Unit V: Z- Transform: Z- transform, the region of convergence for the z-transform, Inverse z- transform, properties of Z transform, analysis and characterization of LTI systems using z transforms, System function algebra and block diagram representations, the unilateral z ï transform.

Unit VI: Discrete Fourier Transform and Fast Fourier Transform Representation of Discrete-Time aperiodic signals and the Discrete-Time Fourier Transform; Fourier Transform for Periodic Signals; Properties of the Discrete-Time Fourier Transform; Discrete-Time LTI Systems and Discrete-Time Fourier Transform. Fast Fourier Transform (FFT)

Text Books:

1. Alan Oppenheim &Alan Willsky ,"Signals and Systems" Prentice Hall India Learning Private Limited; 2nd edition
2. P. Ramesh Babu R. Ananda Natarajan "Signals and Systems." Scitech Publications

Reference Books:

1. Fred Taylor,Principles of Signals and Systems ñTata McGraw-Hill, 1998, New Delhi
2. Nagrath, Sharan, Ranjan Rakesh and Kumar Sukhbinderò Signals and Systemsò Tata McGraw-Hill, 1998, New Delhi.
3. S Haykin and B Van Veen, ñSignals and Systems ñJohn wiley & sons

5EP04 Professional Elective - I

2. NETWORK ANALYSIS AND SYNTHESIS

Course Outcomes :

After completing this course student will be able to

1. Analyze the transient response of series and parallel A.C. circuits
2. Demonstrate the properties of network functions.
3. Demonstrate the properties of positive Real Functions
4. Synthesize driving point functions of RL, RC and RLC
5. Synthesize two port network functions
6. Design passive filters to meet desired specifications

Unit I: Transient Analysis:

Transient response of RC, RL and RLC circuit to various excitation signals such as step, ramp, impulse and sinusoidal signals.Network solution with Laplace transformation, initial and final value theorem and convolution integral.

Unit II: **Network Functions:**

Network Functionsfor one port & two-port networks, poles and zeroes of network functions. Restrictions on poles and zeroes locations for driving point functions and transfer functions. Time domain behavior of electrical network from the pole- zeroes plot.

Unit III: Positive Real function: Driving point function, Bruneôs positive real function, properties of positive real function, testing of driving point function. An application of Maximum Modulus Theorem, properties of Hurwitz polynomial, computation of residue, even and odd functions

Unit IV: Synthesis of One Port Networks
Properties of LC, RC and RL driving point functions and their synthesis in canonical (Foster and Cauer) forms. Synthesis of RLC driving point functions which can be synthesized by partial fraction or continued fractions

Unit V: **Synthesis of Transfer Functions**
Properties of transfer functions, Zeros of Transmissions (ZOTs), synthesis of Y21 and Z21 with 1ohm termination. Synthesis of transfer functions using constant resistance single and double terminated lattice and bridge T networks. Synthesis of open circuit transfer function

Unit VI: Filter fundamentals
Classification of filters, Analysis of prototype filter section, Analysis of a prototype Low Pass Filter, High Pass Filter, Band Pass Filter, Band Stop Filter, M–Derived Filter, Low Pass Filter with RC and RL Circuits, High Pass Filter with RC and RL Circuits, Low Pass Filter with RLC Circuit. Introduction of Different Types of Active Filters

Text Books :
1. Van Valkenberg, ñNetwork Analysisò,, Prentice Hall of India (PHI)
2. Sudhakar and Shyammohan,"Circuits and Networks: Analysis and Synthesis ,McGraw-Hill Education

Reference Books:
1. Van Valkenburg ñIntroduction to Network Synthesisò, Prentice Hall of India (PHI)
2. Kelkar, Pandit, ñLinear Network Theoryò, Pratibha Publication.
3. Franklin Kuo, ñNetwork Analysis and Synthesisò, Wiley international.
4. A.Chakrabarti, ñCircuit Theoryò Dhanpat Rai & Co.
5. C.L Wadhwa, ñNetwork Analysis and Synthesisò New Age International Publishers, 2007.

5EP04 Professional Elective – I

3. **ELECTRONIC COMMUNICATION THEORY**

Course Outcomes:
After successfully completing the course, the students will be able to
1. Explain various types of signal & elements of communication system.
2. Analyze the signal using Fourier Transform
3. Apply Amplitude modulation & Frequency modulation on the communication signal
4. Compare Pulse communication & Digital communication
5. Describe microwave communication system.

Unit I: Introduction to Electronics Communication Systems:
Signals: Analog & digital, Deterministic & Non-deterministic, Periodic & non periodic,Elements of Communication Systems, Transmitter, Receiver, Need for Modulation, bandwidth requirements, Noise, External, internal noise, noise calculation, noise figure.

Unit II: Signal Analysis:
Fourier Series, Exponential Fourier Series, Fourier Transform, Properties of Fourier Transform, Dirac Delta Function, Fourier Transform of Periodic functions, Fundamental of Power Spectral Density & Energy Spectral Density.

Unit III: Amplitude Modulation:
Amplitude Modulation Theory, Generation of Amplitude Modulation, Single Side band Communication, suppression of carrier, suppression of unwanted sideband, AM receiver.

Unit IV: Frequency Modulation:
Theory of Frequency Modulation, characteristics of FM, Generation of FM, pre-emphasis, De-emphasis, wide &Narrowband FM Transmission, FM receiver.

Unit V: A. Pulse Communication:
Information Theory, Classification of pulse modulation, Sampling process, pulse amplitude modulation, PWM and PPM modulation pulse code modulation.

B. Digital Communication:
Fundamentals of data communication systems, data sets and interconnection requirements.

Unit VI: Microwave communication system
Analog microwave communication: LOS, OTH microwave system Satellite communication: Satellite orbits, frequencies, attitude, transmission path.

Text Book: Electronic Communication System by Kennedy, Davis, TMH

Reference Books:
1. Electronics Communication by K.Shoenbcle PHI, India.
2. Electronics Communication techniques, Paul Young, Willey Eastern Pub.
3. Principle of C.E TMIL Taub Schilling.
4. Electronics Communication - Robert Shrader McGraw Hill.

5FEEP05 Open Elective – I
1. ELECTRICAL DRIVES

Course Outcomes:
After completing this course, Students will be able to:

1. Explain the basic Concept of electrical drives
2. Describe Power Electronics devices & their Applications
3. Demonstrate various starting, braking and speed control methods of D.C. Motors
4. Demonstrate various starting, braking and speed control methods of three phase Induction Motor.
5. Describe the construction, working principle and applications of single phase Induction Motor& special motors.

Unit I: Concept of electric drives, classification and comparison of electrical drive system, Cooling and heating of electric motors. Types of duties: continuous, intermittent and short time. Selection of an electric drive for particular applications.

Unit II: Theory, principle, Characteristics of Power Transistor, SCR, Power MOSFET and IGBT. Introduction to single phase & three phase fully controlled bridge convertors.

Unit III: D.C. Motors: Types, characteristics, Torque equation, Starting and braking, Speed controland Applications.

Unit IV: Three phase Induction Motors: Types, construction, principle of working, characteristics and applications. Starting and braking. Speed control methods: Thyristorized stator voltage control of three phase induction motor.

Unit V: Single phase Induction Motors: Double revolving field theory, Cross field theory,types, construction, principle of working, starting methods and applications.

Unit VI: Special Motors: Construction, Principle of working, and applications of D.C. servo motors, stepper motors, Brushless D.C. motors and Universal motor.

Text Books :

1. S.K.Pillai : A First Course on Electrical Drives by New Age International Publishing Co. Ltd
2. I.J.Nagrath & D.P.Kothari : Electric Machines by Tata Mc Graw Hill Publishing Co Ltd.

Reference Books :

1. VedamSubrahmanyam: Electric Drives : Concepts & Applications by Tata Mc Graw Hill Publishing Co Ltd.
2. Ion Boldea, Nasar. S A : Electric Drives by CRC Press India
3. Ashfaq Husain: Electric Machines by Dhanpat Rai & Co. Ltd
4. M.D.Singh &K.B.Khanchandani : Power Electronics by Tata Mc Graw Hill Publishing Co Ltd
5. V.K.Mehta: Principles of Electronics by S.Chand and Co Ltd ,New Delhi

5FEEP05 Open Elective-I:
2. POWER SUPPLY SYSTEM

Course Outcomes:
After completing this course student will be able to

- Describe the Structure of Power system
- Explain construction and working of various generation plants
- Describe layout and working of Substations
- Compare various power distribution system
- Explain Electrical wiring required for various Installations

Unit I: Structure of Power System :
Generation, transmission and distribution. Power generating stations ï different types. Steam power stations: Main parts and working, Water tube boiler, Fire tube boiler and their characteristics. Main flow circuits of steam power station. Power station auxiliaries,

Unit II: Gas-turbine power stations:
Main parts, plant layout and Bryton cycle operation. Combined cycle generation & Cogeneration. Nuclear power stations- Layout of nuclear power station, types of power reactors, main parts and control of reactors, nuclear waste disposal, radioactivity and hazards.

Unit III: Hydro-electric stations:
Site selection, constituents and schematic arrangement of hydroelectric stations, principles of working, types of turbines, Layout and working of Pumped storage plant.

Unit IV: Substation:

Classification of substations, Major equipment, Selection & location of site for substation, Main Electrical connections, Symbols for various apparatus & circuit elements in substation, 66/11kV and 11kV/400V substation Key diagram, Busbar layouts. Auxillary supply, substation earthing.

Unit V: Power distribution system:
Primary and secondary distribution, types of conductors in Distribution system. Connection Scheme: radial, parallel, ring main, comparison of distribution systems

Unit VI: Electrical wiring and installation:
Domestic, commercial and industrial wiring, main, sub-main and sub-circuit wiring.Types and need of Earthing.Fuse and disconnecting devices. Electrical Safety precautions.

Text Books :
1] Principles of Power System, by V K Metha and RohitMetha, S Chand Publication
2] Generation of Electrical Energy, by B R Gupta, S Chand Publication

Reference Books :
1] A Course in Power System J B Gupta, S Chand Publication
2] Elements of Electrical Power Station Design, by M. V. Deshpande, Wheeler publications
3] Electrical Installation Estimating & Costing by J. B. Gupta
4] Transmission & Distribution by H. Cotton.

5FEEP05 Open Elective – I
3. POWER PLANT ENGINEERING

Course Outcomes: -

1) Describe different Sources of Energy Generation
2) Explain the Working and layout of steam power plant & hydro power plant.
3) Discuss the working principle and basic component of Nuclear, Diesel & gas power plant
4) Illustrate various terms related to power plant economics & tariff.

Unit-I: Introduction:
Energy resources and their availability, types of power plants, selection of the plants, Introduction to basic thermodynamic cycles used in power plants, Conventional and non-conventional energy sources, Indian Energy Scenario.

Unit-II: Hydro Electric Power Plant:

Rainfall and run-off measurements and plotting of various curves for estimating stream flow and size of reservoir, Layout of Hydro power plant, operation of different components of hydro-electric power plant , classification of hydro Electric power plant, Pump Storage Plant, site selection, advantages & disadvantages

Unit-III: Steam Power Plants:

Flow sheet and working of modern-thermal power plants, super critical pressure steam stations, Layout of Thermal power plant , Site selection, coal storage, coal handling systems, ash handling systems, working of various parts: Economizer, air preheater, condenser, cooling tower, Electrostatic Precipitator, advantages & disadvantages

Unit-IV: Nuclear Power Plants:

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANada Deuterium- Uranium reactor (CANDU) fast breeder reactor, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants.

Unit-V: Diesel & Gas power plant:

Layout of Diesel power plant, functions of different components of diesel plant, advantages & disadvantages, Principle of Operation of Gas Turbine Plants, Open cycle gas turbine plant, closed cycle gas power plant, Combined gas and steam cycle.

Unit-VI: Power Plant Economics:

Load curve, energy load curve, energy duration curve, connected load, maximum demand, demand factor, load factor, diversity factors, plant capacity and utilization factor, types of loads, operating cost, annual plant cost, Generation cost, Depreciation, Objectives of Tariff, Types of Tariff.

Text Books:

1. Generation of electrical energy by B.R.Gupta, Eurasia Publishing House, New Delhi.
2. Power Plant Engineeirng; R. K. Rajput ; Laxmi Publications.

Reference Books:
1. Non conventional energy resources. By G.D.Rai, Khanna Publishers New Delhi
2. Principles of Power System by V.K.Mehta, S.Chand publication.
3. Conventional energy technology by S.B.Pandya, Tata McGraw Hill Publication.
4. Power Plant Engineeirng. P. K. Nag.

5EP06 POWER SYSTEM – I LAB

Student should perform minimum eight practicals based on the syllabus

List of Experiments:

1. To study the performance of a transmission line using a nominal T model.
2. To study the performance of a transmission line using a nominal ´ model.
3. To calculate A,B,C,D parameters for a transmission line by using nominal T model
4. To calculate A,B,C,D parameters for a transmission line by using nominal ´ model.
5. To study skin effect, proximity effect and Ferranti effect in transmission line.
6. To study Corona phenomenon and corona loss and its control in transmission line.
7. To study conversion of single line diagram to impedance diagram and reactance diagram for a typical power system.
8. To draw the circle diagram for a typical power system.
9. Study of a tap changing transformer (ON load and OFF load tap changing).
10. Study of static VAR generator and synchronous condenser.
11. To study different types of insulators used in power system & their comparison.
12. To conduct a dry and wet test on a pin type insulator.
13. To conduct a flashover test on an insulator.
14. To study a horn gap.
15. To study different types of power cables.
16. To study testing of cables.
17. To draw different Tower structures

Note: Above experiments may be conducted by using models, simulation, numerical, drawing sheets or experimentation.

5EP07 MICROPROCESSOR & MICROCONTROLLER- LAB

List of Experiments:

Student should perform minimum eight practicals based on the syllabus

1. Write an Assembly Language Program for the Addition of two 8-bit/16-bit numbers
2. Writean Assembly Language Program for the Subtraction of two 8-bit numbers
3. Write a Program for Finding the larger and smaller one among the two 8- bit numbers
4. Write a Program for Finding the largest/smallest number in array of 8-bit numbers
5. Write a Program for Masking and setting of nibbles
6. Write a Program for Block data transfer in same and reverse order
7. Write a Program for Sorting of even and odd numbers from an array of 8-bit numbers
8. Write a Program for Multiplication of two 8-bit numbers
9. Write a Program for Square wave generation using 8255 PPI
10. Write a Program for Stepper motor control using 8255 PPI
11. Write a Program for Interfacing ADC with 8085/8051using 8255 PPI
12. Write a Program for Interfacing DAC with 8085/8051 using 8255 PPI
13. Write a Program for Lamp load control using 8255 PPI
14. Write a Program for measurement of DC Voltage /Current using ADC, 8255 PPI
15. Study of Architectural Differences: Microprocessor 8085, and Mcrocontroller 8051

5EP08 ELECTRICAL MACHINES-II LAB

Student should perform minimum eight practicals based on the syllabus**.**

List of Experiments:

1. Perform the load test on three phase IM & plot its performance characteristics.
2. Perform the No load test on three phase IM to separate out its no load losses.
3. Estimate the performance parameters of three phase IM from its circle diagram.
4. Plot the equivalent circuit of three phase Induction motor.
5. Study of different types of starters used for three phase IM
6. Speed control of three phase squirrel cage Induction motor by various methods like stator voltage control method, frequency control method, changing number of poles.
7. Speed control of three phase Induction motor.
8. Perform the electric braking of three phase Induction motor.
9. Perform the load test on single phase IM & plot its performance characteristics.
10. Load test on three phase alternator to determine its performance parameters.
11. Synchronize the three-phase alternator with infinite bus-bar
12. Perform the OC & SC test on synchronous generator to estimate its regulation by EMF & MMF methods
13. Estimate the regulation of three phase alternator using ZPF method.
14. Perform the load test on three phase Synchronous motor.
15. Plot the V & inverted V curves of synchronous motor.

5EP09 INFORMATION & COMMUNICATION TECHNOLOGY - LAB

Student needs to complete minimum eight assignments based on the following:

Word Processing with MS-Word:

- Basic operations- Editing and Formatting text, paragraphs and pages, printing the documents.
- Working with tables, figures, images.
- Mail merge. Working with Charts, Equations, symbols.

Working with workbooks /work sheets.

- Data Entry techniques & Defining data set as a Table.
- Setting, Previewing, and Printing under MS-Excel.
- Performing Calculations, using Excel Formulas, Functions and Charts.
- Sorting/ Filtering data in excel sheet.

Working with MS Power Point.

- Presentation Basics. Adding more components to the slides, Printing the slides.
- Formatting Presentations, backgrounds and layout. Applying Themes. Using Slide Master.
- Working with Graphics, Images and Clips.
- Working with Multimedia. Inserting Sound and Narration.
- Delivering Presentations. Animating Objects. Adding Action effects.
- Live Presentation. Using Custom Shows.
- Saving/Protecting the Presentation.

Working with Latex:

- Basic operations- Editing and Formatting text, paragraphs and pages, printing the documents.
- Working with tables, figure & images.

Web Page Development:

- Introduction to HTML, CSS, JAVA Coding.
- Development of Web page.

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6EP01 POWER ELECTRONICS

Course Outcomes:

After completing this course student will be able to

1. Explain the concepts and techniques used in power electronics
2. Apply the knowledge of series and parallel connection of SCRs in power control applications
3. Analyze various single phase and three phase power converter circuits
4. Analyze the single phase and three phase Inverter circuits
5. Explain the operation of DC/DC and AC/AC converter circuits
6. Demonstrate the applications of power electronic circuits.

Unit I: SCR, Triac, Diac ï Construction and Applications, two Transistor Analogy of SCR, SCR turn ON mechanism, different methods for turning ON SCR, turn OFF mechanism, Thyristor firing circuits, introduction to Power MOSFET and IGBT their construction and characteristics.

Unit II: Series-Parallel operation of SCRs, firing circuits for series and parallel operations, static and dynamic equalizing circuit, equalization of current in parallel connected SCRs ,string efficiency, de-rating factors, protections of SCRs against di/dt, dv/dt, over-voltage and over-current protection, Gate protections, Electro Magnetic Interference(EMI) and Shielding.

Unit III: Principle of phase control, half wavecontrolled rectifier, half controlled bridge and fully controlled bridge rectifier for R, RL and RLE load, derivation for output voltage and current, effect of freewheeling diode, effect of source inductance.

Three phase half controlled bridge and fully controlled bridge rectifier.

Unit IV: Classification of circuit for forced commutation, series inverter, improved series inverter, parallel inverter, single phase PWM inverters, principle of operation of three phase bridge inverter in 120^0 and 180^0mode,single phase transistorized bridge inverter.

Unit V: Basic principle of Chopper, Time ratio control and current limit controlled technique, Voltage commutated Chopper circuit, Jones Chopper, Step up Chopper, Step down Chopper and AC Chopper.

Unit VI: Basic principle of cycloconverter, single phase to single phase cycloconverter, Introduction, principle of operation of single-phase voltage controllers for R and R-L load

Speed control of DC series motor using chopper, Speed control of DC shunt motor using phase controlled rectifier. Speed control of three phase Induction motor by stator voltage control method, V/f control.

Text Books:

1. M.D. Singh & K.B. Khanchandani, ñPower Electronics ñTata Mc-Graw Hill, New Delhi
2. Rashid Muhammad, H., ñPower Electronics: Circuits, Devices and Applicationsò, 2nd Edition. Prentice-Hall, 1998

Reference Books:

1. Mohan Ned, Undeland Tore, M. and Robbins William, P., ñPower Electronics: Converter, Applications and Designò, John Wiley & Sons, 1994.
2. LandevCyrill, W., ñPower Electronicsò, McGraw Hills, London, 1981.
3. Dewan, S.B. and Satrughan A., ñPower Semiconductor Circuitsò, John Wiley & Sons,
4. Dubey, G.K., Doradlla, S.R., ñThyristerised Power Controllersò, Wiley Eastern, 1987.

Unit III:Transformer Design – II:
Transformer Winding - types, and design calculation, Layout, no-load current calculation, primary and secondary winding resistance and leakage reactance from design data, mechanical forces ï types & causes.Estimation of efficiency & regulation from design data.
Cooling methods for a transformer, design of transformer tank. Calculation of cooling tubes.

Unit IV: AC winding Design :
Concentrated & distributed winding, Integral slot & fractional slot winding, Full pitch & short pitch windings, Single layer& double layer winding, distribution factor, coil pitch factor and winding factor, EMF equation, Development of winding diagrams.

Unit V: Induction motor stator design:
Specific electric and magnetic loadings selection, output equation, main dimensions (D&L) calculation, stator slot-numbers, shape and dimensions, stator teeth dimension, stator core dimensions.Air gap length calculation.

Unit VI: Induction motor rotor design:
Squirrel cage rotor design ï selecting number of rotor slots, design of rotor bars & slots, design of end rings. **Wound type rotor design** - rotor winding design, rotor slots design, and rotor core design. Bearings, shaft design. estimation of no-load current, stator and rotor winding resistances from design data, dispersion coefficient & its effect on performance of IM.

Text Books:
1. A. K. Sawhney, ñA Course in Electrical Machine Designò Dhanpat Rai & Co Ltd, 2016
2. R.K.Agrawal, ñPrinciples of Electrical Machine Designò, S.K.Kataria and Sons, Delhi

Reference Books:
1. M.G.Say,ñThe Performance and Design of Alternating Current Machinesò, C.B.S. Pub., Delhi.
2. K.G.Upadhyay,ñDesign of Electrical Machinesò, New Age international Publishers,1st Edition 2008
3. S.K.Sen,ñPrinciples of Electrical Machine Design with Computer Programsò, Oxford and I.B.H. Company Pvt. Ltd., New Delhi
4. IndrajitDasgupta, ñDesign of Transformersò, TMH 1st Edition 2002
5. Indian Standards for Transformer & Three phase IM design from BIS websites.

6EP04 Professional Elective - II
1. ADVANCED CONTROL SYSTEMS

Course Outcome
After completing this course students will be able to
1. Design compensator using time domain and frequency domain specifications
2. Represent system using state space model
3. Analyze controllability and observability for systems and design full state feedback controller.
4. Analyze digital systems using Z Transform
5. Develop the describing function for the nonlinearity to assess the stability of the system.
6. Analyzethe Nonlinear system using Phase plane Analysis

Unit I: Compensation Techniques:
Introduction, preliminary consideration of classical design. Lead compensator, Lag Compensator, Lead-Lag compensator, Feedback compensation in frequency domain.

Unit II: State Space Technique I:
State, state space and state variables ,SISO /MIMO linear systems state Variable models- differential equations, transfer functions, block diagrams And state diagrams. Transfer function decomposition ï Phase variable Forms, canonical forms and Jordan canonical forms, STM computation, L.T, Canonical transformation, and Cayley Hamilton theorem. Time Response ï SISO systems.

Unit III: State Space Technique II:
Concept-controllability and observability , SISO/ MIMO linear Systems Gilbertôs method and Kalmanôs test; SISO controllable Systems design ï state feedback.

Unit IV: Sampled Data Control Systems:
Representation, Z transform, Sampler and hold, ZOH, Open loop and closed loop SDCS, Z transfer Function, difference equation, solution, Pulse transfer function, Stability Analysis, S and Z domain relationship, Juryôs test, and bilinear Transformation. Root locus method.

Unit V: Non-Linear System Analysis I:
Non linear system behaviour, types and characteristics, Describing function Stability analysis limit cycles, Limitation of Describing function.

Unit VI: **Non-Linear System Analysis II**:

Linearization, Singular points, Classification and nature, Phase plane method, non linear system analysis, Phase trajectories, construction ï analytical and graphical method by isoclines, stability analysis, limit cycles, limitations ï phase plane method.

Text Books:

1. Nagrath and Gopal, òControl system Engineeringò Wiley Eastern Ltd , New Delhi
2. K.Ogata,ò Modern Control Theory ñPrentice Hall Of India Pvt Ltd , New Delhi.

Reference Books:

1. Naresh Sinha. ñControl system Engineeringò Wiley Eastern Pvt. Ltd., New Delhi.
2. B.C. Kuo. ñAutomatic Control systemò Prentice Hall Of India Pvt Ltd Delhi
3. D Roy Choudhury, ñModern Control EngineeringòPublisher: PHI Learning.

6EP04 Professional Elective – II:
2. PROCESS CONTROL SYSTEMS

Course Outcomes:

After Completing this course student will be able to

1. Explain the various Electronic Instruments for measurement of electrical parameters.
2. Analyse the different signals
3. Demonstrate the signal counting, recording and working of digital readout devices.
4. Demonstrate the Various techniques of A/D and D/A conversions.
5. Apply various signal processing tools as per requirement
6. Develop ladder diagrams &programmes for PLC

Unit I : Electronics Instruments for Measurement of Electrical Parameters Advantages of Electronic Instruments, Electronic Voltmeters Electronic Multi-meter, 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 Distortion Analysers, Spectrum Analysis.

Unit III: Signal Counting and Recording Decade counting Assembly, Binary counter, Decimal counter, Decade counter with digital display, universal counter, Digital readout devices, storage type CRO, Servo type X-Y recorder.

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 of A/D and D/A conversions. Modulation and demodulation PCM techniques, phase locked loop.

Unit V: Signal Processing Pulse times, triggered delayed sweeps, discrete pulse delay circuits, pulse sequencing, analog multiplexers and de-multiplexers, 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,TMH 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 A Course in Electrical & Electronics Instrumentation, Dhanpat Rai & Sons, New Delhi.

6EP04 Professional Elective – II
3. INDUSTRIAL ELECTRICAL SYSTEM

Course Outcomes:

At the end of this course, students will demonstrate the ability to

1. Understand the electrical wiring systems for residential, commercial and industrial consumers.
2. representing the systems with standard symbols and drawings, SLD.
3. Understand various components of industrial electrical systems.
4. Analyze and select the proper size of various electrical system components.

Unit I: Electrical System Components :
LT system wiring components, selection of cables, wires, switches, distribution box, meteringsystem, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse currentcharacteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator,Relays, MPCB, Electric shock and Electrical safety practices

Unit II: Residential and Commercial Electrical Systems:
Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

Unit III: Illumination Systems:
Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, flood lighting.

Unit IV: Industrial Electrical Systems – I:
HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction ï kVAR calculations, type of compensation, Introduction to PCC,MCC panels. Specifications of LT Breakers, MCB and other LT panel components.

Unit V: Industrial Electrical Systems – II:
DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing theDG, UPS and Battery Banks, Selection of UPS and Battery Banks.

Unit VI: Industrial Electrical System Automation:
Study of basic PLC, Role of in automation, advantages of process automation, PLC basedcontrol system design, Panel Metering and Introduction to SCADA system for distribution automation.

Text Book: S. L. Uppal and G. C. Garg, ñElectrical Wiring, Estimating & Costingò, Khanna publishers, 2008.

Reference Books:

1. K. B. Raina, ñElectrical Design, Estimating & Costingò, New age International, 2007.
2. S. Singh and R. D. Singh, ñElectrical estimating and costingò, Dhanpat Rai and Co.,
3. Web site for IS Standards.
4. H. Joshi, ñResidential Commercial and Industrial Systemsò, McGraw Hill Education, 2008.

6FEEP05 Open Elective – II
(1) ENERGY AUDIT AND MANAGEMENT

Course Outcomes:
After completing this course student will be able to:

1. Discuss energy scenario and its management.
2. Conduct the energy audit of different systems.
3. Determine the economics of energy conservation
4. Discuss various energy Conservation methods & their case studies
5. Explain fundamentals of Harmonics.

Unit I : Energy Scenario & Management:
Indian energy scenario, Energy needs of growing economy, Energy pricing in India Energy sector reforms, various forms of energy, Primary and secondary energy, commercial and non-commercial energy, Global primary energy reserves, Energy and environment, Necessity of conserving energy, Energy strategy for the future, Electrical energy management, Concept of supply side management and demand side management, Methods of implementing Demand side management and advantages to consumer, utility and society.

Unit II: Energy Audit:
Definition, Need of energy audit, Preliminary and detailed energy audit. Procedure for carrying out energy audit, Instruments used for energy audit, Data Analysis-Energyð production relationship, specific energy consumption, Sankey diagram, CUSUM Technique, Bench marking energy performance, Recommendations for energy conservation, Action plan, Executive Summary.

Unit III: Economics of energy conservation:
Cost factors, Budgeting, Standard costing and Sources of capital, Cash flow diagram and activity chart, Simple Payback period analysis, Time value of money, Net present value method, internal rate of return method, Profitability index for benefit cost ratio

Unit IV: Energy Conservation:
Energy conservation in motive power, Illumination, Heating & cooling systems, Pumping systems, thermal power stations and Transmission & Distribution Sector. Cogeneration &Waste heat recovery systems.

Unit V: Energy Audit Case Studies:

Energy Intensive Industries, Commercial, Industrial, Municipal and Agriculture Sector, IT industries, Hospitals.

Unit VI: Fundamentals of Harmonics:
Harmonic distortion, voltage versus current distortion, Power systems quantities under non sinusoidal conditions- active reactive and apparent power, displacement and true power factor, harmonic phase sequences, triplen harmonics, harmonic indices- Total harmonic distortion (THD), Total demand distortion (TDD) , Harmonic sources from commercial and industrial load.

Text Book: Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, Book-2, Book-3, Book-4 (available online BEE website)

Reference Books:
1. S. C. Tripathy, ñUtilization of Electrical Energy and Conservationò, McGraw Hill, 1991.
2. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)
3. Energy Conservation and Audit ByThumman, Fairmont Press
4. Energy Audit and Conservation TERI

6FEEP05 Open Elective – II (2) ELECTRICAL ESTIMATING & COSTING

Course Outcomes:
After completion of the course students will be able to
1. Understand methods of installation and estimation of service connection
2. Decide type of wiring, its estimation and costing for residential building
3. Carry out electrification of commercial complex, factory unit installations
4. Design & estimate for feeders & distributors
5. Understand contract, tendering and work execution process.

Unit I: Electrical Installation:
Classification of Electrical Installation, General requirement of Electrical Installation. Important definitions related to Installation.
Service Connection: Concept of service connection, Types of service connection & their features. Methods of Installation of service connection. Estimation of service connection.

Unit II : Residential Building Electrification :
Procedures for designing the circuits and deciding the number of circuits. Selection of type of wiring and rating of wires & cables. Earthing of Residential Installation. Estimate and cost Preparation of Residential Installation.

Unit III: Electrification of commercial Installation:
Concept of commercial Installation. Differentiate between electrification of Residential and commercial Installation Deciding the size of cables, busbar and busbar chambers. Earthing of the electrical Installation Selection of type wire, wiring system.Preparation of detailed estimate and costing of commercial Installation.

Unit IV: Electrification of factory unit Installation:
Concept of Industrial load. concept of Motor wiring circuit.Important guidelines about power wiring and Motor wiring.Selection and rating of wire, cable size. Sequence to be followed to prepare estimate. Preparations of detailed estimate and costing of small factory unit/ workshop.

Unit V: Design & estimate for feeders &distributors:

Different schemes for feeders & distributors, estimates for different feeders & distributors, Distribution transformer, Deciding Size & location, Estimate for outdoor & indoor type distribution substation.

Unit VI: Contracts, Tenders and Execution:
Tender and tender notices. Procedure for submission and opening tenders. Comparative statements, criteria for selecting contractors, General conditions in order form. Principles of Execution of works administrative approval, technical sanctions. Billing of executed work.

Text & Reference Books:

1. Electrical Design; Estimating and costing by K.B. Raina, S.K.Bhattacharya New Age International (p) Limited, New Delhi.
2. Electrical Estimating and costing by Surjit Singh Dhanpat Rai and company, New Delhi
3. Electrical Estimating and costing by N. Alagappan S. Ekambaram, Tata Mc Graw Hill Publication New Delhi

6FEEP05 Open Elective - II
3. ELECTRICAL MATERIALS

Course outcomes:
After completing this course students will be able to
1. understand importance of electrical engineering materials
2. understand how electric conduction takes place in conductors
3. understand importance of semiconductors and magnetic materials in electrical engineering.
4. understand importance of dielectric materials in electrical engineering.
5. Identify the need of special materials in electrical engineering.

Unit-I Introduction to Electrical Engineering Materials:
Importance of materials, Classification of electrical materials, Scope of electrical materials, Requirement of Engineering materials.Types of engineering materials, Levels of material structure.

Unit-II Conducting Materials:
Review of metallic conduction on the basis of free electron theory. variation of conductivity with temperature and composition, materials for electric resistors- General Electric properties; material for brushes of electrical machines, lamp filaments,fuses and solder.

Unit-III Semiconductors:
Semiconductors: Mechanism of conduction in semiconductors, types of semiconductors. Hall effect, compound semiconductors, basic ideas of amorphous and organic semiconductors.

Unit-IV Magnetic Materials:
Classification of magnetic materials- origin of permanent magnetic dipoles, magneto materials used in electrical machines, instruments and relays.
Magnetic Circuit terminology, Relation between relative permeability and magnetic susceptibility. Classification of magnetic materials, Diamagnetic, Paramagnetic, Ferromagnetic, Antiferromagnetic. Magnetization curve, Initial and maximum permeability. Hysteresis loop and loss, Eddy current loss.

Unit-V Dielectrics & Insulating Materials:
Dielectrics, Factors influencing dielectric strength. Capacitor materials. Insulating materials, Insulating Materials: Inorganic materials (mica, glass, porcelain, asbestos), organic materials (paper, rubber, cotton silk fiber, wood, plastics and bakelite), resins and varnishes, liquid insulators(transformer oil) gaseous insulators (air, SF6 and nitrogen) and ageing of insulators.

Unit-VI Materials for Special Applications:
Materials for solar cells, fuel cells and battery. Materials for coatings for enhanced solar thermal energy collection and solar selective coatings, Cold mirror coatings, heat mirror coatings, antireflection coatings, sintered alloys for breaker and switch contacts.

Text & Reference Books:

1. Electrical Engineering Materials by Dekker A.J (PHI)
2. Electrical Engineering Materials by S.P.Seth (Dhanpatrai and Sons)
3. An Introduction to Electrical Engineering Materials by Dr. C. S Indulkar & Dr. S. Thiruvelgadam (S Chand Publication)

6EP06 POWER ELECTRONICS LAB

Perform minimum eight experiments:
List of Experiments:

1. To verify the V-I characteristics of SCR
2. To verify forward and reverse characteristics of DIAC
3. To verify forward and reverse characteristics of TRIAC
4. To study UJT as relaxation oscillator
5. AC voltage control using triac - diac combination
6. To verify the operation of half and full controlled converter
7. To verify the operation of SCR commutation circuits
8. To design & simulate dc-dc buck converter
9. To design & simulate dc-dc boost converter
10. Construct and test the dc chopper control circuit using thyristor
11. Study of PWM based step down dc chopper using MOSFET/IGBT
12. To verify the operation of Single phase single pulse / sinusoidal PWM inverter using MOSFET/IGBT
13. To verify the operation of Single phase parallel inverter using MOSFET/IGBT
14. To verify the operation of Single phase to single phase cycloconverter
15. To verify the operation of Single phase dual converter With R - RL loads
16. To verify the operation of Single phase ac voltage controller

6EP07 ELECTRICAL ENERGY DISTRIBUTION & UTILIZATION LAB

Perform minimum eight experiments
List of Experiments:
1) Study of Distribution substation equipments.
2) Study of various types of busbar arrangements.
3) Study of Power distribution system.
4) Study of Distribution Automation system.
5) Prepare a report on visit to distribution substation.
6) Simulation of various types of Electrical Distribution System (Radial, Parallel, Ring main)
7) Development of single line diagram of of 33/11 kV substation in AutoCAD Electrical
8) Determination of Efficiency by Performing Load Test on Three-Phase Induction Motor.
9) Determination of Efficiency by Performing Load Test on DC Shunt Motor.
10) Electric Braking of DC.Shunt Motor.
11) Electric Braking of Three-Phase Induction Motor.
12) Speed Control of Three-Phase Slip-Ring Induction Motor.
13) Determination of Efficiency by Performing Load Test on Single-Phase Induction Motor.

7EP04 PROFESSIONAL ELECTIVE – III

1 WIND AND SOLAR SYSTEMS

Course Outcomes:

After successful completion of this course, students will be able to:

1. Understand the energy scenario and the consequent growth of the power generation from renewable energy sources.
2. Understand the basic physics of wind and solar power generation.
3. Understand the power electronic interfaces for wind and solar generation.
4. Understand the issues related to the grid-integration of solar and wind energy systems.

Unit I:
Physics of Wind Power: History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power-cumulative distribution functions.

Unit II:
Wind Generator Topologies: Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent-Magnet Synchronous Generators, Power electronics converters. Generator-Converterconfigurations, Converter Control.

Unit III:
The Solar Resource: Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.

Unit IV:
Solar Photovoltaic: Technologies-Amorphous, monocrystalline, polycrystalline, V-I characteristics of a PV cell, PV model, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms. Converter Control.

Unit V:
Network Integration Issues: Overview of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behaviour during grid disturbances. Power quality issues. Power system interconnection experiences in the world. Hybrid and isolated operations of solar PV and wind systems.

Unit VI:
Solar Thermal Power Generation:
Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, Elementary analysis.

Books Recommended:

Text Books:

1. T. Ackermann, “Wind Power in Power Systems”, John Wiley and Sons Ltd., 2005.
2. S. P. Sukhatme, “Solar Energy: Principles of Thermal Collection and Storage”, McGraw Hill, 1984.

References Books:

1. G. M. Masters, “Renewable and Efficient Electric Power Systems”**,** John Wiley and Sons, 2004.
2. H. Siegfried and R. Waddington, “Grid integration of wind energy conversion systems”, John Wiley and Sons Ltd., 2006.
3. G. N. Tiwari and M. K. Ghosal, “Renewable Energy Applications”, Narosa Publications, 2004.
4. J. A. Duffie and W. A. Beckman, “Solar Engineering of Thermal Processes”, John Wiley & Sons, 1991.

7EP04 PROFESSIONAL ELECTIVE – III

2 ELECTRICAL ESTIMATING & COSTING

Course Outcomes:

After successful completion of this course, students will be able to:

1. Understand methods of installation and estimation of service connection.
2. Decide type of wiring, its estimation and costing for residential building.
3. Carry out electrification of commercial complex, factory unit installations.
4. Design & estimate for feeders & distributors.
5. Understand contract, tendering and work execution process.

Unit I:
Electrical Installation:
Classification of Electrical Installation, General requirement of Electrical Installation, Important definitions related to Installation, Service Connection: Concept of service connection, Types of service connection & their features, Methods of Installation of service connection, Estimation of service connection.

Unit II:
Residential Building Electrification: Procedures for designing the circuits and deciding the number of circuits, Selection of type of wiring and rating of wires & cables, Earthing of Residential Installation, Estimate and cost Preparation of Residential Installation.

Unit III:
Electrification of Commercial Installation: Concept of commercial Installation, differentiate between electrification of Residential and commercial Installation Deciding the size of cables, busbar and busbar chambers, earthing of the electrical Installation Selection of type wire, wiring system, preparation of detailed estimate and costing of commercial Installation.

Unit IV:
Electrification of Factory Unit Installation:
Concept of Industrial load, Concept of Motor wiring circuit, Important guidelines about power wiring and Motor wiring, Selection and rating of wire, cable size, Sequence to be followed to prepare estimate, preparations of detailed estimate and costing of small factory unit/workshop.

Unit V:
Design & Estimate for Feeders & Distributors: Different schemes for feeders & distributors, estimates for different feeders & distributors, Distribution transformer, Deciding Size & location, Estimate for outdoor & indoor type distribution substation.

Unit VI:
Contracts, Tenders and Execution: Tender and tender notices, Procedure for submission and opening tenders, Comparative statements, criteria for selecting contractors, General conditions in order form, Principles of Execution of works administrative approval, technical sanctions, Billing of executed work.

Books Recommended:

Text Book:

1. N. Alagappan S. Ekambaram, “Electrical Estimating and Costing”, Tata Mc Graw Hill Publication, New Delhi

Reference Books:

1. K. B. Raina, S. K. Bhattacharya, “Electrical Design; Estimating and Costing”, New Age International (p) Limited, New Delhi
2. Surjit Singh, “Electrical Estimating and Costing”, Dhanpat Rai and Company, New Delhi

7EP04 PROFESSIONAL ELECTIVE – III

3. POWER SYSTEM OPERATION AND CONTROL

Course Outcomes:

After successful completion of this course, students will be able to:

1. Summarise the knowledge of preliminaries on power system operation and control.
2. Determine the optimal scheduling of generation for a two-plant system with and without losses for the economic operation of the power system.
3. Develop the mathematical model of the Automatic Load-Frequency Control (ALFC) loop and the Automatic Voltage Regulator (AVR) loop.
4. Build the block diagram of two area system.
5. Explain the role of the power system stabilizer in damping the steady-state oscillations set up in the power system.

Unit I:
Preliminaries on Power System Operation and Control: Power sector scenario in India: an overview,Players in the Indian power sector,Concept of grid: necessity and types of grids, Need of voltage and frequency control, Energy control centers (Load dispatch centers): Operation and functions, Levels of power system operation and control, SCADA: components and functions, Operating states of power system: normal state, alert state, emergency state, in extremis state and restorative state, State transition diagram showing various state transitions and control strategies.

Unit II:
A. Economic Operation – Part I: Meaning of optimum scheduling, definition of unit, plant load and system load, UCP and LSP, Input – Output characteristics, Heat rate characteristic, Incremental fuel rate, Incremental fuel cost, Reserve requirements: Installed reserves, spinning reserves, Cold reserves, Hot reserves, Methods of obtaining incremental fuel costs, Conditions for incremental loading, Optimum scheduling of generation between different units (Only two plant system without transmission loss).

B. 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.

Unit III:
1. 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.

2. Automatic Voltage Regulator (AVR): Functions of AVR, Types of Exciters, Brushless AVR loop: Exciter modeling, Generator modeling, Transfer function block diagram representation, Static performance, dynamic response, Stability compensation, Effect of generator loading.

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 – 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, Introduction to power system security.

Books Recommended:

Text Books:

1. O. L. Elgerd, "Electric Energy Systems Theory: An Introduction", Second edition, McGraw-Hill Book Comp. N. Y. 1987.
2. J. Nagrath, D. P. Kothari, "Modern Power System Analysis", Second edition, Tata Mc-Graw Hill Publishing Company, New Delhi.

Reference Books:

1. L. K. Kirchmayor, "Economic Operation of Power System", Wiley Eastern Pvt. Ltd., New Delhi.
2. B. R. Gupta, "Generation of Electrical Energy", S. Chand & Company Ltd.
3. P. S. R. Murty, "Power System Operation and Control", Tata Mc-Graw Hill Publishing Company, New Delhi.
4. Wood and Wallenberg, "Power Generation, Operation and Control", Willey Inter Science Publication.
5. Abhijit Chakrabarti, Sunita Halder, "Power System Analysis Operation and Control", PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.

7EP05 PROFESSIONAL ELECTIVE – IV

1 ARTIFICIAL INTELLIGENCE

Course Outcomes:

After successful completion of this course, students will be able to:

1. To understand and communicate fundamentals of Artificial Neural Networks and Systems.
2. To understand and present various learning methods and architectures of neural network.
3. To understand and describe fuzzy logic and genetic algorithm fundamentals and be able to solve problems.
4. To apply AI techniques to solve electrical engineering problems along with inter disciplinary problems.

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, Korhonen's self-organizing maps, Hopfield's networks.

Unit IV:
Introduction to Fuzzy: 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

Unit VI:
Genetic Algorithm (GA): Introduction to genetic algorithm, workingprinciple, 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.

Books Recommended:

Text Books:

1. J.M. Zurada, "Introduction to Artificial Neural Network", Jaico Publishing House.
2. T J Ross, "Fuzzy Logic with Engineering Application", Wiley Publication.

Reference Books:

1. G. J. Khir and T. A. Folger, "Fuzzy sets, Uncertainty and Information", PHI Publication.
2. Koska Bart, "Neural Network & Fuzzy systems", Prentice Hall of India Pvt Ltd, New Delhi.
3. Meherotra Kishan, Mohan C. K., Ranka Sanjay, "Elements of Artificial Neural Networks", Penram International Publishing (India) Pvt. Ltd.
4. D. E. Goldberg, "Genetic Algorithm in Search Optimization and Machine Learning", Addison-Wesley Longman Publishing Co., US.
5. Kalyanmoy Deb, "Optimization for Engineering Design Algorithms and Examples", Prentice Hall of India, New Delhi.

7EP05 PROFESSIONAL ELECTIVE – IV

2 ELECTRICAL DRIVES & CONTROL

Course Outcomes:
After successful completion of this course, students will be able to:

1. Explain the basic Concept of electrical drives
2. Demonstrate various modern speed, torque control techniques of DC drives
3. Demonstrate various modern speed, torque control techniques of AC drives

Unit I:
Introduction to Electrical Drives: Overview of electrical drive, comparison of DC & AC drive, components of load torque. Stability of an electrical drive. Introduction to frame of references (synchronous and rotating), Park and Clark transformation.

Unit II:
DC Drive Control: Introduction to Four quadrant operation of dc drive, reviewof principle of operation of the chopper, four quadrant chopper circuit operation. Steady state analysis of chopper-controlled DC motor drive: continuous and discontinuous current conduction. Closed loop speed controlled separately excited dc motor drive.

Unit III:
AC Drive Control: Review of basic principle of operation, speed control of induction motor: Impact of rotor resistance of the induction motor torque--speed curve. Review of slip energy recovery scheme. Closed loop control of slip energy recovery-controlled induction motor drive. Power electronic based rotor side control of slip ring Induction motor.

Unit IV:
Scalar Control of Induction Motor: overview of three-phase voltage source inverter, generation of three-phase PWM signals, sinusoidalmodulation, space vector theory, conventional space vector modulation, voltage fed inverter control: open loop v/f control, close loop speed control with v/f control and slip regulation.

Unit V:
Vector Controlled Drive: Review of DC drive analogy, equivalent circuit and phasor diagram, principles of vector control, direct or feedback vector control, flux vector estimation, indirect or feed forward vector control, vector control of line side PWMrectifier, statorflux-oriented vector control, vector controlof current Fed inverter drive.

Unit VI:
Direct Torque & Flux Control (DTC): Torque expression with stator & rotor fluxes, control strategy of DTC, Adaptive control: self-tuning control, Model Referencing adaptive control (MRAC), sliding mode control: Control Principle, sliding trajectory control of vector drive.

Books Recommended:

Text Books:

1. Bimal K. Bose, "Modern Power Electronics and AC Drive", Pearson Education.
2. Vedam Subrahmanyam, "Electric Drives: Concepts & Applications", Tata Mc Graw Hill Publishing Co Ltd.
3. Austin Hughes and Bill Drury, "Electric Motor and Drives: Fundamentals, Types and Applications", Newnes, Oxford.

Reference Books:

1. S. K. Pillai, "A First Course on Electrical Drives", New Age International Publishing Co. Ltd.
2. Gopal. K. Dubey, "Fundamentals of Electrical Drives", CRC Press
3. R. Krishnan, "Electric Motor Drives: Modeling, Analysis & Control", Prentice Hall of India Pvt Ltd.
4. M. D. Singh & K. B. Khanchandani, "Power Electronics", Tata Mc Graw Hill Publishing Co Ltd.
5. G. K. Dubey, "Power Semiconductor Controlled Drives", Prentice Hall.
6. Dr. P. S. Bimbhra, "Generalized theory of Electrical Machine", Khanna Publishers

7EP05 PROFESSIONAL ELECTIVE – IV

3 DISTRIBUTION AUTOMATION

Course Outcomes:

After successful completion of this course, students will be able to:

1. Summarize distribution system planning and automation.
2. Select appropriate communication technology for SCADA applied to distribution automation.
3. Demonstrate the knowledge of substation automation.
4. Improve the voltage profile of distribution feeder using distribution automation.
5. Explain the concept of remote metering.
6. Choose the appropriate type of energy management.

Unit I:
Distribution System Planning and Automation: Power Sector Reforms, Basic Distribution Systems, Short-Term Load Forecasting, Long-Term Energy Forecasting, Technological Forecasting, Problems with existing Distribution System, Need for Distribution Automation, Characteristics of Distribution System, Distribution Automation (Objectives, Functions, Benefits), Basic architecture of Distribution automation system, Feeder Automation, Communication Requirements for DA, Remote Terminal Unit (RTU), Communication Technologies for DA.

Unit II:
SCADA-Control and Communication: Introduction, Block Diagram, Components of SCADA, Functions of SCADA, SCADA applied to Distribution Automation, Advantages of DA through SCADA, Requirements and Feasibility, DA Integration Mechanisms, Communication Protocols in SCADA Systems.

Unit III:
Substation Automation: Introduction, Definition of Substation Automation, Benefits of Substation Automation, Functions of Substation Automation System, State and Trends of Substation Automation, Intelligent Affordable Substation Monitoring and Control, Advantages of an EEM (Enterprise Energy Management) Substation Automation Solution.

Unit IV:
Feeder Automation: Losses in Distribution Systems, System Losses and Loss Reduction, Network Reconfiguration, Improvement in Voltage Profile, Capacitor Placement in Distribution System for Reactive Power Compensation, Algorithm for location of capacitor.

Unit V:
Remote Metering: Background of Remote Metering, Components of AMR Systems, Communications Methods used for Meter Reading, AMR System, Services and Functions, Financial Analysis, Planning for AMR Implementation.

Unit VI:
Energy Management: Energy Management, Need Based Energy Management (NBEM), Demand Side Management (DSM), Maintenance of Automated Distribution Systems, Difficulties in Implementing Distribution Automation in Actual Practice, Urban/Rural Distribution.

Books Recommended:

Text Book:

1. Dr. M. K. Khedkar and Dr. G. M. Dhole, "A Textbook of Electric Power Distribution Automation", University Science Press (Laxmi Publications Pvt. Ltd.), 2011.

Reference Books:

1. Bassett, K. Clinard, J. Grainger, S. Purucker, and D. Ward, "Tutorial Course: Distribution Automation", IEEE Tutorial Publication 88EH0280-8-PWR, 1988.
2. James Northcote-Green, Robert Wilson, "Control and Automation of Electrical Power Distribution Systems" CRC Press, Taylor and Francis Group, 2007
3. James A. Momoh, "Electric Power Distribution, Automation, Protection, and Control", CRC Press, Taylor and Francis Group, 2007
4. S. Sivanagaraju, V. Sankar, "Electrical Power Distribution and Automation", Dhanpat Rai and Co, 2006.

7EP06 POWER SYSTEM – II LAB

Student should perform minimum eight practical based on syllabus.

List of Experiments:

1. Determination of Xd and Xq by slip test.
2. Determination of Xd' and Xd'' by sudden symmetrical short circuit test.
3. Determination of Xd'' and Xq'' by conducting static test.
4. Determination of X1, X2 and Xo by conducting direct test.
5. Determination of X1, X2 and Xo by conducting In-direct test.
6. Symmetrical Component Analysis of Unbalanced Three Phase Vector.
7. Symmetrical and Unsymmetrical Fault Analysis
8. Improvement transient stability using Facts Devices.
9. Power System Stability improvement using STATCOM.
10. Solution of swing equation using Point by Point Method.
11. Solution of swing equation using by Runge-Kutta method.
12. To Study Equal Area Criteria for transient stability.
13. To Study abc to dq0 (Parks) Transformation.
14. Transient stability analysis of a multi-machine power system.

7 EP07 DIGITAL SIGNAL PROCESSING LAB

Student will carry out minimum eight assignments based on syllabus. List of experiments is given below for reference.

List of Experiments:

1. To generate various continuous and discrete signals.
2. To verify sampling theorem.
3. To find linear convolution of given sequences.
4. To compute auto-correlation between two sequences.
5. To find impulse response of given system.
6. To find DFT and IDFT of given sequence.
7. To find FFT of a given sequence.

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			Total HOURS/WEEK	CREDITS	THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D			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	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

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 Technniques 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

*****

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.

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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Course Outcomes:

At the end of Measurement System course, the student will be able to:

1. Analyze different measurement systems.
2. Calculate different types of errors in the measurement system.
3. Use strain gauges and pressure measurement devices for several applications.
4. Compare different methods of force, Power and flow measurement using different methods.
5. Select appropriate liquid level and temperature measurement devices for given applications.
6. Measure speed of motors and rotating shafts by using tachometers, stroboscope.

UNIT I : 1. Generalized Measurement system: Significance of measurement, generalized systems. application of measuring instruments. Types of measuring instruments.
2. General configuration and functional elements of measuring instruments, types of inputs, various methods of correction for interfering and modifying inputs. (6 Hrs)

UNIT II : General performance Characteristics:-

1. Static characteristics, different types of errors, combination of component errors in overall systems.
2. Dynamic characteristics: General mathematical model of zero order, first order and second order instruments, response of first and second order instruments to following inputs step, ramp, impulse and frequency. (8 Hrs)

UNIT III : Strain Measurement :

1. Types of strain gauges, strain gauge circuits, calibration, Temperature compensation, use of strain gauges on rotating shafts, selection and installation of strain gauges.
2. Pressure Measurements:- Basic methods of pressure measurement: strain gauge pressure cell, High pressure measurement Bridgeman type, low pressure Measurement - Mcleod, Knudsen, ionisation, Thermal conductivity gauges. **(8 Hrs)**

UNIT IV : 1. Force Measurement: Various mechanical. Hydraulic, pneumatic and electrical methods.
2. Torque and Power Measurements: Various mechanical, hydraulic & electric methods.
3. Flow Measurements: Construction- orifice, Rota meter. Pressure probes- Pitot static tube, turbine meter, electro-magnetic flow meter. **(6 Hrs)**

UNIT V : 1. Temperature Measurements : Standards, Various temperature measuring devices, Bimetallic strip, pressure thermometers, thermo couples, electrical resistance thermometers, Thermistors, radiation Thermometers.
2. Liquid Level Measurements : Various methods such as- single float, displacement or force transducers. Pressure sensitivity, bubbler or Page system, capacitance variation type (for both conducting and non conducting type liquids) Resistance variation type. **(8 Hrs)**

UNIT VI: 1. Speed Measurements: Various mechanical type tachometers, electrical types tachometers, stroboscope etc.
2. Vibration Measurements : Seismic, Strain gauge and piezoelectric accelerometers.
3. Displacement measurements : Linear and angular displacement measurements, LVDT, LDR, Capacitive & inductive pick ups. **(8** Hrs)

BOOKS RECOMMENDED:

Text Books:-

1. Measurement Systems : - By Erenest O. Doebelins - MC Graw Hill.
2. Mechanical Measurement & Control: By D.S.Kumar.

References Books:-

1. Mechanical Measurements :- By T.G.Beckwith & N.L.Bulk - Addison Werllv.
2. Instrumental Measurement & Analysis : By Nakra Choudhari Tata Mc Graw Hill.
3. Mechanical Measurement & Instrumentation : By R.K.Rajput,Katsons Books Publications.

5ME05 OPEN ELECTIVE - I (1) PRODUCTION MANAGEMENT

Course Learning Objectives:

1. To study the new product design & manufacturing process technology.
2. To study the objectives of forecasting, factors affecting forecasting.
3. To study method study, work measurement.
4. To study objectives and functions of Production Planning and Control.
5. To study inventory control & inventory control application
6. To study quality management, quality related costs, quality function deployment & total quality management.

Course Outcomes:

1. Apply the knowledge of operations management and its applications in industrial environment.
2. Demonstrate the knowledge of advanced manufacturing technologies and philosophies.
3. Students will demonstrate the importance of inventory control, JIT in manufacturing.
4. Apply the basic concept of quality management, TQM etc.

UNIT I: Designing products, services and processes; Historical evolution of productions and operations management, newproduct designs, manufacturing process technology.
Flexible manufacturing systems (FMS) and computer integrated manufacturing (CIM). **(9 Hrs.)**

UNIT II: Sales Forecasting: Objectives, types of forecasting, factors affecting forecasting, process of sales forecasting, methods of sales forecasting. **(7 Hrs.)**

UNIT III : Work study: method study, recording techniques of method study, principles of motion economy. Work measurement techniques. **(7 Hrs.)**

UNIT IV: Production planning and control: Objectives and functions of PPC, types of production systems, principles of sound production control system. **(7 Hrs.)**

UNIT V: Inventory Control: Demand and control system characteristics, inventory concepts, costs Modeling, Deterministic inventory models, stochastic inventory models, inventory control application, just-in-time manufacturing. **(7 Hrs.)**

UNIT VI: Quality Management: Quality and quality related costs, quality function deployment(QFD), Taguchiôs off-line quality control methods, managerial responsibility in managing for quality products & services. TQM. Failure analysis, bath tub curve, Reliability of system. **(8 Hrs.)**

Books Recommended:

Text Books:

1. Production and operations management- concepts models and Behaviour by Everett E. Adam,Jr., & Ronald J. Ebert (Prentice- Hallof India)
2. Industrial engineering & production Management by M. Mahajan(Dhanpat Rai & Co.)

References Books:

1. Production and operations management ï Total Quality and responsiveness by Hamid Noori & Russell Radfort (Mc Graw Hill, Inc.)
2. Industrial engineering & management by O. P. Khanna (Dhanpat Rai& Co.)
3. Production and Operations Management; J.P. Saxena; McGraw Hill.

5ME05 OPEN ELECTIVE-I

(2) MANUFACTURING TECHNIQUES

Course Learning Objectives:

1. To study the fundamentals of different manufacturing processes and various activities in manufacturing.
2. To study the fundamentals of metals & alloys, properties of engineering materials like ferrous, non- ferrous metals and their alloys
3. To study different machine tools. cutting tools used in machine shop , various operations performed with working principles of these machine tools
4. To study the activities related to mechanical working of metals, various hot working & cold working operations fundamentals of metal forming ; sheet metal working processes with different tools and equipment
5. To study the necessary details regarding pattern making, moulding, core making and casting with foundry tools & equipment, also melting practice by cupola furnace.
6. To study different Joining processes, basic terms of welding processes tike arc welding, gas welding, resistance welding. friction welding , soldering ; brazing processes with tools & processes.
7. To study the methods of producing metal powders
8. To study plastic part manufacturing by different processes like extrusion. Injection, blow, compression, and transfer moulding processes.

Course Outcomes:

1. Apply the knowledge of various manufacturing techniques and its applications in engineering.
2. Understand the knowledge of machining operations, sheet metal working and processes.
3. Students will show the ability to apply various joining methods in practice.
4. Students will exhibit the knowledge of powder metallurgy.

Unit I : Overview of manufacturing: Classification of manufacturing processes, selection of manufacturing processes, types & properties of materials, selection of materials, Introduction to conventional and non-conventional machining processes. (6Hrs)

Unit II : Introduction to cutting type shaping processes, Basic concept of metal cutting, Types of cutting tools, Orthogonal & oblique cutting, General purpose machines Vs Special purpose machines. (8Hrs)

Unit III: Introduction & application of various metal cutting operations ï Turning, drilling, boring, milling, shaping, planning and grinding process. (8Hrs)

Unit IV: Introduction to metal forming and sheet metal process: Forming process- Forging, rolling, extrusion, wire drawing. Sheet metal processes- Forming, bending, drawing, coining, embossing. Cutting process: Punching, blanking, shearing, lancing. (7Hrs)

Unit V : Metal casting: Steps involved in casting, advantages of casting, pattern, difference between pattern and casting, pattern allowances, material used for patterns, molding sand, sand mould making core, types of cores, defects of castings, melting furnace(Cupola), casting process and its applications. (6Hrs)

Unit VI: Joining process with its types, advantages and disadvantages of riveting, soldering, brazing. Arc welding, gas welding, resistance welding, friction welding. (6Hrs)

Books Recommended:

Text Books:

1. Manufacturing processes ï Workshop practice, R.A. Khan, Ali Hassan, Scitech Pub.
2. Workshop Technology - Hajra Chaudhary, Dhanpat Rai and Sons.

Reference Books :

1. Processes and materials of manufacture E.P. Degarmo, Prentice Hall of India (PHI)
2. Material and processes in manufacturing Lindberg, Tata McGraw Hill Pub.

Course Outcomes:

1. Understand the basic system concept and study different types of systems.
2. Understand the concept Transient- Response analysis and will apply in numerical methods, the knowledge of basic control action and industrial controllers.
3. Understand the concept of Stability and exhibit the knowledge of root locus concept.
4. Understand the concept of Frequency Response method and use bode diagram in solving analytical problems.

Unit I: Introduction system concept, open & closed loop systems, Mathematical models of physical systems, transfer functions. Block diagrams reduction and signal flow graphs. (8 Hrs)

Unit II : Basic control actions and Industrial controllers :-Classification of industrial automatic controllers, control actions, proportional controllers, obtaining derivative and integral control action, effects of integral and derivative control action on systems performance. (7 Hrs)

Unit III : Transient Response Analysis :- Introduction Std. Test signals, steady state response of first and second order systems for stop, ramp and impulse input, transient response specifications, steady state error & error constants. (7 Hrs)

Unit IV: Concept stability, necessary condition for stability, Rauths stability criterion, Root locus concept, construction of Root loci, systems with transporation lag. (8 Hrs)

Unit V : Frequency Response methods :-Introduction, concept of Bode diagrams. (7 Hrs)

Unit VI : Study of important automatic speed control systems in machine tools, Prime movers, system generators, etc. Analysis of performance characteristics. (7 Hrs)

BOOKS RECOMMENDED:-

TEXT BOOKS :

1. Automatic Control Engineering by F. H. Ravan Mc-Graw-Hill.
2. Modern Control Engg. - by Katsuhiko Ogata, PHI, .
3. Control System Engg. - by Nagrath & Gopal.

REFERENCE BOOKS:

1) Automatic Control Engg. - by Kuo B.C. & F. Golnaraghi,
2) Modern Control System by Richard C. Dorf, Robert H. Bishop,

6ME04 PROFESSIONAL ELECTIVE-I (1) TOOL ENGINEERING

Course Learning Objectives (CLOs):

1) To study the basic geometries of different cutting tools, chip formation mechanism, tool force analysis etc. in metal cutting.
2) To understand the steps in designing and drawing of single and multipoint cutting tools and form tools.
3) To study the basic principles of workpiece positioning and clamping. To get acquainted with designs of locators, clamps, drill bushes and methods of location.
4) To understand the design and operation of various types of Jigs and Fixtures.
5) To develop a graphical design of a jig or fixture suitable to the requirements of a workpiece.
6)To understand the theory of metal cutting and how to estimate the required force and clearance amount in sheet metal cutting and forming operations.
7)To study construction and working of various types of dies used for different press working operations.
8) To study the steps in designing and drawing of different cutting, drawing and forming dies in press working.

Course Outcomes:

1. Create the design of single and multi-point cutting tools.
2. Apply the knowledge related to machining in order to estimate tool life and selection of cutting fluids.
3. Create the design of multipoint tools like twist drills, reamers, broach and milling cutters & press working dies like punching, blanking and drawing.
4. Analyze the real time problems of work holding by designing jigs and fixtures.

Unit I: Single Point cutting Tool: Shear angle, shear strain, velocity relations, un-deformed chip thickness, Merchant's circle, energy relations, nomenclature, single point cutting tool design, recommended speed, feed and depth of cut Form tools. Graphical approach of circular form tool design. (08 Hours)

Unit II: Jig & Fixture Design: Economics, principles of locations, types of locations, prevention of jamming, problems of chip & dust in location, use of dowels. Redundant location, Principles of clamping, types of clamps, power clamping, Tool guiding & tool setting, types of drill Jigs & fixtures, (07 Hours)

Unit III: Jig & Fixture Design: Design of Plate, Channel, Box, Turnover and Post type Drill Jigs. Design of Turning, Milling, Fixture, Broaching, Assembly & Welding Fixtures. (07 Hours)

Unit IV: Multi-point Cutting Tools: Types, Geometric elements and forces in various tools like Twist drills & Reamers, Circular Broaches, Milling Cutters, Taps and Dies, Gear shaper cutter & Gear Hobs. (07 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. (07 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 Compound, Combination and progressive dies miscellaneous dies- Horn die, Cam-action die, Rubber & Building die, Suppress die. (08 Hours)

Text Books:

1. Tool Design - Cyril Donaldson (Tata Mc-graw Hill)
2. Jigs & Fixtures - P.H.Joshi (Tata Mc-graw Hill)
3. Fundamentals of Metal Cutting & M/c Tools - Juneja (New Age International).
4. Fundamentals of Tool Design - A.Kumar (Dhanpatrai & Sons).
5. A Text book of Production Engineering- P.C.sharma (S.Chand Publication).

Reference Books :

1. Metal Cutting Theory & Cutting Tool Design- Arshinov (Mir Publications)
2. Tool Design - ASTME (ASTME)
3. Jigs and Fixture- Grantt.

6ME04 Professional Elective – I (2) NON-CONVENTIONAL ENERGY SOURCES

Course Learning Objectives (CLOs):

1. To study the introduction to renewable and non-renewable resources of energy.
2. To study the radiation transmission through covers & Solar Energy collections.
3. To study the solar energy utilisation and solar energy storage.
4. To study energy from ocean and energy from wind.
5. To study biomass energy resources like biomass and biodiesel.
6. To study photo voltaic cell, fuel cell and geothermal energy.

Course Outcomes (COs):

1. Able to study the concept of renewable and non-renewable sources.
2. Apply the basic concept of solar energy utilization and storage.
3. Apply the concept of energy from ocean and wind.
4. Study the concept of bio-mass energy resources.

UNIT I :

1. Introduction:- Global and Indian energy scenario, Need of Renewable energy, need, Renewable and non renewable energy sources, energy and environment,

2. Solar Radiation: Solar constant, Definitions of basic earth-sun angles. Types of Solar radiation, Measurement of solar radiation using Pyrheliometer, Pyranometer and Sunshine Recorder, estimation of solar radiation intensity. (7 hrs)

UNIT II :

1.Solar thermal systems : Low temperature applications: solar water heating, space heating, drying. High temperature applications, dish and parabolic collectors. Central tower solar thermal power plants. Solar energy storage and utilization: Methods of storage- mechanical, thermal, electrical storage systems.

2. Solar Photovoltaic Systems: Basic principle of power generation in a PV cell ; Types of photovoltaic cell, Application of PV; Brief outline of solar PV stand-alone system; Storage battery and Balance of system.(8 Hrs)

Unit III :

Wind Energy Systems: Potential of wind electricity generation in India and current scenario. Wind pattern and wind speed data, Types of turbines, Coefficient of Power, Betz limit. Wind electric generators, Power curve; wind characteristics and site selection; Windfarms for bulk power supply to grid. Application for pumping (7 Hrs.)

Unit IV :

Biomass Energy: Biomass: Sources and Characteristics; Wet biogas plants; Biomass gasifiers: Classification and Operating characteristics; Updraft and Downdraft gasifiers; Gasifier based electricity generating systems.

Biogas-Types of bio gas plants, factors affecting production rates. Introduction to biodiesel and ethanol as alternative fuels, (7 Hrs.)

Unit V : **Energy from Ocean:** Energy from tides, basic principle of tidal power, single basin and double basin tidal power plants, advantages, limitation and scope of tidal energy.

Ocean Thermal Electric Conversion (OTEC) systems like open cycle, closed cycle, Hybrid cycle, prospects of OTEC in India. Wave energy and power from wave, wave energy conversion devices, advantages and dis-advantages of wave energy (7 Hrs.)

UNIT VI : Fuel Cells: Introduction, working principle of fuel cell, Types of fuel cells, conversion efficiency of fuel cell, application of fuel cells.

Hydrogen Energy: Hydrogen as alternative fuel, Production methods, Hydrogen storage, **Geothermal Energy Resources:** Hot Dry Rock system, Vapor dominated, liquid dominated, flash steam, binary fluid and total flow concept of power generation. **(8Hrs)**

Books Recommended:

TEXT BOOKS:-

1. Solar Energy, S.P.Sukhatme, TMH.
2. Non-Conventional Energy Sources, G.D.Rai, Khanna Publications.
3. Non-Conventional Energy Sources, B. H. Khan

REFERENCE BOOKS:-

1. Treatise on Solar Energy : H.P. Garg; John Wiley & Sons.
2. Renewable Energy Conversion, Transmission and Storage, Bent Sorenson; Elsevier Publication
3. Renewalle Energy; GodfreyBoyle, Oxford University Press, Mumbai.

6ME04 PROFESSIONAL ELECTIVE-I
(3) COMPUTER AIDED DESIGN & SIMULATION

Course Learning Objectives (CLOs):

1. To study product cycle & fundamentals of CAD/CAM.
2. To understand the concept of representations of curves and surfaces.
3. To study the solid modeling techniques.
4. To study the geometric transformation techniques.
5. To study basic probability & statistics and physical modeling.
6. To study Simulation of Mechanical Systems & Simulation of manufacturing systems.

Course Outcomes (COs):

1. Understand the concept of CAD/ CAM and CIM .
2. Apply knowledge using CAD modeling for component design
3. Apply the knowledge of geometric transformation.
4. Understand the Mechanical & Manufacturing simulation systems.

Unit I: Fundamentals of CAD/CAM:
Product cycle and scope of CAD/CAM/CIM in product cycle, CAD/CAM, Hardware and software, selection of software, CAD workstation configurations. (6 Hrs)

Unit II: Representations of curves and surfaces:
Introduction to analytical curves, synthetic curves: Hermite cubic Spline, Bezier Curve, B- Spline curve. Surface Representation : Synthetic Surfaces, Applications of surface modeling. (6 Hrs)

Unit III: Solid Modeling :
2D Vs 3D modeling, Comparison of Wireframe, surface and solid modeling techniques, Geometry Vs Topology, Requirements of Solid Modeling Methods: Constructive Solid Geometry (CSG), Boundary Representation (B-rep), etc. (6 Hrs)

Unit IV: Geometric transformation
2D geometric transformations, Homogeneous co-ordinate representation, Composite Transformations, 3D transformations, Inverse transformations, geometric mapping. (8 Hrs)

Unit V: Introduction to statistics and physical modeling: A review of basic probability and statistics, random variables and their properties , Estimation of means variances and correlation. Physical Modeling- Concept of System and environment, Principles of modeling, types of models. (8Hrs)

Unit VI: Simulation of Mechanical Systems: Basic Simulation modeling, Role of simulation in model evaluation and studies, advantages of simulation Simulation of manufacturing Systems: Introduction to Flexible manufacturing systems, Simulation software for manufacturing. (8 Hrs)

Books Recommended :

Text Books:

1) P. N. Rao; CAD/CAM Principles and Applications; McGraw Hills Publications.
2) Mikel P. Groover and Emory W. Zimmers: Computer Aided Design and Manufacturing, Prentice hall.
3) Ibrahim Zeid: Mastering in CAD- CAM, Tata McGraw Hill Publication.
4) Geoffrey Gordon, System Simulation; Prentice Hall

Reference Books:

1) Mikell P. Groover: Automation, Production systems & Computer Integraded manufacturing, Prentice Hall.
2) Robert E. Shannon; System Simulation: The Art and Science ; Prentice Hall
3) J. Schwarzenbach and K.F. Gill Edward Arnold; System Modelling and Control
4) P. Radhakrishnan and Subramaniam: CAD/CAM/CIM, wiley Eastern Ltd.

6ME05 OPEN ELECTIVE -II
(1) NON-CONVENTIONAL ENERGY SOURCES

Course Learning Objectives(CLOs):

1. To study the introduction to renewable and non-renewable resources of energy.
2. To study the radiation transmission through covers & Solar Energy collections.
3. To study the solar energy utilisation and solar energy storage.
4. To study energy from ocean and energy from wind.
5. To study biomass energy resources like biomass and biodiesel.
6. To study photo voltaic cell, fuel cell and geothermal energy.

Course Outcomes (COs):

1. Understand concept of renewable and non-renewable sources.
2. Understand the basic concept of radiation transmission through covers and solar energy collections, the basic concept of Solar energy utilization and storage.
3. Demonstrate, concept of energy from ocean and wind.
4. Understand the concept of bio-mass energy resources, concept of direct energy conversion and fuel cell.

UNIT I :

1. **Introduction:-** Global and Indian energy scenario, Need of Renewable energy, need, Renewable and non renewable energy sources, energy and environment,
2. **Solar Radiation:** Solar constant, Definitions of basic earth-sun angles. Types of Solar radiation, Measurement of solar radiation using Pyrheliometer, Pyranometer and Sunshine Recorder, estimation of solar radiation intensity. (7 hrs)

UNIT II: Solar thermal systems. Low temperature applications: solar water heating, space heating, drying. High temperature applications, dish and parabolic collectors. Central tower solar thermal power plants.

Solar Photovoltaic Systems: Basic principle of power generation in a PV cell ; Types of photovoltaic cell, Application of PV ; Brief outline of solar PV stand-alone system ; Storage battery and Balance of system. (8 Hrs)

Unit III : Wind Energy Systems: Potential of wind electricity generation in India and current scenario. Types of turbines, Coefficient of Power, Wind electric generators, Power curve; wind characteristics and site selection; Windfarms for bulk power supply to grid. (7 Hrs.)

Unit IV : Biomass Energy: Biomass: Sources and Characteristics; Wet biogas plants ; Biomass gasifiers: Classification and Operating characteristics; Updraft and Downdraft gasifiers; Gasifier based electricity generating systems. Introduction to biodiesel and ethanol as alternative fuels, (7 Hrs.)

Unit V : **Energy from Ocean:** Energy from tides, basic principle of tidal power, single basin and double basin tidal power plants, advantages, limitation and scope of tidal energy. **Ocean Thermal Electric Conversion** (OTEC) systems like open cycle, closed cycle, Hybrid cycle, prospects of OTEC in India.

Wave energy and power from wave, wave energy conversion devices, advantages and disadvantages of wave energy. (7 Hrs.)

UNIT VI:

1. **Fuel Cells :** working principle, types of fuel cells, applications.
2. **Geothermal Energy Resources:** Hot Dry Rock system, Vapor dominated, liquid dominated, flash steam, binary fluid and total flow concept of power generation. (8Hrs)

BOOKS RECOMMENDED:

Text Books:

1. Solar Energy; S.P. Sukhatme; TMH
2. Non-Conventional Energy Sources; G.D. Rai; Khanna Publications
3. Non-Conventional Energy Sources; B. H. Khan.

Reference Books:

1. Treatise on Solar Energy; H.P. Garg; John Wiley & Sons.
2. Renewable Energy Conversion, Transmission and Storage; BentSorensen; Elsevier Publication
3. Renewable Energy; Godfrey Boyle; Oxford University Press, Mumbai
4. Renewable Energy Sources and Emerging Technology; D.P. Kothari, K.C. Singal, Rakesh Ranjan; PHI

6ME05 OPEN ELECTIVE-II (2) AUTOMOBILE ENGINEERING

Course Learning Objectives:

1. To study the Introduction of automobiles, engine types and working of SI and CI engines.
2. To study the fuel feed systems, their types and to understand the basics of cooling system.
3. To study the electrical system, Battery capacity and its ratings, starter motor drive and to understand the basics of Ignition system.
4. To study the basics of transmission system, clutches, gear boxes and to understand the principle of differential.
5. To study the braking system, steering system, wheel balancing and alignment and to study the introduction of power steering.
6. To study the basics of suspension system, shock absorbers and to study the types of lubricants and lubrication system, crankcase ventilation.

Course Outcomes (COs):

1. Understand the basics of automobile engineering and its components.
2. Analyze &develop about the cooling system and its function.
3. Understand basic concept of transmission system and types of gears box, basic concept of electrical system and ignition system.
4. Apply the knowledge of suspension and lubrication.

UNIT I : Introduction, Classification of automobiles, chassis layout, basic working of SI and CI engines, engine parts, engine types, Multiple cylinder engines. (7 Hrs)

UNIT II : Fuel feed systems- fuel feed systems for petrol and diesel engines, Basic principles of Multipoint Fuel Injection Systems(MPFI) and Common Rail Diesel Injection Systems(CRDI). Cooling system: purpose, Air cooling and liquid cooling system, radiator, by pass recirculation system, antifreeze mixtures. (7 Hrs)

UNIT III : The electrical system. Battery Capacity, standard capacity ratings, starter motor drive-Bendix drive. Ignition system:- Battery coil ignition system, Electronic ignition system. (7 Hrs)

UNIT IV: Transmission system:- Layout, Working principle of clutch, single plate friction clutch and multiplate clutch, Gear Boxes:- Sliding mesh, constant mesh gear box, Propeller shaft, Hotchkiss drive, torque tube drive, differential. (8 Hrs)

UNIT V: Braking system: Mechanical, hydraulic brakes, power brakes and vacuum brakes. Steering system:- Function, types of linkages, steering gears, wheel balancing, wheel alignment, camber, castor, king pin inclination, toe-in& toe-out & their effects, Introduction to power steering. (7 Hrs)

UNIT VI: Suspensions : shock absorbers, Rigid axle and independent suspension system, Auto lubrication :- Types of lubricants, their ratings, multi viscosity oils. Engine lubrication:- types of lubricating systems, full pressure system, dry sump system, crankcase ventilation. (6Hrs)

BOOKS RECOMMENDED:

Text Books:

1. Automobile Engineering- Vol. I & II; Kirpal Singh; Standard Publishers Distributors
2. Automobile Engineering; R.K. Rajput; Laxmi Publications, New Delhi

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.

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

SYLLABUS PRESCRIBED FOR B.E. SEMESTER VII & VIII

7ETC04 PROFESSIONAL ELECTIVE - III (PE-III)

(i) HIGH SPEED ELECTRONICS

Course Requisite:
4ETC02 Analog Electronics

Course Objectives: To learn:

1. Basic concepts of the active and passive devices.
2. Basics of non-ideal interconnect issues.
3. The PCB making design concepts.

Course Outcomes:
At the end of the course, students will demonstrate the ability to:

1. Explain significance and the areas of application of high-speed electronics circuits.
2. Analyze effect of noise in high speed application
3. Summarize the properties of various components used in high speed electronics
4. Design the various type of RF amplifier for high speed application
5. Explain the operation of the Mixer, Oscillator and PLL transceiver
6. Design the various types of PCB using CAD tool

Unit-1
Transmission line theory (basics): The Importance of Interconnect Design, Transmission Line Structures, Wave Propagation, Transmission Line Parameters, Transmission Line Reflections, Termination Schemes to Eliminate Reflections, Multiple Reflections, Crosstalk, Crosstalk Estimation, Crosstalk Termination Schemes. (6)

Unit-2
Basics of Non ideal Interconnect Issues, Transmission Line Losses, Concentric-Ring Skin-Effect Model, Serpentine Traces.
Noise Analysis: Sources, Noise Figure, Gain compression, Harmonic distortion, Inter modulation, Cross-modulation, Dynamic range. (6)

Unit-3
Buffer Modeling, Types of Models, CMOS Output Buffer, Digital Timing Analysis, Common-Clock Timing, Source Synchronous Timing, Clock Repeaters, Zero-Delay Clock Repeaters, Clock Jitter. (6)

Unit-4
Devices: Passive and active, Lumped passive devices (models), Active (models, low vs. high frequency). (6)

Unit-5
RF Amplifier Design, Stability, Low Noise Amplifiers, Broadband Amplifiers (and Distributed) Power Amplifiers, Class A, B, AB and C, D E Integrated circuit realizations. (6)

Unit-6
Printed Circuit Board: Printed Circuit Board Anatomy, CAD tools for PCB design, Standard fabrication, Microvia Boards. Board Assembly: Surface Mount Technology, Through Hole Technology, Process Control and Design Challenges. (6)

TextBooks:

1. Stephen H. Hall, Garrett W. Hall, James A. McCall “High-Speed Digital System Design: A Handbook of Interconnect Theory and Design Practices”, August 2000, Wiley-IEEE Press

2. Thomas H. Lee, “The Design of CMOS Radio-Frequency Integrated Circuits”, Cambridge University Press, 2004, ISBN 0521835399.
3. BehzadRazavi, “RF Microelectronics”, Prentice-Hall 1998, ISBN 0-13-887571-5.

Reference Books:

1. Guillermo Gonzalez, “Microwave Transistor Amplifiers”, 2nd Edition, Prentice Hall
2. Kai Chang, “RF and Microwave Wireless systems”, Wiley.
3. R.G. Kaduskar and V.B.Baru, Electronic Product design, Wiley India, 2011
4. Chris Schroeder , “PCB Design Using AutoCAD” 1st Edition, 1997

7ETC04 Professional Elective - III (PE-III)

(ii) Mobile Communication and Networks

Course Requisite:
4ETC01 Analog and Digital Communication

Course Objectives:

1. To know the evolution of Mobile communication and cell concept to improve capacity of the system.
2. To know the role of equalization in Mobile communication and to study different types of Equalizers and Diversity techniques.
3. To understand the concepts of orthogonal frequency division multiplexing.

Course Outcomes:
After completing the course, the students will be able to:

1. Explain basic concept of Cellular systems and standards
2. Demonstrate knowledge of Signal propagation model
3. Compare different multiple access techniques in mobile communication.
4. Summarise the concept of rake receiver
5. Demonstrate advance knowledge of MIMO
6. Compare different Mobile Communication Systems and standards

Unit-1
Cellular concepts: Evolution of Mobile Radio Communication Systems, 1G, 2G, 2.5G, and 3G Wireless Cellular Networks and Standards, Cell structure, frequency reuse, cell splitting and sectoring, Channel assignment, concept of handoff, Interference (both Adjacent Channel and Co-Channel), capacity, power control mechanisms. (7)

Unit-2
Signal propagation-Mobile Radio Propagation: Large Scale Path Loss, Free Space Propagation Model, Reflection, Ground Reflection (Two-Ray) Model, Diffraction, Scattering, Small Scale Fading and Multipath Propagation, Types of Small-Scale Fading: Time Delay Spread; Flat, Frequency selective, Doppler Spread. (7)

Unit-3
Multiple access schemes-Multiple access techniques in wireless communication: FDMA TDMA, CDMA, SDMA and Hybrid, Introduction of OFDM techniques. (5)

Unit-4
Receiver Structure- Diversity receivers- selection and MRC receivers, RAKE receiver, Equalization: Linear and Adaptive, Algorithms for adaptive equalization, space, polarization, frequency diversity, Interleaving. (6)

Unit-5

MIMO Channels: Physical modelling, MIMO and space time signal processing, spatial multiplexing, diversity/multiplexing tradeoff. (5)

Unit-6

Mobile Systems - GSM, GPRS, CDMA 2000 and WCDMA, LTE, Introduction to Cognitive Radio, Introduction to 5G (6)

Text Books

1. T.S.Rappaport, "Wireless Communications Principles and Practice", 2nd edition, PHI,2002.
2. William C.Y.Lee, "Mobile Cellular Telecommunications Analog and Digital Systems", 2nd edition, TMH, 1995. Asha Mehrotra, "A GSM system Engineering" Artech House Publishers Bosten, London,1997
3. V.K.Garg, J.E.Wilkes, "Principle and Application of GSM", Pearson Education, 5th edition, 2008.
4. V.K.Garg, "IS-95 CDMA & CDMA 2000", Pearson Education, 4th edition, 2009.

Reference Books:

1. D. Tse and P. Viswanath, Fundamentals of Wireless Communication, Cambridge Univ. Press, 2005.
2. A. Goldsmith, Wireless Communications, Cambridge Univ. Press, 2005.
3. A. Kumar, D. Manjunath, and J. Kuri, Wireless Networking, Morgan Kaufmann, 2008.

7ETC04 PROFESSIONAL ELECTIVE - III (PE-III)

(iii) MIXED SIGNAL DESIGN

Course Requisite

4ETC02 Analog Circuits

Course Objectives: The student will understand the concepts of –

1. CMOS Process flow, basic MOSFET and op-amp circuits,
2. Switched capacitors Circuits
3. Phase lock loops
4. Data Converter fundamentals.
5. Nyquist Rate A/D Converters and applications
6. The Oversampling Converters and Continuous-Time Filters

Course outcomes: After successfully completing the course, the students will be able to:

1. Expand knowledge of the CMOS Process, and op-amp design
2. Devise appropriate switch capacitor circuits
3. Analyze phase lock loop circuits
4. Use desired data converters in various applications.
5. Explain Various types of A/D Converters
6. Understand D/A converters

Unit-1

Submicron CMOS: Overview and Models, CMOS process flow, Capacitors and Resistors. Digital circuit design: The MOSFET Switch, Delay Elements, An Adder. Analog Circuit Design: Biasing, Basic Op-Amp Design. (6)

Unit-2

Switched Capacitor Circuits: Introduction to Switched Capacitor circuits basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, switched capacitor integrators, first order filters, Switch sharing. (6)

Unit-3

Phased Lock Loop (PLL): Basic PLL topology, Design and Analysis of various PLL blocks, Basic charge pump PLL, Non-ideal effects in PLLs, Design of FM detector circuit. (6)

Unit-4

Data Converter Fundamentals: DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters- Decoder based converters, Binary-Scaled converters, Hybrid converters. (6)

Unit-5

Nyquist Rate A/D Converters: Successive approximation converters, Flash converter, Interpolating A/D converters, Folding A/D converters, Pipelined A/D converters, Time interleaved converters. (6)

Unit-6

Oversampling Converters: Noise shaping modulators, Decimating filters and interpolating filters, Higher order modulators, Delta sigma modulators with multibit quantizers, Delta sigma D/A. (6)

Text Books:

1. Design of Analog CMOS Integrated Circuits- BehzadRazavi, Tata McGraw Hill, 2nd Edition
2. Analog Integrated Circuit Design- David A. Johns,Ken Martin, Wiley Student Edition

Reference Books:

1. CMOS Mixed-Signal Circuit Design - R. Jacob Baker, Wiley Interscience, 2009.
2. CMOS Analog Circuit Design –Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

7ETC05 PROFESSIONAL ELECTIVE - IV (PE-IV)

(i) INTRODUCTION TO MEMS

Course Requisite:

3ETC02: Electronic Devices & Circuits

Course Objectives: The learners will-

1. Understand Scope, importance and application of MEMS
2. Distinguish materials for MEMS devices
3. Examine fundamental laws governing MEMS devices
4. Summarize MEMS design process.
5. Recommend MEMS sensors and actuators
6. Devise MEMS Applications.

Course Outcomes:

After successfully completing the course, the students will be able to

1. Demonstrate skills to select appropriate material for MEMS devices
2. Understand fabrication process of MEMS
3. Select appropriate sensor and actuator in a given application.

Unit-1

Introduction: Historical background**,** classification, intrinsic characteristics of MEMS, miniaturization issues, microelectronic integration, precision parallel fabrication, scaling effects, future trends (6)

Unit-2

MEMS Materials: Overview, Physical Properties, Materials: Piezoelectric, Electrostrictive, Magnetostrictive, Magnetoelectric; Fluids: Magnetorheological and Electrorheological Fluids. (6)

Unit-3

Mechanics of solids in MEMS/NEMS: Stress, Strain, Hookes's law, Poisson effect, Linear Thermal Expansion, Bending; Overview of Finite Element Method, Modeling of Coupled Electromechanical Systems (6)

Unit-4

Review of Basic MEMS fabrication modules: Oxidation, deposition techniques, lithography (LIGA), Etching, Surface Micromachining, sacrificial layer processes, bulk micromachining, isotropic and anisotropic etching. (6)

Unit-5

MEMS Sensors and Actuation: Sensors and actuators consideration, Electrostatic Sensors, Micro Grippers, Micro Motors, Thermal Resistors, Thermal Bimorph , Piezoresistive Sensors, Pressure and flow Sensors (6)

Unit-6

Applications of MEMS : Electronics, automotive and medical; automotive airbag sensor, medical pressure sensor, blood Pressure Sensors, microphone, Bio-MEMS, acceleration sensing, gyros. (6)

Text Books:

1. G. K. Ananthasuresh, K. J. Vinoy, S. Gopalkrishnan K. N. Bhat, V. K. Aatre, "Micro and Smart Systems", Wiley India, 2012. 2.
2. S. E.Lyshevski, "Nano-and Micro-Electromechanical systems: Fundamentals of Nano-and Microengineering" (Vol. 8). CRC press, (2005).
3. S. D. Senturia, "Microsystem Design", Kluwer Academic Publishers, 2001.

Reference Books:

1. Tai-Ran Hsu, "MEMS and Microsystems Design and Manufacture", Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2002.
2. Chang Liu, "Foundations Of MEMS", Pearson Education Inc., 2012.
3. Mark Madou, "Fundamentals of Microfabrication", CRC Press, New York, 1997.

7ETC05 PROFESSIONAL ELECTIVE - IV (PE-IV)

(ii) ERROR CORRECTING CODES

Course Requisite

Analog and Digital Communication

Course Objectives:

After completing this course the students should be able to:

1. Understand Block Codes and Maximum Likelihood Decoding.
2. Understand Decoding Tables, Hamming Weight and Distance and Error Correction vs Detection.
3. Understand Generator Matrix, Parity-Check Matrix and Error-Correcting Capability of a Linear Code
4. Understand Binary Cyclic Codes, encoding with (n-k)-Stage Shift Register and Syndrome Calculations and Error Detection.
5. Understand Error Trapping Decoding for Cyclic Codes.
6. Understand BCH Codes and the encoding and decoding techniques.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand the error sources
2. Understand error control coding applied in digital communication
3. Able to transmit and store reliable data and detect errors in data through coding
4. Able to understand the designing of various codes like block codes, cyclic codes, convolution codes, turbo codes and space codes

Unit-1

Error Control Coding: Introduction to Error Control Coding, Types of Errors, Methods of Controlling Errors, Linear Block Codes: Matrix Description of Linear Block codes, Hamming Distance, Hamming Weight, Minimum Hamming Distance, Hamming Codes. (6)

Unit-2

Linear block codes: Systematic linear codes and optimum decoding for the binary symmetricchannel; Generator and Parity Check matrices, Syndrome decoding on symmetric channels;Encoder for Linear Block code, Syndrome Decoding, Syndrome Decoder for (n, k) Linear Block Code, Error Detection and Correction capability of Linear Block Codes (Derivation expected). (7)

Unit-3

Cyclic Codes: Properties of Cyclic Codes, Systematic and Non-Systematic generator Matrix, Parity Check Matrices for Cyclic Codes, Encoders for Cyclic Codes, Syndrome Decoding for Cyclic Codes.
Introduction to Convolution Codes: Time Domain Approach and Transform domain approach for convolution code generation, Code Tree and Code Trellis for Convolution code. (6)

Unit-4

Cyclic Codes. BCH codes; Reed-Solomon codes, MDS codes, Spectral properties of cyclic codes. ; Cyclic codes - Syndrome calculation, Encoder and decoder – CRC. (6)

Unit-5

Decoding of BCH codes: Berlekamp's decoding algorithm, Massey's minimum shift register synthesis technique and its relation to Berlekamp's algorithm. (5)

Unit-6

A fast Berlekamp - Massey algorithm. Convolution codes; Wozencraft's sequentialDecoding algorithm, Fann's algorithm and other sequential decoding algorithms; Viterbi decoding algorithm. (6)

Text Books:

1. F.J. McWilliams and N.J.A. Slone, The theory of error correcting codes, 1977.
2. R.E. Balahut, Theory and practice of error control codes, Addison Wesley, 1983.

Reference Books:

1. Digital Communications-Fundamental and Application - Bernard Sklar, PE
2. Digital Communications- John G. Proakis, 5th ed., 2008, TMH.

7ETC05 PROFESSIONAL ELECTIVE - IV (PE-IV)

(iii) ANTENNA AND PROPAGATION

Course Requisite:
3ETC04: Electromagnetic Waves

Course Objectives: The student will learn and understand

1. Basic terminology and concepts of Antennas.
2. Concept of radiation mechanism of various antennas and antenna array.
3. Principle of aperture antennas.
4. Concept of Broadband &Micro strip antennas.
5. Smart antenna environments & implementation.
6. Mechanism and models for radio-wave propagation

Course Outcomes:
At the end of the course, students will demonstrate the ability to:

1. Describe the basic concepts and applications of Antenna systems.
2. Determine the radiation pattern and directivity of antenna arrays.
3. Describe the concept of Huygens Principle &Babinet’s Principle.
4. Understated the properties of broadband antennas and micro strip antennas.

5. Describe thebasic principles of smart antenna systems.
6. Understand different ways of propagation of radio waves.

Unit-1:

AntennaFundamental: Concept of radiation, Radiation pattern, near-and far-fields, reciprocity, directivity and gain, effective aperture, polarization, input impedance, efficiency, Friis transmission equation. (6)

Unit-2:

Antenna Arrays: Radiation from Wires and Loops- Infinitesimal dipole, finite-length dipole, small circular loop, Antenna array, Analysis of uniformly spaced arrays with uniform and non-uniform excitation amplitudes, extension to planar arrays. (6)

Unit-3

ApertureAntennas: Huygens' Principle,radiationfromrectangularandcircularapertures,designconsiderations,Babinet'sprinciple, Radiationfromsectoralandpyramidalhorns,designconcepts, parabolic reflector and Cassegrain antennas. (6)

Unit-4

Broadband&Micro stripAntennas: Broadband Antennas: Broadband concept, Log-periodic and Yagi-Uda antennas, frequencyindependentantennas.Micro strip Antennas- Basic characteristics of micro strip antennas, feeding methods, Introduction of rectangular and circular patch antennas. (6)

Unit-5:

Smart Antennas:Smart Antennas: Concept and benefits of smart antennas, fixed weight beam forming basics, Adaptive beam forming. (6)

Unit-6:

WavePropagation: Modes of Propagation: Ground, Sky & Space Wave Propagations, Structure of Atmosphere, Fading, ionospheric absorptions, Multi-hop propagationand Super refraction. (6)

Text Books:

1. C. A. Balanis, "Antenna Theory and Design", 3rd Ed., John Wiley &Sons, 2005.
2. Harish A. R., Antenna and wave propagation, Oxford University Press. Tri T. Ha, "Digital
3. Satellite Communications", Tata McGraw-Hill,2009J.D.Kraus,"Antennas,McGraw-Hill,1988
4. R.S.Elliot, "Antenna Theory and Design", IEEE Press, John Wiley, 2005,
5. K.D.Prasad, "Antennas and Radiating Systems", Satyaprakasa

Reference Books:

1. R.E. Collin, Antennas and Radio Wave Propagation, McGraw Hill, 1985.
2. R.C. Johnson and H. Jasik, Antenna Engineering Handbook, McGraw hill, 1984.
3. I.J. Bahl and P. Bhartia, Micro Strip Antennas, Artech House, 1980.
4. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill, 2005.
5. R.E. Crompton, Adaptive Antennas, John Wiley.

8ETC03 PROFESSIONAL ELECTIVE V (PE-V)

(i) NANO ELECTRONICS

Course Prerequisite:
3ECTO2: Electronics Devices and Circuits

Course Objective:

1. The course intends to give students a broad understanding of fundamentals, fabrication technologies and applications of nano scale structures.
2. Students will also be trained for literature study and critique, oral presentation, problem formulation, solution development, and formal writing.
3. To introduce the students to nanoelectronics, nanodevices, spintronics and molecular electronics. To identify quantum mechanics behind nanoelectronics.
4. To describe the principle and the operation of nanoelectronic devices.
5. To explain the principle and application of spintronic devices.
6. To identify quantum mechanics behind nanoelectronics

Course Outcomes:
After successfully completing the course, the students will be able to:

1. Understand various aspects of nano-technology and the processes involved in making nanocomponents and material.
2. Leverage advantages of the nano-materials and appropriate use in solving practical problems.
3. Understand various aspects of nano-technology and the processes involved in making nanocomponents and material.
4. Leverage advantages of the nano-materials and appropriate use in solving practical problems.
5. Students will understand the divers electronic device fabrication.
6. Students will have in-depth technical knowledge in one or more areas of specialization

Unit- 1
Introduction: Recent past, the present and its challenges, Future, Overview of basic Nano electronics. Introduction to nanotechnology, meso structures, Basics of Quantum Mechanics: Schrodinger equation, Density of States. Particle in a box Concepts, Degeneracy. Band Theory of Solids. Kronig Penny Model. Brillouin Zones. (6)

Unit-2:
Nano electronics &Nano computer architectures: Introduction to Nano computers, Nano computer Architecture, Quantum DOT cellular Automata (QCA), QCA circuits, Single electron circuits, molecular circuits, Logic switches, Interface engineering, Properties (Self-organization, Size-dependent) – Limitations.
(6)

Unit-3
Nano electronic Architectures: Nanofabrication, Nano patterning of Metallic/Semiconducting nanostructures (e-beam/X-ray, Optical lithography, STM/AFM- SEM & Soft-lithography) – Nano phase materials – Self assembled Inorganic/Organic layers.
(6)

Unit-4:
Spintronics: Introduction, Overview, History & Background, Generation of Spin Polarization Theories of spin Injection, spin relaxation and spin dephasing, Spintronic devices and applications, spin filters, spin diodes, spin transistors.
(6)

Unit-5

Memory Devices and Sensors: Memory devices and sensors, Nano Ferroelectric random access memory, Fe-RAM circuit design, ferroelectric thin film properties and integration, calorimetric – sensors, semiconductor sensor array **(6)**

Unit-6

Shrink-down approaches: Introduction, CMOS Scaling, The nanoscale MOSFET, Finfets, Vertical MOSFETs, limits to scaling, system integration limits (interconnect issues etc.) **(6)**

Text Book:

1. Stephen D. Sentaria, Microsystem Design, Kluwer Academic Press
2. Marc Madou, Fundamentals of microfabrication & Nanofabrication.
3. T. Fukada&W.Mens, Micro Mechanical system Principle & Technology, Elsevier, 1998.
4. Julian W.Gardnes, Vijay K. Varda, Micro sensors MEMS & Smart Devices, 2001.
5. G.W. Hanson, Fundamentals of Nanoelectronics, Pearson, 2009.
6. K.E. Drexler, Nanosystems, Wiley, 1992.

Reference Books:

1. Nano Terchnology and Nano Electronics – Materials, devices and measurement Techniques by WR Fahrner – Springe
2. Nano: The Essentials – Understanding Nano Scinece and Nanotechnology by T.Pradeep; Tata Mc.Graw Hill.
3. Spin Electronics by M. Ziese and M.J. Thornton
4. Nanoelectronics and Nanosystems – From Transistor to Molecular and Quantum Devices by Karl Goser, Peter Glosekotter, Jan Dienstuhl
5. Silicon Nanoelectronics by ShunriOdo and David Feny, CRC Press, Taylor &Franicd Group
6. Nanotubes and nanowires by C.N.R. Rao and A. Govindaraj, RSC Publishing
7. Quantum-Based Electronic Devices and Systems by M. Dutta and M.A. Stroscio, World Scientific. 8. James R Sheats and Bruce w.Smith, "Microlithography Science and Technology", Marcel Dekker Inc., New York, 1998.
8. J.P. Hirth and G.M.Pound "Evaporation: Nucleation and Growth Kinetics" Pergamon Press, Oxford, 1963

8ETC03 PROFESSIONAL ELECTIVE V (PE-V)

(ii) WIRELESS SENSOR NETWORKS

Course Requisite:

7ETC04: Mobile Communication and Networks

Course Objectives:

1. Basic concepts of Wireless Sensor Networks
2. Architecture details of WSN
3. Case study of the WSN.

Course Outcomes: After successfully completing the course, the students will be able to,

1. Understand the basis of Sensors with its applications
2. To learn the architecture and placement strategies of Sensors
3. To analyze routing and congestion algorithms
4. To design, develop , and carry out performance analysis of sensors on specific applications
5. To explore and implement solutions to real world problems using sensor devices, enumerating its principles of working
6. To understand the working through the case study on WSN

Unit-1

Introduction to wireless sensor Networks – Advantages of ad-hoc/sensor networks, Unique constraints and challenges-. Applications Platforms for WSN: Sensor node hardware: mica2, micaZ, telosB, cricket, Imote2, tmote, btnode . Sensor node software introduction (Operating System): tiny0S, MANTIS, Contiki, and Ret0S. (7)

Unit-2

Single-Node Architecture. WSN coverage and placement: Coverage problems in WSN – Type of coverage – OGDC coverage Algorithm- Placement Problem. (6)

Unit-3

Topology management in wireless sensor Networks-: Different classification of topology management Algorithms- topology discovery-sleep cycle management. Medium access control in wireless networks. (6)

Unit-4

Routing in sensor networks: Data centric- position based routing- data aggregation- Clustered based routing Algorithms. (5)

Unit-5

Congestion and flow control: Source of congestion- congestion control scenarios- Protocols for congestion and flow control in sensor networks: ESRT-CODA-PSFQ-RCRT-RMST-Fusion. (6)

Unit-6

Hard ware design of sensor Networks : Characteristics – Design challenges- Design of Architecture- Functional components- Energy supply- operating system. Application: Home Control, Highway Monitoring, Environmental Engineering Applications. (6)

TestBooks:

1. Holger Karl and Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley & Sons, 2005.
2. Zhao and L. Guibas, “Wireless Sensor Networks”, Morgan Kaufmann, San Francisco, 2004
3. C. S. Raghavendra, K.M.Shivalingam and T.Znati, “Wireless Sensor Networks”, Springer, New York, 2004

Reference Books

1. Anna Hac, “Wireless Sensor Network Designs”, John Wiley & Sons, 2004.
2. KazemSohraby, Daniel Minoli and TaiebZnati, “Wireless Sensor Networks: Technology, Protocols, and Applications”, Wiley Inter Science, 2007.

8ETC03 PROFESSIONAL ELECTIVE V (PE-V)

(iii)WAVELETS

Course Requisite:

1. (5ETC03) Digital Signal Processing
2. (7ETC02) Digital Image and Video Processing

Course Objectives:

After taking this course student will be capable to

1. Introduce with basic concepts of Wavelets.
2. Understand the wavelet transform for continuous and discrete time signals

3. Study the basic concepts of multi resolution analysis.
4. Study filter bank algorithm in details.
5. Study the application of wavelet transform for data compression.
6. Learn the application of Wavelet transform in different fields.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Comprehend the fundamentals of wavelets.
2. Explain the concepts, theory, and algorithms related with wavelet transform.
3. Understand the modern signal processing tools using signal spaces, bases, operators etc.
4. Analyse wavelets, filter banks, and multiresolution techniques.
5. Understand data compression techniques using wavelets.
6. Comprehend projects ideas based on wavelet transform.

Unit-1

Introduction to Time Frequency Analysis: Vector Spaces, Properties, Dot Product, Dimension, Orthogonality and Orthonormality, Relationship Between Vectors and Signals, Signal Spaces, Signal representation using basis and frames, Brief introduction to Fourier transform and short time Fourier transform, Time frequency analysis (6)

Unit-2

Continuous Wavelet transform: Continuous Time Wavelets, definition of CWT, Construction of continuous wavelets: Spline, orthonormal, bi-orthonormal, Inverse continuous wavelet transform, Redundancy of CWT, zoom property of the continuous wavelet transform, Filtering in continuous wavelet transform domain (6)

Unit -3

Discrete Wavelet Transform and Filter Bank Algorithms: Introduction toDiscrete Wavelet Transform,Decimation and Interpolation, Convolution Followed by Decimation, Interpolation Followed by Convolution, Signal Representation in the Approximation Subspace, Wavelet Decomposition Algorithm, Reconstruction Algorithm (6)

Unit-4

Multiresolution Analysis: Introduction, Formal definition of MRA, Construction of general orthonormal MRA, A Wavelets basis for MRA, Digital Filtering Interpretations, Examples of orthogonal basis generating wavelets, interpreting orthonormal MRAs for discrete time signal (6)

Unit-5:

Wavelet Transform and Data Compression: Introduction, transform Coding, DTWT for Image Compression, Image compression using DTWT and run length coding, Embedded Tree Image Coding, Audio Compression, Audio Masking, standard specifying sub band implementation, wavelet-based audio coding, video coding using multiresolution techniques (6)

Unit-6

Applications of Wavelet transform: Introduction, Wavelet Denoising, speckle Removal, Edge Detection or Object Isolation, Image Fusion, Object detection by wavelet transform of projections (6)

Text Books:

1. Raghuveer Rao and Ajit S. Bopardikar, Wavelet transforms: Introduction to Theory and applications, Pearson Education Asia, 2000.
2. J. C. Goswami& A. K. Chan, Fundamentals of Wavelets: Theory, Algorithms, and Applications, 2nd edition, Wiley, 2011
3. S. Mallat, A Wavelet Tour of Signal Processing, 2nd edition, Academic Press, 1999.

Reference Books:

1. Y.T. Chan, Wavelet Basics, Kluwer Publishers, Boston.
2. J. S. Walker, A premier on Wavelets and their scientific applications, CRC press, 2002.
3. Gerald Kaiser, A Friendly Guide to Wavelets, Birkhauser, New York, 1995.
4. P. P. Vaidyanathan, Multirate Systems and Filter Banks, Prentice Hall, New Jersey, 1993.
5. A.N. Akansu and R.A. Haddad, Multiresolution signal Decomposition: Transforms, Subbands and Wavelets, Academic Press, Oranld, Florida, 1992.
6. B. Boashash, Time-Frequency signal analysis, In S. Haykin, (editor), Advanced Spectral Analysis, pages 418--517. Prentice Hall, New Jersey, 1991

8ETC03 PROFESSIONAL ELECTIVE V (PE-V)

(iv) BIO-MEDICAL ELECTRONICS

Course Requisite:

1.(3ETC02) Electronic Devices and Circuits
2.(5ETC01) Microcontroller
3.(7ETC02) Digital Image and Video Processing

Course Objectives:

1. Understanding role of engineers in medical field
2. Studying various electrical signals generated in human body.
3. To study various transducers, electrodes, recorders and problems for recording biomedical signals.
4. Study different medical imaging systems.
5. Introduction to patient care & safety
6. Introduction of various therapeutic life saving instruments.

Course Outcome:

After successfully completing the course, the students will be able to:

1. Understand fundamentals of Medical Instrumentation, Biomedical Signals and Electrode.
2. Identify and classify various Biomedical Transducers.
3. Illustrate the significance of human signals and recording techniques
4. Familiarize with Modern medical imaging systems.
5. Conceptualize requirements and importance of Patient Care and Monitoring and Safety.
6. Describe the function and necessity of Physiological and electrotherapy equipments.

Unit-1

Introduction: Sources of bioelectric potentials, Different bioelectric signals like ECG, EMG and EEG, Bio potential Electrode theory, Basic electrode, Electrodes for EEG, ECG, EMG, Biochemical electrodes. Skin contact Theory, motion artifacts, Nernst Equation. (6)

Unit-2

Biomedical transducers: Classification of Transducers-Pressure, force, acceleration, flow, respiration sensor, Smart sensors, pulse sensor, temperature, potential, dissolved ions and gases. (6)

Unit-3

Biomedical Recorders and Measurement: Biomedical recorders for EEG, ECG, EMG, Measurement of Blood Pressure: Direct method, Indirect methods- The Rheographic method, Ultrasonic Doppler shift method, Blood flow meter - Square wave electromagnetic, Measurement of Heart rate, Measurement of pulse rate.

(6)

Unit-4

Medical Imaging System: Instrumentation for diagnostics X-rays, X- rays basics properties, X-ray machine, Special imaging techniques: Computerized Axial Tomography (CAT), Ultrasonic imaging system: Physics of Ultrasound, Biological effect of ultrasound. Ultrasonics: A-scan, M-scan, B-scan (6)

Unit-5

Patient Care and Monitoring and Safety: System concepts, Bedside patient monitors, central monitors, Intensive care monitoring. Biotelemetry: Single channel and Multichannel bio-telemetry, PATIENT SAFETY: Electric shock hazards, leakage current. Types of Leakage current, measurement of leakage current, methods of reducing leakage current, precautions to minimize electric shock hazards.

(6)

Unit-6

Therapeutic Equipments &Ventilators: Need of Physiological and electrotherapy equipments. Cardiac pacemakers, Cardiac Defibrillators, Nerve and Muscle stimulators. Diathermy Machines: Short wave, Microwave, Ultrasonic. Ventilators: Mechanics of respiration, Artificial Ventilators, Microprocessor controlled Ventilators.

(6)

Text Books:

1. Khandpur R.S. “Handbook of Biomedical Instrumentation”, Tata Mc-Graw Hill, New Delhi.
2. Cromwell L. &Wiebell. F. J., “Biomedical Instrumentation”, PHI Publications.

Reference Books:

1. Webstar J.G., “Medical Instrumentation”, Third ed. John Wiely& Sons.
2. Carr & Brown, “Introduction to Biomedical Equipment Technology”, Prentice Hall.

ETC04 PROFESSIONAL ELECTIVE VI (PE-VI)

(i) 5G-6G MOBILE COMMUNICATION

Course Pre-requisites:

7ET04: Mobile Communication and Networks

Course Objectives:

1. To Understand latest trends in wireless technologies, a path towards 5G and 6G system.
2. To study network architecture, components, features and benefits of 5G system.
3. To understand various radio waveforms and channel model for 5G.
4. To understand different networking techniques in 5G system.

5. To study introduction of 6G system.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Illustrate the evolution of mobile communication leading to the introduction of 5G.
2. Explain the key innovations in radio and network.
3. Elaborate the standardization process and timeline for 5G
4. Identify the spectrum requirements.
5. Discuss key issues and challenges in 5G deployment.
6. Understand the concept of 6G

Unit-1

INTRODUCTION TO 5G: Historical trend and evolution of LTE technology to beyond 4G – Key building blocks of 5G – 5G use cases and System Concepts – The 5G Architecture – IoT: relation to 5G. (6)

Unit-2

RF FRONT END FOR 5G: Millimeter Wave Communications: Hardware technologies for mmW systems – Architecture and Mobility – Massive MIMO: Resource allocation and Fundamentals of baseband and RF implementations in massive MIMO - Beamforming (6)

Unit-3

5G WAVEFORMS AND CHANNEL MODELS: 5G Radio Access Technologies: Radio Access for V2X Communication - Radio access for massive machine-type communication - 5G wireless propagation channel models: Modelling requirements and scenarios

(6)

Unit-4

NETWORKING IN 5G: Coordinated multi-point transmission in 5G: Joint Transmission CoMP enablers - Distributed cooperative transmission - Relaying and network coding in 5G: Multi-flow wireless backhauling - Buffer aided relaying

(6)

Unit-5

APPLICATIONS of 5G: Machine-type communications: Fundamental techniques for MTC - Massive MTC - Ultra-reliable low-latency MTC - Device-to-device (D2D) communications - Multi-hop D2D communications - Multi-operator D2D communication - Simulation methodology: Evaluation methodology – Calibration

(6)

Unit-6

INTRODUCTION TO 6G:

Key building blocks of 6G – 6G use cases and System Concepts – The 6G Architecture

(6)

Text Books:

1. Wei Xiang, Kan Zheng, Xuemin (Sherman) Shen, - 5G Mobile Communications, Springer, 2017.
2. AfifOsseiran, Jose F. Monserrat and Patrick Marsch, - 5G Mobile and Wireless Communications Technology, Cambridge University Press, 2016.

Reference Book:

Jonathan Rodriguez, - Fundamentals of 5G mobile networks, John Wiley & Sons, Ltd, 2015.

8ETC04 PROFESSIONAL ELECTIVE VI (PE-VI)

(ii) Information Theory and Coding

Course Prerequisite
3ETC03: Digital System Design
4ETC01: Analog and Digital Communication

Course Objectives
Students undergoing this course are expected to:

1. Understand the basics of information theory and coding theories.
2. Introduce the concept of amount of information, entropy, channel capacity, error-detection and error-correction codes, block coding, convolution coding.
3. Understand and explain the basic concepts of information theory, source coding, channel and channel capacity, channel coding and relation among them.
4. Describe the real life applications based on the fundamental theory.
5. Calculate entropy, channel capacity, bit error rate, code rate, and steady-state probability and so on.
6. To get exposed to information and entropy, compression technique, audio & video

Course Outcomes:
After successfully completing the course, the students will be able to:

1. Understand the concept of information and entropy
2. Understand Shannon's theorem for coding
3. Calculation of channel capacity
4. Discuss the various capacity reduction based coding techniques for text, audio and speech type of data
5. Compare various capacity reduction based coding techniques for image and video type of data.
6. Implement various error control techniques for Convolutional codes

Unit-1
Basics of information theory, Entropy, Information rate, classification of codes, entropy for discrete ensembles;Source coding theorem, Shannon-Fano coding, Huffman coding. (6)

Unit-2
Extended Huffman coding – Joint and conditional entropies, Mutual information – Discrete memoryless channels – BSC, BEC – Channel capacity, Shannon limit Shannon's noiseless Coding theorem; Encoding of discrete sources. (6)

Unit-3
Markov sources; Shannon's noisy coding theorem and converse for discrete channels; Calculation
of channel capacity and bounds for discrete channels; Application to continuous channels. (6)

Unit-4
Text: Adaptive Huffman Coding, Arithmetic Coding, LZWalgorithm
Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audiolayers I,II,III, Dolby AC3 –Speech: Channel Vocoder, Linear Predictive Coding. (7)

Unit-5:
Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF – Imagecompression: READ, JPEG Video Compression: Principles-I, B, P frames, Motion estimation,Motion compensation, MPEG standard. (6)

Unit-6
Techniques of coding and decoding; Huffman codes and uniquely detectable codes;Cyclic codes, convolutional arithmetic codes. **(**5)

Text Books :

1. N. Abramson, Information and Coding, McGraw Hill, 1963.
2. M. Mansurpur, Introduction to Information Theory, McGraw Hill, 1987.

Reference Books :

1. R.B. Ash, Information Theory, Prentice Hall, 1970.
2. Shu Lin and D.J. Costello Jr., Error Control Coding, Prentice Hall, 1983.
3. Ranjan Bose, Information Theory, Coding and Cryptography, Publication,2005

8ETC04 PROFESSIONAL ELECTIVE VI (PE-VI)

(iii) Scientific Computing

Course Prerequisite
3ETC01: Engineering Mathematics-III

Course Objective :
To enable the student to understand

1. the basics of scientific computing
2. variety of tools and techniques to transform into computer model
3. Use of Matlab and python in scientific computing

Course Outcome : After successfully completing the course, the students will be able to:

1. View scientific computing as the point of intersection between computer science, numerical mathematics, and modeling.
2. introduce to numerical mathematics and prepares them for the scientific computing part.
3. Learn to solve Nonlinear equations useful for computer models
4. Learn to solve Numerical differentiation useful for computer models
5. Learn to use MATLAB
6. Learn to use python for the applications in scientific computing

Unit-1
Introduction to scientific computing, applications involving scientific computing, Tools and languages to solve complex scientific problems **(6)**

Unit-2
Systems of Linear Algebraic equations: Introduction, Gauss Elimination Method, LU decomposition, Symmetric and banned coefficient Matrices, Pivoting, Matrix Inversion, Iterative Methods, Other methods. **(6)**

Unit-3
Solving Nonlinear Equations. The Bisection Method for Root-Finding.,Convergence Criteria and Efficiency, Scripts and Function Files , The False Position Method, The Newton—Raphson Method for Root-Finding , Fixed Point Iteration. (6)

Unit-4
Numerical Differentiation: Finite Difference approximations; Numerical Integration; Initial Value Problems; Two-Point Boundary Value Problems; Symmetric Matrix Eigen value problems; Introduction to Optimization.
(6)

Unit-5
Basics of MATLAB. Defining and Using Scalar Variables, Saving and Reloading the Workspace, Defining and Using Arrays, Operations on Vectors and Matrices,more on Plotting Functions of One Variable, Loops and Logical Operators, Working with indices and arrays, Number representation.
(6)

Unit 6 : Scientific computation using python - Statistical data analysis, image processing, web development and hardware interfacing using Python (**6)**

Text Books

1. Hans PetterLangtangen, A Primer on Scientific Programming with Python (Link)
2. Claus Fuhrer, Jan Erik Solem, Olivier Verdier, Scientific Computing with Python 3Packt Publishing Limited
3. Martin C. Brown, Python: The Complete Reference, McGraw Hill Education
4. Hemant Kumar Mehta, Mastering Python Scientific Computing, Packt Publishing Limited

Reference Books

1. By Dan StanescuLong Lee ,"A Gentle Introduction to Scientific Computing ", First edition Chapman and Hall/CRC
2. JaanKiusalaas, "Numerical Methods in Engineering with Python", Cambridge University Press, 2005.

Text Books:

1. Nagoorkani,ñDigital Signal Processingò,Tata McGraw-Hill Education, Second Edition.
2. S.Salivahanan, A.Vallavaraj,ñDigitalSignalProcessingò,TataMcGraw-HillEducation,2001.

References:

1. Oppenheim&Schafer,ñDiscretetimeProcessingò,PHI.
2. Proakis&ManolakisD.G.,ñDigital Signal Processingò,PHI.
3. MitraS.K.,ñDigital Signal Processingò, TMH.
4. Roman Kuc,ñDigital Signal Processingò, MGH.
5. IfeacherE.C.,JervisB.W.,ñDigital Signal Processingò,AddisonWesley.
6. P.P.Vaidyanathan,ñDSP and Multirate Systemsò, PHI.

5ETC04 Professional Elective - I (PE-I): (i) POWER ELECTRONICS

Course Pre-Requisite:

1. 1B3Basic Electrical Engineering.
2. 3ETC02 Electronic Devices and Circuits.

Course Objectives:

1. To introduce power electronics devices; SCR, TRIAC, IGBT, MOSFET and to learn their characteristics.
2. To develop the ability to analyze the dynamics in power electronic converters/drives systems.
3. To study AC-DC converters and effect of freewheeling diode.
4. To study AC-AC, DC-AC, DC-DC converters.
5. To build and test circuits using power devices such as SCR
6. To study applications of power converters in DC drives.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Analyze the characteristics of various power electronics devices .
2. Understand SCR firing circuits, commutation techniques.
3. Analyze and design controlled rectifiers and dual converters
4. Analyze and design DC to DC, AC to AC converters and DC to AC inverters,
5. Design and develop power electronic circuits for various applications.
6. Know various applications of power converters in DC drives.

	Subject: POWER ELECTRONICS	L
Unit-1	SCR -construction, characteristics, two transistor analogy for turning ON-OFF a SCR, different methods of turning ON of a SCR, turn OFF mechanism, Thyristor firing circuit using UJT, Protection of SCR (snubber circuit)	6
Unit-2	Triac, Diac-construction, characteristics. power transistor, power MOSFET, IGBT - their construction & characteristics, Introduction to GTO, Classification of circuit for forced commutation.	7
Unit-3	Principle of phase control, single phase half wave controlled rectifier, half controlled bridge & fully controlled bridge rectifier for resistive and RL load, derivation for output voltage and current, effect of freewheeling diode, single phase dual converters.	6
Unit-4	Series inverter, improved series inverter, parallel inverter, principle of operation for three phase bridge inverter in 120 deg. and 180 deg. mode, single phase transistorized bridge inverter.	6
Unit-5	Basic principles of chopper, time ratio control and current limit control techniques, voltage commutated chopper circuit, Jones chopper, step-up chopper, step up/down chopper and AC chopper.	6
Unit-6	Basic principle of cyclo-converter, single phase to single phase cyclo-converter. speed control of DC series motors speed control of DC shunt motor using phase controlled rectifiers UPS, fan speed regulator	5
	Total	**36**

Text Books:

1. M.D.Singh, K.B. Khanchandani, ñPower Electronicsò, Tata McGraw-Hill.
2. Muhammad H. Rashid, ñPower electronicsò Prentice Hall of India.

References:

1. Ned Mohan, Robbins, ñPower electronicsò, edition III, John Wiley and sons.
2. P.C. Sen., ñModern Power Electronicsò, edition II, Chand& Co.
3. V.R.Moorthi, ñPower Electronicsò, Oxford University Press.
4. Cyril W., Lander,ò Power Electronicsò, edition III, McGraw Hill.
5. G K Dubey, S R Doradla,: Thyristorised Power Controllersò, New Age International
6. Publishers. SCR manual from GE, USA.

5ETC04 Professional Elective - I (PE-I): (ii) FIBER OPTICS COMMUNICATION

Course Pre-Requisite:

1. 3ETC04 Electromagnetic Waves
2. 4ETC01 Analog and Digital Communication

Course Objectives:

1. To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures
2. To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors
3. To learn the various optical source materials, LED structures, quantum efficiency, Laser diode
4. To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration
5. To learn the fiber optical network components, variety of networking aspects, operational principles WDM.
6. To learn and understand the applications.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Understand the principles fiber-optic communication, the components and Losses and dispersion in fiber.
2. Understand the properties of the optical fibers and optical components in sources.
3. Understand operation of lasers, LEDs, and detectors in fiber
4. Analyze system performance of optical communication systems in networks
5. Understand the block diagram of FOC System with Power budgeting parameters.
6. To apply the knowledge of fiber optical components, links, and systems.

	Subject: FIBER OPTICS COMMUNICATION	L
Unit-1	**Optical Fiber Communication System:** Basic optical laws and definitions, Optical fiber modes andconfigurations, N.A. Attenuation: Units, absorption, scattering losses radioactive losses, core and cladding losses.Step index fibers, Graded index fibers, Single mode fibers, Cutoff wavelength, Mode field diameter, effective refractive index.Material dispersion, wave guide dispersion, intermodal dispersion. [Numerical based on N.A. and mode calculations]	6
Unit-2	**Optical Sources:** Light Emitting Diodes: Structure, Light source materials. Laser Diodes: Structure, threshold conditions, Modulations of laser diodes. Light source linearity, reliability considerations.	6
Unit-3	**Optical Detectors:** Principles of photodiodes, Photo detector noise, Detector response time, Avalanche multiplication noise, Temperature effect on avalanche gain.	6
Unit-4	**Optical switches** Coupled mode analysis of directional couplers, electro-optic-switches. Optical amplifiers - EDFA, Raman amplifier	6
Unit-5	WDM and DWDM systems. Principles of WDM networks. Nonlinear effects in fiber optic links. Concept of self-phase modulation, group velocity dispersion and solution based communication.	6
Unit-6	Block Diagram of fiber optic communication, selection of optical fiber types for short haul, long haul and high speed data links, optical power and dispersion budget calculations of fiber optic communication link, Repeaters, optical fiber amplifiers, optical fiber transmitter and optical fiber receiver design considerations. [Numerical are not expected]	6
	Total	**36**

Text Book: G. Keiser, ñOptical Fibre Communicationò, McGraw Hill International.

Reference:

1. Seniors J. M., ñOptical Fibre Communication and Applicationsò, Prentice Hall of India Pvt. Ltd., New Delhi

5ETC04 Professional Elective - I (PE-I): (iii) SPEECH AND AUDIO PROCESSING

Course Pre-Requisite:

1. 3ETC01 Engineering Mathematics-III
2. 4ETC04 Signals and Systems
3. 4ETC01 Analog and Digital Communication

Course Objectives:

1. To be able to relate human physiology and anatomy with signal processing paradigms.
2. To acquire the knowledge of speech generation and speech recognition models.
3. To understand methods/techniques used in speech signal estimation & detection.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Illustrate how the speech production is modeled
2. Summarize the techniques involved in collecting the features from the speech signal in time and frequency domain.
3. Summarize the various speech coding techniques.
4. Understand the process Speech Synthesis.
5. Apply techniques/methods used for speech enhancement.
6. Apply techniques/methods used for speech recognition.

	Subject: SPEECH AND AUDIO PROCESSING	L
Unit-1	**Speech Production and Acoustic Phonetics:** Process of speech production, Articulatory phonetics, Acoustic Phonetics, Acoustic theory of speech production, Co- articulation, Prosody, Digital models of speech signals, Brief applications of speech & audio processing	6
Unit-2	**Speech Analysis:** Time and frequency domain methods for analysis of speech: Methods for extracting energy ,average magnitude, zero crossing rate, silence discrimination using ZCR and energy, short time Fourier analysis, Formant extraction, Pitch extraction, Cepstral analysis.	6
Unit-3	**Coding of Speech Signals:** Introduction, Quantization, Speech redundancies, Time domain waveform coding, Linear predictive coding: Linear Delta Modulation ,Adaptive Delta Modulation, Adaptive Differential Pulse Code Modulation	6
Unit-4	**Speech Synthesis:** Principles of speech synthesis, Articulatory synthesis, Formant synthesis and LPC synthesis.	6
Unit-5	**Speech Enhancement:** Introduction, Nature of interfering sounds, speech enhancement techniques: spectral subtraction and filtering, harmonic filtering, Spectral subtraction, Adaptive noise cancellation	6
Unit-6	**Speech Recognition:** Introduction, Bayeôs rule, Segmental feature extraction, MFCC, DTW, HMM approaches for speech recognition	6
	Total	**36**

Text Books:

1. ñSpeech Communications: Human & Machineò, Douglas O'Shaughnessy, Universities Press.
2. ñDigital Processing of Speech Signalsò, Rabiner and Schafer, Prentice Hall, 1978.

References:

1. ñDiscrete-Time Speech Signal Processing: Principles and Practiceò, Thomas F. Quatieri,Publisher: Prentice Hall.
2. ñSpeech and Audio Signal Processing: Processing and Perception of Speech and Musicò,Nelson Morgan and Ben Gold, John Wiley & Sons.
3. ñSpeech Analysis Synthesis and Perceptionò, J. L. Flanagan, Second edition, Springer-Verlag(1972).
4. ñSpeech and Audio Signal Processingò, Gold & Morgan, 1999, Wiley and Sons.

5ETC05 Open Elective - I (OE-I): (i) SENSORS AND TRANSDUCERS

Course Pre-Requisite:

1. 1B3 Basic Electrical Engineering.
2. 3ETC02 Electronic Devices and Circuits.

Course Objectives:

1. To provide a basic knowledge about Sensors and transducers.
2. To learn about the various sensor and transducer for measurement of physical quantities.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Understand the basic aspect of transducers and sensors
2. Gain knowledge of statistical characteristic and Errors of system.
3. Realize the fundamental concept about temperature and Velocity measurement
4. Acquire knowledge of measurement of displacement and Humidity.
5. Familiarize the basic information about measurement of Pressure, Flow, Level
6. Aware about the basics of Strain gauge and smart sensors

	Subject: SENSORS AND TRANSDUCERS	L
Unit-1	**Sensor & Transducers:** Definition, Types & selection of sensors, Need of sensor, Difference between Sensors & Transducers, Classification of Transducer, Selection criteria. Introduction to Generalized Instrumentation system with example.	6
Unit-2	**Characteristic, parameters and Errors** Characteristics of instruments ï static characteristics, Statistical Parameters with numericals. Error and its Types: Gross error, Systematic Error, Random Error with remedies.	6
Unit-3	**Temperature Measurement:** Introduction to Thermistor, RTD, Thermocouple and LM 335,Total Radiation Pyrometer **Velocity Measurement:** Velocity measurement system by encoder, Magnetic Pickup and Photo detector (Linear and Angular Measurement)	6
Unit-4	**Measurement of Displacement:** Resistive, Inductive (LVDT), Capacitive Methods **Humidity Measurement:** Resistive, Capacitive, Piezoelectric, and Infrared	6
Unit-5	**Measurement of Pressure:** Primary pressure sensors - elastic elements like bourdon tube and diaphragm Electrical/Secondary Pressure Transducers: Capacitive, piezo-electric and its material, Low Pressure (Vacuum): Pirani gauge. **Measurement of Flow:** Hot wire anemometer **Measurement of Level:** Resistive method, Ultrasonic level detector	6
Unit-6	**Strain Measurement:** Introduction, types of strain gauge, gauge factor calculation, materials for strain gauge, resistance strain gauge bridges, temperature compensationand applications of strain gauges. **Introduction to smart sensors**: Objective, block diagram, advantages and disadvantages.	6
	Total	**36**

Text Books:

1. Sawney A K and Puneet Sawney, ñA Course in mechanical measurements and instrumentation and controlò, 12th edition, DhanpatRai and Co, new delhi,2013.
2. Electronics instrumentation" by H. S. Kalsi [TMH]

References:

1. David A. Bell, Electronic Instrumentation and Measurements, Third Edition, Oxford Higher Education
2. D.Patranabis, Principles of Industrial Instrumentation, Tata McGraw Hill Publishing Ltd., New Delhi, 1999.
3. R.K.Jain, Mechanical and Industrial Measurements, Khanna Publishers, New Delhi, 1999.
4. Ernest O.Doebelin, Measurement systems Application and Design, International Student Edition, IV Edition, McGraw Hill Book Company, 1998.

5ETC05 Open Elective - I (OE-I): (ii) DATA STRUCTURE

Course Pre-Requisite:

1. 3ETC05 Object Oriented Programming

Course Objectives:

To impart the concepts of data structures and algorithms.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Able to understand basics and applications of different linear and nonlinear data structures
2. Able to design and implement various data structure algorithms and analyze the efficiency of an algorithm.
3. Able to understand Linked List and implement algorithm.
4. Able to understand the working principle and Implementation of stacks and queues.
5. Able to implement learn Trees, Graph and their applications
6. Able to write an algorithm on different sorting methods and analyze the complexities of algorithms.

	Subject: DATA STRUCTURE	L
Unit-1	**Introduction and Overview** Basic Terminologies: Elementary Data Organizations, Introduction to Linear Array, Types and Representation in Memory, Data Structure Operations, Algorithms: Complexity, Time-Space Tradeoff, Searching Methods:Linear Search and Binary Search Techniques and their Complexity Analysis..	6
Unit-2	**Linked List:** Introduction to Linked List, Representation of Linked List in Memory, Traversing a Linked List, Searching a Linked List, Memory Allocation; Garbage Collection, Insertion into a Linked List, Deletion from linked list, Header Linked Lists, Circular Linked Lists, Two-Way Lists (Doubly linked list) and Operations.	6
Unit-3	**Stacks, Queues and Its Applications:** Introduction to Stack, Array and Linked List Representation of Stack, Applications of Stacks: Arithmetic Expressions: Polish Notation, Recursion, Tower of Hanoi Problem, Queues: Linked Representation of Queues, Circular queue, Deques, Priority Queues.	6
Unit-4	**Tree** Basic Tree Terminologies and Representing Binary Trees in Memory, Traversing Binary Trees, Header Nodes; Threads, Threaded Binary Trees, Binary Search Trees, Searching and Inserting in Binary Search Trees, Deleting in a Binary Search Tree, Balanced Binary Trees, AVL Search Trees, Heap and Heapsort, Pathlengths; Huffmanôs Algorithm. General trees.	6
Unit-5	**Graph and Their Applications** Introduction, Graph Theory Terminology, Sequential Representation of Graphs; Adjacency Matrix; Path Matrix, Warshallôs Algorithm; Shortest Paths, Linked Representation of Graph, Traversal algorithms, Operations on Graph, BFS, DFS, Spanning Trees	6
Unit-6	**Sorting And Hashing** Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Radix Sort, Performance and Complexity Analysis of various Sorting Methods, Hashing.	6
	Total	**36**

Text Books:

1. ñIntroduction to data structures with Cò by Seymour lipschutz.
2. Fundamentals of Data Structuresò, Illustrated Edition by Ellis Horowitz, SartajSahni, Computer Science Press.

References:

1. Algorithms, Data Structures, and Problem Solving with C++ò, Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
2. Data Structures through C by YashwantKanetkar

5ETC05 Open Elective - I (OE-I): (iii) INTRODUCTION TO JAVA

Course Pre-Requisite:

1. 3ETC05 Object Oriented Programming.

Course Objectives:

1. To Learn basics of programming
2. To understand the foundation of Object-Oriented Programming
3. To learn basic principles of Object-Oriented Programming
4. To study the process of building an application in a modular fashion using Java Programming Language

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Fundamentals of Object Oriented Programming and can build & run a basic application at their own
2. Use of selection & repetition statements in Java Program, dealing with methods and playing with classes and objects in real world
3. To create and process single dimensional & multidimensional arrays, to handle strings in Java
4. To create interactive graphical user interface in a desktop application using AWT and/or SWING Components.
5. To handle exceptions and create user defined exception, also learns file handling in Java.
6. To learn concept of multithreading; create, manage threads; and purpose of synchronization.

	Subject: INTRODUCTION TO JAVA	L
Unit-1	**Java Basics:** History of Java, Characteristics of Java, Types of Java Program, an introduction to Classes & Objects, Messages & methods, introduction to Inheritance, Software Engineering & Software Life Cycle, Structure of a java application, Edit-Compile-Run cycle of a java program. **Java Building Elements**: Identifiers, Variables, Constants, Data types, Arithmetic Expressions, Standard Input & Output, Programming Style & Documentation **Control Structure:** Selection Statements- if, ifé else, Nested if, switch. Repetition Statements- for loop, While loop & do loop, using break & Continue.	6
Unit-2	**Methods:** Creating Methods, Calling a method, Overloading Methods, Concept of Recursion **OOP:** Objects & classes, Passing Objects to methods, Instance Variables & class Variables, Instance Methods & Class Methods, Scope of Variables, Introduction to Packages, the Math Class **Arrays:** Declaring & Creating Arrays, Initializing & Processing Arrays, Array of Objects, Multidimensional arrays.	6
Unit-3	**Strings:** The String Class, The String Buffer Class, The String Tokenizer Class, Command Line Arguments **Inheritance:** Super classes and Subclasses, the super keyword, the *this*keyword, the Object class, the final and abstract modifiers, the concept of Wrapper Classes, Introduction to Interfaces.	6
Unit-4	**Graphics Programming:** The AWT Class Hierarchy, Frames, Event Driven Programming (Delegation Event Handling Model), Layout Managers, Panels, The Color Class, The repaint(), update() and paint(), Methods, Drawing Lines & different shapes, introduction to adapter classes. **Creating GUI:** Button, Label, Text Field, Text Area, Choice, List, Checkbox, Dialog, Menu, Creating Multiple Windows, introduction to swing components.	6
Unit-5	**Exception Handling:** Exceptions & Exception Types, Understanding Exception Handling, Creating Exception classes, the finally clause. **File Input & output:** File & J File Chooser Objects, Low-Level File I/O, High Level File I/O.	6
Unit-6	**Multi-Threading:** Concept of thread, The Thread class, The runNable interface, Thread Life cycle, Thread Priority, Thread Groups, concept of synchronization.	6
	Total	**36**

Text Books:

1. Y. Daniel Liang, ñAn Introduction to Java Programmingò Eastern Economy Edition, PHI
2. C. Thomas Wu, ñAn Introduction to Object-Oriented Programming JAVAò, Fourth Edition, Tata McGraw Hill

References:

1. Kathy Sierra & Bert Bates, ñHead First Javaò, OôREILLY
2. E Balagurusamy, ñProgramming with JAVA, A Primerò, Third Edition, TMH

5ETC06- MICROCONTROLLER- LAB

Å Minimum Eight Experiments based on syllabus of **5ETC01: MICROCONTROLLER** must be conducted.

Å Course Objectives and Course Outcomes shall be specified based on the experiments conducted

5ETC07- DIGITAL SIGNAL PROCESSING LAB

Å Minimum Eight Experiments based on syllabus of **5ETC03: DIGITAL SIGNAL PROCESSING** must be conducted.

Å Course Objectives and Course Outcomes shall be specified based on the experiments conducted

5ETC08- POWER ELECTRONICS LAB

Å Minimum Eight Experiments based on syllabus of **5ETC04: PE(1): (i) POWER ELECTRONICS** must be conducted.

Å Course Objectives and Course Outcomes shall be specified based on the experiments conducted

5ETC09: ELECTRONIC LAB BASED ON INSTRUMENTATION

Course Outcomes:

At the end of this course student will demonstrate the ability to

1. Learn about various Sensors
2. Examine the measurement of various physical quantities using transducers
3. be aware of statistical data analysis of different transducers
4. Understand computerized data acquisition

Minimum Eight Experiments from the list give must be conducted

List of Experiments:

1. Temperature measurement using temperature sensor.
2. Measurement of linear displacement using LVDT.
3. Study of instrumentation amplifier
4. Measurement of force using strain gauge
5. Measurement of Pressure using Piezo-electric Transducer.
6. To measure the speed of a motor shaft with the help of non-contact type pick-ups (magnetic or photoelectric).
7. Displacement measurement by Capacitive Transducer
8. Temperature measurement by thermistor.
9. Liquid level measurement using level transducers.
10. Displacement measurement by resistive Transducer.
11. Comparative study of temperature measurement using: RTD, Thermistor and Thermocouple.
12. Study of Smart Sensors and Data Acquisition Systems

6ETC03 PROFESSIONAL ELECTIVE - II (PE-II): (I) CMOS DESIGN

Course Pre-Requisite:

1. 3ETC02 - Electronic Devices & Circuits.
2. 3ETC03 - Digital System Design

Course Objectives:

1. To study CMOS transistor theory and performance parameters.
2. To study layout design rules for size & power optimization.
3. To understand the concept of combinational CMOS circuit design.
4. To implement the concept of sequential circuit in CMOS design.
5. To learn the dynamic CMOS logic circuit

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. To understand the concept of CMOS circuit.
2. To draw Layout, Stick diagrams of CMOS Circuits.
3. To analyses the CMOS circuit performance parameter
4. To implement combinational CMOS circuit design using CMOS logic families.
5. To design sequential CMOS circuit.
6. To design the CMOS circuit using dynamic CMOS logic

		L
	Subject: CMOS Design	
Unit-1	**BCMOS Device Fundamentals:** Mooreôs Law, MOS structure capacitance, Channel capacitance, Junction capacitance,Review of MOS transistor models, Non-ideal behaviour of the MOS Transistor. Transistor as a switch, CMOS Inverter and its Characteristics.	8
Unit-2	**VLSI Circuit Design Processes:** VLSI Design Flow, CMOS Process enhancements ï Interconnect, Circuit Elements, CMOS Lambda-based Design Rules, Stick Diagrams, Physical layout of simple CMOS Logic Gates, RC Parasitic, CMOS Fabrication [P-well process, N-well process].	6
Unit-3	**CMOS Performance Parameter:** Introduction to Delays in CMOS,RC Delay model, linear delay model, logical path efforts. Power, interconnect and Robustness in CMOS circuit layout.	6
Unit-4	**Combinational Circuit Design:** CMOS logic families, CMOS logic gates design, Complex CMOS circuit, Transmission gate, Pass transistor logic.	5
Unit-5	**Sequential Circuit Design:** Design of latches and Flip-flops, Static Read - Write Memory (SRAM) Circuits (6T), Dynamic Read-Write Memory (DRAM) Circuits (3T).	5
Unit-6	**CMOS Clocking Styles:** CMOS Clocking Styles, Clocks Skew, Clock distribution techniques, Clock Jitter. **Dynamic Logic Circuit:** Dynamic Pass transistor logic, Dynamic CMOS logic, Domino logic, NORA logic.	6
	Total	**36**

Text Books:

1. S. M. Kang and Y. Leblebici, ñCMOS Digital Integrated Circuits: Analysis and Designò, 3rd Edition, MH, 2002.
2. Neil H. Weste, D. Harris, ñPrinciples of CMOS VLSI design A Circuit & System Perspectiveò 4th Edition, Pearson (Addison-Wesley), 2011.
3. Wayne Wolfe, ñModern VLSI Design: IP based Approachò, 4th Edition, PHI.
4. Jan M. Rabaey, A. Chandrakasan, B. Nikolic, ñDigital Integrated Circuits: A Design Perspectiveò, 2nd Edition, Pearson

References:
1. S.K. Ghandhi, ñVLSI Fabrication Principlesò, John Wiley Inc., New York, 1994 (2nd Edition).
2. Plummer, Deal, Griffin, ñSilicon VLSI Technology: Fundamentals, Practice &Modelingò PH, 2001.
3. S.M. Sze (Ed), ñVLSI Technologyò, McGraw Hill.
4. C. Mead and L. Conway, Introduction to VLSI Systems, Addison Wesley, 1979.

6ETC03 PROFESSIONAL ELECTIVE - II (PE-II): (II) SATELLITE COMMUNICATION

Course Pre-Requisite:

1. 3ETC04 Electromagnetic Waves
2. 4ETC01 Analog and Digital Communication

Course Objectives:

1. To understand the frequency bands used in satellite communication
2. Toknowthebasicsoforbitalmechanism,thetypesof satelliteorbitsandorbitalaspectsof Satellitecommunication.
3. To understand the various typical phenomenon in satellitecommunication.
4. To understand different satellite channel parameters.
5. To understand the working of different satellitesubsystems
6. To understand the various services ofsatellite.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

At the end of this course students will demonstrate the ability to

1. Visualizethearchitectureof satellitesystems as ameansof highspeed,highrange communicationsystem.
2. Statevariousaspectsrelatedtosatellitesystemssuchas orbitalequations,sub-systemsin asatellite
3. Solvenumerical problemsrelatedtoorbitalmotionanddesignoflinkbudgetforthe given parametersandconditions.
4. Learnadvancedtechniquesandregulatoryaspectsofsatellitecommunication
5. Understand role of satellite in variousapplications
6. Understand VSAT and GPS

	Subject: Satellite Communication	L
Unit-1	**Introduction to Satellite Communication:** Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication, satellite types ï LEO, MEO, GEO, HEO.	6
Unit-2	**Orbital Mechanics:** Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity, look angle determination of a satellite, concepts of Solar day and Sidereal day. Geo stationary and non-Geo- stationary orbits.	6
Unit-3	**Typical Phenomena in Satellite Communication :**Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift, space launch vehicles.	6
Unit-4	**Satellite Channels:** Electromagnetic field propagation, Atmospheric losses, Receiver noise, Carrier to Noise ratio, Satellite system link model: Uplink, Downlink, Cross link, Transponder, Satellite system parameters, Satellite link analysis, Frequency reuse and depolarization.	6
Unit-5	**Satellite sub-systems:** Study of Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system (AOCS), Communication sub-system, power sub-systems etc. Satellite link budget.	6
Unit-6	**Very Small Aperture Satellite (VSAT):** Overview of VSAT system, Network architecture, Access control protocols, Signal format, Modulation coding and interference issues, VSAT antennas, Transmitter and Receiver, Link analysis for VSAT network. **Satellite Navigation and Global Positioning System (GPS):** Radio and Satellite navigation, Position, Location in GPS, GPS receivers and codes, GPS navigation message and signal levels, Timing accuracy, GPS receiver operation, Differential GPS.	6
	Total	**36**

Text Books:

1. Timothy Pratt Charles W. Bostian, Jeremy E.Allnutt: Satellite Communications: Wiley India. 2nd Edition, 2002
2. Tri T. Ha: Digital Satellite Communications: Tata McGraw Hill,2009

Reference: Dennis Roddy: Satellite Communication: 4th Edition, McGraw Hill, 2009

6ETC03 PROFESSIONAL ELECTIVE - II (PE-II): (III) ADAPTIVE SIGNAL PROCESSING

Course Pre-Requisite:

1. 3ETC01 Engineering Mathematics-III
2. 4ETC04 Signals and Systems
3. 5ETC03 Digital Signal Processing

Course Objectives:

1. To introduce with adaptive signal processing and adaptive systems.
2. To be acquainted with desired response,mean square error performance and Wiener Filters.
3. To make familiar with gradient search algorithms and functions.
4. To Understand LMS algorithms and its performance analysis.
5. To Understand Linear LeastSquare Estimation and RLS algorithms
6. To study the applications of adaptive signal processing

Course Outcomes:

Upon successful completion of this course, the student will be able to:

At the end of this course students will demonstrate the ability to :

1. Comprehend adaptive system and functions.
2. Evaluate the performance of various methods for designing adaptive filters through estimation of different parameters.
3. Understand the concepts of gradient and mean square error performance in adaptive systems
4. Analyse convergence and stability issues associated with adaptive filter design and come up with optimum solutions.
5. Apply an adaptive filter algorithm that recursively finds the coefficients that minimize a weighted linear least squares cost function.
6. Implement applications of adaptive signal processing.

	Subject: Adaptive Signal Processing	L
Unit-1	**Adaptive Systems:** AdaptiveSystems: Definition and characteristics,General Properties, Applications and examples of an adaptive system. Review of probability, random variables and random processes.	6
Unit-2	**Wiener Filters:** Input signal and weight vectors, desired response and error, Mean Square Error (MSE), Principleof Orthogonally, FIR Wiener Filters, Wiener Hopfequation.	6
Unit-3	**Steepest Descent Algorithms:** Searching the performance surface ï Methods & Ideas of Gradient Search methods ï Gradient Searching Algorithm & its Solution ï Stability & Rate of convergence ï Learning Curves Gradient Search by Newtonôs Method, Method of Steepest Descent, Comparison of Learning Curves.	6
Unit-4	**Least Mean Square (LMS) Algorithms:** Derivation of LMS algorithm, Convergence, Stability and performance analysis of LMS Algorithm, Normalized Least-Mean-Square Algorithm.	6
Unit-5	**Recursive Least Square Algorithms:** Linear LeastSquare Estimation Problem, Introduction to RecursiveLeast-Squares Adaptive filters, Matrix Inversion Lemma, RLS Algorithm.	6
Unit-6	**Applications of Adaptive filtering:** System identification, Adaptive Equalization, noise cancellation, linear prediction, Echo Cancellation, Lattice Filters.	6
	Total	**36**

Text Books:

1. "Adaptive Filter Theory", Simon Haykin, 3rd Ed, Prentice HallInc, 2002.
2. Bernard Widrow & Samuel. D. Stearns, ñAdaptive Signal Processingò, Pearson Edu, 2001.

References:
1. "Adaptive Filtering Primer with MATLAB", Alexander D.Poulanikas & Zayed M Ramadan, Taylor & Francis Series, CRS Press.
2. "Adaptive Signal Processing", Bernard Widrow, Prentice-HallSignal Processing Series.
3. ."Real Time Digital Signal Processing: Implementation and Applications", Sen M. Kuo, Bob H. Lee and Wenshun Tian,2nd Ed, John Wiley & Sons, 2006.
4. "Adaptive Digital Filters", Maurice G Bellanger, 2nd Edition,
5. "Adaptive Nonlinear System Identification", Marcel DekkarInc. T Ogunfummi, Springer

6ETC04 Open Elective - II (OE-II): (i) INTRODUCTION TO PYTHON PROGRAMMING

Course Pre-Requisite:
1. (3ETC05) Object Oriented Programming

Course Objectives:

1. Describe the core syntax and semantics of Python programming language.
2. Discover the need for working with the strings functions.
3. Illustrate the process of structuring the data using Lists, Tuples, Sets and Dictionary.
4. Indicate the use of regular expressions and built-in functions to navigate the file system.
5. To understand steps involved in Python to Mongo DB communication.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Interpret the fundamental Python syntax and semantics
2. Be fluent in the use of Python control flow statements
3. Perform basic CURD operations on Mongo DB using Python.
4. Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, tuples and sets.
5. Identify the commonly used operations involving file systems and regular expressions.
6. To learn and use operators

	Subject: INTRODUCTION TO PYTHON PROGRAMMING	L
Unit-1	**Parts of Python Programming Language:**What is Python?, Features of Python, Identifiers, Keywords, Statements and Expressions, Variables, Data Types, Constants, Escape characters, Comments	6
Unit-2	**Operators:** Arithmetic Operators, Assignment Operators, comparison Operators, Logical Operators, Bitwise Operators, Membership Operator, Precedence and Associativity.	6
Unit-3	**Control Flow Statements:** Conditional statements: if, if-else, if-elif-else, Iterative statements: for, while Loops, Transfer statements: break, continue, pass.	6
Unit-4	**Tuples, Sets and Dictionaries:** List:Creation of List Objects, List Methods, Tuples: Creation of Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Sets: Sets Set Methods, Dictionary : Creation of Dictionary, Accessing, Modifying and Deleting Elements.	6
Unit-5	**Functions:** Built in Functions,User Defined Functions, Types of Arguments: Positional Arguments, Keyword Arguments, Default Arguments, Variable Length Arguments, Lambda expressions..	6
Unit-6	**Object Oriented Programming, MongoDB with Python3:** Classes and Objects, Creating Classes in Python, Creating Objects in Python, Mongo DB with Python3: Introduction to Mongo DB, use of pymongo, Steps in Python to MongoDB communication, Basic *CRUD* Operations.	6
	Total	**36**

Text Book:
1. Gowrishankar S, Veena A, **"Introduction to Python Programming",** 1st Edition, CRC Press/Taylor & Francis, 2019. ISBN-13: 978-0815394372

References:

1. Martin C. Brown, ñPython: The Complete Referenceò, Mc-Graw Hill Education (India) Edition 2018, New York
2. Niall O'Higgins, "MongoDB and Python", Oõ Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472, ISBN: 9781449310370.
3. Yashavant Kanetkar, Aditya Kanetkar, ñLet Us Pythonò, bpb publication, 3rd Edition Dec.2020, ISBN : 9789389898521
4. R. Nageswara Rao, ñCore Python Programmingò, Dreamtech Press; 2nd edition, ISBN : 978-9386052308.
5. Paul Barry, :Head-First Python: A Brain-Friendly Guideò (2nd Edition), Shroff Publishers, ISBN: 9789352134823.

6ETC04 Open Elective - II (OE-II): (ii) DATABASE MANAGEMENT SYSTEM

Course Pre-Requisite: None

Course Objectives:

1. Basic knowledge of file structure and Data Base.
2. Knowledge of Entity Relation Diagram and data Modeling.
3. The basic knowledge of SQL query and structure.
4. The process of building normalization and apply to the database system.
5. Gaining the knowledge of transaction which applied on database.
6. Understanding the issues of concurrency and dead lock control.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Differentiate database systems from file systems by enumerating the features provided by database systems and describe each in both function and benefit.
2. Define the terminology, features, classifications, and characteristics embodied in database systems.
3. Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram and other optional analysis forms, such as a data dictionary.
4. Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
5. Understand the basic issues of transaction processing
6. Understanding the basic issues of concurrency control and dead lock in database.

	Subject: DATABASE MANAGEMENT SYSTEM	L
Unit-1	**Introduction to Database Systems:** Database System Applications, Database Systems versus File Systems, View of Data, Data Models, Transaction Management, Database System Structure, Application architectures. Entity Relationship Model, Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R Features, Design of an E-R Database Schema	6
Unit-2	**Data modelling using ER model (Entity Relationship Model):** Relational Model: Structure of Relational Databases, The Relational Algebra, Extended Relational-Algebra Operations, Modification of the Database, Views, The Tuple Relational Calculus, The Domain Relational Calculus.	6
Unit-3	**SQL Structure:** SQL: Basic Structure, Set Operations, Aggregate Functions, Null Values, Nested Subqueries, Views. Integrity and Security, Domain Constraints, Referential Integrity, Assertions, Triggers, Security and Authorization, Authorization in SQL	6
Unit-4	**Normalization:** Purpose of Normalization, Data Redundancy and Anomalies, Non-Loss decomposition and Functional Dependencies, First, Second and Third Normal Forms, Boyce/Codd Normal Form (BCNF)	6
Unit-5	**Transaction Processing:** The Concept of Transaction, States of Transaction, Concurrent Execution of Multiple Transactions, Serializability - Conflict and View Serializability	6
Unit-6	**Concurrency Control and Dead Lock: Concurrency Control and Deadlock Recovery:** Lock Based Protocols - Two Phase Locking Protocol and Time Stamp Based Protocol, Types of Locks, Deadlock Handling - Deadlock Detection, Deadlock Recovery, Deadlock Prevention	6
	Total	**36**

Text Book: Korth, and Sudarshan: Database System Concept, McGraw Hill, 4th Edition.

References:

1. Raghu Ramkrishnan :ò Database Systemò. McGraw Hill
2. C.J.Date : ñDatabase Systemò, 7th ed. (Pearson Education)
3. Connolly &Begg, : Database System,Low Price Ed.
4. Nawathe& Al-Masseri ñ Database Systemsò (Pearson Education)

6ETC04 Open Elective - II (OE-II): (iii) RENEWABLE ENERGY SOURCES (SOLAR & ELECTRIC VEHICLES)

Course Pre-Requisite: None

Course Objectives:

1. To learn the concept of Solar cell
2. To understand Solar Photovoltaic systems
3. Understand the working of hybrid electric vehicles
4. The process of building normalization and apply to the database system.
5. Gaining the knowledge of electric drives and storage

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Understand the concept of Solar cell and estimate solar energy availability
2. Learn Solar cell Technologies
3. Understand the concept of Power Electronic Converters
4. Learn about Hybrid Electric Vehicles
5. Learn Electric drives
6. Learn about electric storage

	Subject: **(iii) RENEWABLE ENERGY SOURCES (SOLAR & ELECTRIC VEHICLES)**	L
Unit-1	**Solar Cell Fundamentals and Solar Resource** Place of PV in World Energy Scenario, P-N Junction Diode: An Introduction to Solar Cells, solar radiation spectra, solar geometry, Earth Sun angles, and observer Sun angles, solar day length, Estimation of solar energy availability.	6
Unit-2	**Solar Cell Technologies** Production of Si, Si Wafer-based Solar Cell Technology, Advances in c-Si Cell Processes Suitable for Near Future Commercialization, Solar Cell Technologies-Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array.	6
Unit-3	**Solar Photovoltaic Systems and Applications** Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms, Converter Control, Grid-Connected System and Standalone system, Solar Water Pumps, Solar street lights, Battery sizing.	6
Unit-4	**Introduction to Hybrid Electric Vehicle** Review of Conventional Vehicle: Introduction to Hybrid Electric Vehicles: Electric Vehicle Evolution, Types of EVs, Types of battery for EVs.	6
Unit-5	**Electric Drives:** Energy consumption Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains, Electric Propulsion unit, Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, switched reluctance motor.	6
Unit-6	**Energy Storage:** Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles: - Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis.	6
	Total	**36**

Text Books:

1. Chetan Singh Solanki, ñSolar Photovoltics- Fundamentals, Technologies And Applicationsò PHI third Edition.
2. D. P. Kothari, K. C. Singal and Rakesh Ranjan, ñRenewable Energy Sources and Emerging Technologiesò, PHI Second Edition.
3. A. K. Babu, Electric and Hybrid Vehicles, Khanna Publishers, 2019
4. S. P. Sukhatme and J.K. Nayak, ñSolar Energy: Principles of Thermal Collection and Storageò, McGraw Hill, 3 rd ed., 2008.
5. G. N. Tiwari and M. K. Ghosal, ñRenewable Energy Applicationsò, Narosa Publications, 2004.

References:

1. G. M. Masters, ñRenewable and Efficient Electric Power Systemsò, John Wiley and Sons, 2004.
2. J. A. Duffie and W. A. Beckman, ñSolar Engineering of Thermal Processesò, John Wiley & Sons, 1991
3. B.H. Khan, ñNon-Conventional Energy Resourcesò, McGraw Hill 2nd Edition 2017.
4. Emadi, A. (Ed.), Miller, J., Ehsani, M., ñVehicular Electric Power Systemsò Boca Raton, CRC Press, 2003
5. Husain, I. ñElectric and Hybrid Vehiclesò Boca Raton, CRC Press, 2010.
6. Larminie, James, and John Lowry, ñElectric Vehicle Technology Explainedò John Wiley and Sons, 2012

6ETC05: ENGINEERING ECONOMICS

Course Pre-Requisite:

1. 3ETC03 Digital System Design
2. 5ETC01 Microcontroller

Course Objectives:

1. To familiarize the basic concepts and structure of Engineering Economics
2. To understand different principles of Engineering Economics
3. To learn the concepts Production and cost associated with it
4. To learn different types of cash flow
5. To learn depreciation analysis
6. To understand the concept of Banking system in India

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Learn basics of Engineering Economics
2. Understand and compute the production cost
3. Study different cash flow methods
4. to evaluate Engineering alternatives
5. Understand depreciation analysis
6. Understand Indian Banking System

	Subject: 6ETC05: ENGINEERING ECONOMICS	L
Unit-1	Definition and Scope of Engineering Economics , Subject Matter of Economics, Principles of Engineering Economics, Micro-economics Vs Macro-economics , Utility Analysis, Laws of diminishing utility analysis, derivation of demand curve and law of Demand, Elasticity of demand	6
Unit-2	Theory of Production: Theory, Importance, Isoquants and its properties, Marginal rate of Technical substitution, Law of variable proportions, Returns to Scale, Cost of Production and Cost of Curves, The law of supply, Price determination	6
Unit-3	Time value of Money, Techniques for adjusting time value of money, Uniform Gradient series factor, annuity, annuity due, calculation of deferred annuity , Types and components of cash flow, cash flow diagrams, principles of equivalence, Uses, significance and limitation of Cash flow statement	6
Unit-4	Evaluation of Engineering alternatives, Present worth method, Future worth Method, Equivalent annual worth comparison , Rate of return method, Project evaluation and Cost benefit analysis	6
Unit-5	Depreciation Analysis, Causes of depreciation, Depreciable property, depreciation methods, Digit method, Break even analysis, determination of breakeven point, Breakeven point in terms of quantity, sales and as percentage of capacity, Break even chart, Breakeven analysis assumptions, Managerial uses, Limitations	6
Unit-6	Commercial Banking, Functions of Commercial Banks , Role of Commercial banks in developing economy, sound baking system for under-developed countries, types of banks, balance sheet of a bank, New developments in banking system.	6
	Total	**36**

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 (08Hrs)

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). (08Hrs)

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 Wiley1996
5. F.Fluckiger, ñUnderstanding Networked Multimediaò, Prentice- Hall 1995

7KS05 PROFESSIONAL ELECTIVE - I
(III) WEB ENGINEERING

UNIT I: Introduction to the Web: History of web, Protocol governing the web, Web architecture, Major issues in Web solution development, Web servers, Web browsers, Internet Standards, TCP/IP protocol suites, IP Address, MIME, Cyber laws. Hypertext Transfer Protocol (HTTP): Introduction, web server and client, Resources, URL and its Anatomy, Message Format, Examples, Persistent and non persistent Connections, Web caching, Proxy. (08Hrs)

Unit II: Hypertext Markup language (HTML): History of HTML, HTML basics, Elements, attributes and tags of HTML, Basic Tags, Advanced Tags, Frames, Images, Meta Tag, Planning of web page, Model amd Structue of web site, Desiging web pages, Multimedia content. Cascading Style Sheet (CSS): Introduction, advantages, Adding CSS, Browser compatibilty, CSS and page layout, Selectors, Grouping, Type Selectors. (08Hrs)

Unit III: Extensible Markup Language (XML): Common Usage, Role of XML, Prolog, Body, Elements, Attribuyes, Validation, Displying XML, Namespaces. XML DTD, Introduction to DTD, Purpose of DTD, DTD in XML document, element type declaration, Attribute declaration, Entity declaration, DTD validation. 08 Hrs

Unit IV: W3C XML Schema: Introduction, limitation of DTD, strengths of schema, schema structure, schema element, element declaration, schema validation, Built in data types, declaring simple elements. (08Hrs)

Unit V: Java Script: Introduction, variables, literals, operators, control structure, conditional statements, Arrays, Functions, Parameter Passing, Function Pointer, Inner/Nested Functions, Objects. (08Hrs)

Unit VI: Common Gateway Interface (CGI): Internat programming paradigm, Server side programming, Language for CGI, Applications, Server environment, Environment variables, CGI building blocks, CGI scripting using C, shell script, writing CGI progarm, CGI security, Alternatives and enhancement in CGI. (08 Hrs)

TEXT BOOK:

Roy Uttam K: Web Technologies, Oxford University Press, 2010.

REFERENCES:

1. Dr. Raja Subramanian: Creating Web Sites in Engineering, University Science Press.
2. Mohler J.L. & Duff J.M.: Desiginig Interactive Web Sites, CENGAGE Learning.
3. Joel Sklar: Text Book of Web Design, CENGAGE Learning.
4. Meenakshi G.M.: Web Graphics, Scitech Publications(India) Pvt. Ltd.

7KS05 PROFESSIONAL ELECTIVE - I
(IV) HUMAN COMPUTER INTERFACE

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. (08 Hrs)

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. (08 Hrs)

UNIT III: Direct manipulation and virtual environments, example of direct manipulation system, Explan ations of direct manipulation, OAI model, Visual thinking and icons, direct manipulation programming, home automation, Remote Direct manipulation, Virtual environments. (08 Hrs)

UNIT IV: lnteraction 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. (08 Hrs)

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. (08 Hrs)

UNIT VI: lnformation 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. (08 Hrs)

TEXT BOOK:

Ben Shneiderman:òDesigning the User Interfaceò, Pearson Education.

REFERENCE BOOKS:

1. R. Beale, A.J. Dix, J. E. Finlay, G. D. Abowd ñHuman-Computer Interactionò,Prentice-Hall.
2. Joann Hackos, Janice Redish, ñUser and Task Analysis for Interface Designò,Wiley.
3. Jeff Raskin, ñThe Humane Interfaceò, Pearson Education.
4. Jesse James Garrett, ôThe Elements of User Experienceò, New Riders.

7KS06 DIGITAL SIGNAL PROCESSING - LAB.:

Minimum Eight experiments/programming assignments must be completed based on the respective syllabus uniformly covering each of the units.

7KS07 DESIGN & ANALYSIS OF ALGORITHMS - LAB.:

Minimum Eight experiments/programming assignments must be completed based on the respective syllabus uniformly covering each of the units.

7KS08 OBJECT ORIENTED ANALYSIS & DESIGN - LAB.:

Minimum Eight experiments/programming assignments must be completed based on the respective syllabus uniformly covering each of the units along with one mini project.

7KS09 PROJECT AND SEMINAR

Seminar should be preferably based on the proposed project to be completed in final year. The seminar 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 sessions:- 10 marks

SEMESTER : EIGHT

8KS01 ARTIFICIAL INTELLIGENCE

Unit I : Introduction: Definition of AI, AI Techniques, Tic-Tac-Toe, Pattern Recognition, Level of the model, Critical for Success, Problems and Problem Specifications, Defining the Problems, Production Systems, Control Strategies, Futuristic Search, Problem Characteristics, Decomposition of Problems, Solution steps, Predictability, Absolute & Relative Solutions.

Unit II: Basic Problem Solving methods: Reasoning, Problem trees and graphs, Knowledge Representation, Matching indexing with variables, Heuristic Functions, Weak Methods, Problem reduction, Constraints Satisfaction, Means-ends analysis, Analysis of Search Algorithms.

Unit III: Games Playing, Minimax Search Procedure, adding alpha beta cutoffs, additional refinements, waiting for quiescence, Secondary Search, Using Book moves limitations.

Unit IV : Knowledge Representation using Predicate Logic: Representing simple facts in logic, augmenting the representation, resolution, conversion to clause form, Resolution in Propositional Logic and Predicate Logic, Unification Algorithms, Question Answering and Natural Deduction.

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. (08 Hrs)

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. (08 Hrs)

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. (08 Hrs)

TEXTBOOK:

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)

8KS04 PROFESSIONAL ELECTIVE - II
(I) DISRIBUTED COMPUTING

UNIT-I: Basic distributed system: Introduction, Distributed computing models, Software concepts, Issues in designing distributed system, Client Server model, Case studies. (08 Hrs)

UNIT II: Inter process Communication: Message passing Group Communication, Remote Communication: Introduction, Remote procedural call basics, RPC Implementation, RPC Communication, Other RPC Issues, Remote method, Invocation basics, RMI Implementation. (08 Hrs)

UNIT III: Synchronization: Introduction, Clock Synchronization, Logical clocks, Global state, Mutual Exclusion, Election algorithms, Deadlock in Distributed systems. (08 Hrs)

UNIT IV: Distributed system management: Introduction Research management, Task assignment approach, Load balancing

approach, Load sharing g approach, Process management in a distributed environment, Process migration, Threads, Fault tolerance. (08 Hrs)

UNIT V: Distributed shared memory: Introduction, Basic concepts of DSM, Hardware DSM, Design Issues in DSM, Issues in implementing DSM systems, Heterogeneous and other DSM systems. (08 Hrs)

UNIT VI: Distributed File System: Introduction to DFS, File models, DFS design, Semantics of file sharing, DFS Implementation, File catching in DFS, Replication in DFS. (08 Hrs)

TEXT BOOK :

Sunita Mahajan & Seema Shah: "Distributed Computing" Oxford University Press

REFERENCE BOOKS:

1. Tanenbaum: "Distributed Operating Systems" Pearson Education.
2. Sinha: "Distributed Operating Systems Concepts & Design" PHI.
3. Tanenbaum & Van Steen: "Distributed Systems Principles & Paradigms" PHI, Second Edition.
4. Crichlow: "Distributed Systems- Computing Over Networks" PHI.

8KS04 PROFESSIONAL ELECTIVE - II
(II) MOBILE COMPUTING

Unit I : Introduction: Applications, History of wireless communication, A simplified reference model, Wireless Transmissions: Frequencies for Radio Transmissions, Signals, Antennas, Signal Propagations, Multiplexing, Modulation, Spread Spectrum, Cellular System. (08 Hrs)

Unit II: Medium Access Control: Motivations for a specialized MAC, SDMA, FDMA, TDMA.CDMA, Comparison of S/T/F/CDMA, Telecommunications System: GSM, DECT, TETRA, UMTS and IMT-2000. (08 Hrs)

Unit III: Satellite Systems: History, Applications, Basics, Routing, Localizations, Handover, Examples, Broadcast Systems: Cyclical Repetition of Data, Digital Audio Broadcasting, Digital video Broadcasting, Convergence of Broadcasting and mobile communications. (08 Hrs)

Unit IV: Wirelesses LAN: Infra Red Vs Radio Transmission, Infrastructure and Ad-hoc Network, IEEE 802.11, HIPERLAN, Bluetooth. (08 Hrs)

Unit V: Mobile Network Layer: Mobile IP, Dynamic Host Configuration Protocol, Mobile Ad-hoc Networks, Mobile Transport Layer:

Traditional TCP, Classical TCP improvements, TCP over 2.5/3G Wireless Networks. (08 Hrs)

Unit VI: Support for Mobility: File Systems, World Wide Web, Wireless Application Protocol (version 1.X) Arhitecture, i-mode, SyncML, WAP2.0. (08 Hrs)

TEXT BOOK :

ochen Schiller: ñMobile Communicationò Pearson Education, Second Edition.

REFERENCE BOOKS:

1. Mazliza Othman: ñ Principles of Mobile Computing and Communicationsò, Auerbach.
2. Agrawal and Zeng: ñIntroduction to Wireless and Mobile Systemsò Cengage Learning.
3. Upena Dalal: ñ Wireless Communicationò Oxford University Press.
4. Raj Kamal: ñMobile Computingò Oxford University Press.

8KS04 PROFESSIONAL ELECTIVE - II
(III) SOFT COMPUTING

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: Architecture of a Backpropagation 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: 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 IV: 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)

UNIT V: Fundamental of Genetic Algorithm: Genetic Algorithms, Basic Concepts, Creation of offspring, Working Principle, Encoding, Binary, Octal, Hexadecimal, Permutation, Value, Tree, Fitness function, Reproduction. (08 Hrs)

UNIT VI: Genetic Modeling: Inheritance Operators, Cross over, Inversion & Deletion, Mutation Operator, Bit wise operator, Bit wise operator used in GA, Generational cycle, Convergence of genetic algorithm, Application, Multilevel Optimization, Real life problem, Differences and similarities between GA and other traditional methods, Advances in GA. (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. Haykin: ñ Neural Networksò Pearson Education.
2. Jang,Sun and Mezutani: ñ Neuro Fuzzy and Soft Computingò .McGraw-Hill
3. J.Yen, R. Langari: ñ Fuzzy Logic: Intelligence, Control & Information ñ. Pearson Education.
4. N.P.Pahey: ñArtificial Intelligence and Intelligent Systemsò, Oxford University Press.

8KS04 PROFESSIONAL ELECTIVE - II
(IV) NETWORK SECURITY

Unit I: Introduction: Security Trends, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Internetwork Security, Internet Standards and the Internet Society. Symmetric Encryption and Message Confidentiality: Symmetric Encryption Principles, Symmetric Block Encryption Algorithms, Stream Ciphers and RC4, Cipher Block Modes of Operation, Location of Encryption Devices, Key Distribution. (08 Hrs)

Unit II: Public-Key Cryptography and Message Authentication: Approaches to Message Authentication, Secure Hash Functions and HMAC, Public Key Cryptography Principles, Public Key Cryptography Algorithms, Digital Signatures, Key Management. (08 Hrs)

Unit III: Authentication Applications: Kerberos, X.509 Authentication Service, Public-Key Infrastructure, Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME, (08 hrs)

Unit IV: IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Key Management, Web Security: Web Security Considerations, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET). (08 Hrs)

Unit V: Network Management Security: Basic Concepts of SNMP, SNMPv1 Community Facility, SNMPv3, Intruders**:** Intruders, Intrusion Detection, Password Management. (08 Hrs)

Unit VI: Malicious Software: Viruses and Related Threats, Virus Countermeasures, Distributed Denial of Service Attacks, Firewalls: Firewall Design Principles, Trusted Systems, Common Criteria for Information Technology Security Evaluation. (08 Hrs)

TEXT BOOK:

William Stallings: ñNetwork Security Essentials Applications and Standardsò Pearson Education, Third Edition.

REFERENCE BOOKS:

1. Atul Kahate: ñCryptography and Network Securityò Mc Graw Hill.
2. Forouzan and Mukhopahyay: ñòCryptography and Network Securityò Mc Graw Hill.
3. Matt Bishop: ñ Computer Security: Art & Scienceò Pearson Education.
4. Brijendra Singh: ñ Network Security & Managementò PHI.

8KS05 ARTIFICIAL INTELLIGENCE - LAB.

Minimum Eight experiments/programming assignments must be completed based on the respective syllabus uniformly covering each of the units.

8KS06 EMBEDDED SYSTEMS - LAB.

Minimum Eight experiments/programming assignments must be completed based on the respective syllabus uniformly covering each of the units.

8KS07 PROJECT & SEMINAR

The project shall be internally evaluated (for 75 Internal Marks) in three phases based on the progress of the project work. Each phase shall be internally evaluated for 25 marks as follows:

Phase I: - Problem Definition and Design

Phase II: - Problem Implementation and Testing

Phase III: - Project Demonstration & Report submission.

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
COMPUTER ENGINEERING
SEMESTER PATTERN (C. G. S.)

SEVENTH SEMESTER

7KE01 SIGNALS AND SYSTEMS

Unit I : Continuous time and discrete time signals, transformation of the independent variable, exponential and sinusoidal signals, unit impulse and unit step functions, operations on signals like folding, time-shifting, amplitude scaling and time-scaling, mixing of signals and modulation. (08Hrs)

Unit-II: Continuous time and discrete time systems, basic system properties, discrete time LTI systems, Continuous time LTI systems, Properties of linear time invariant systems, Causal LTI systems described by differential and difference equations, Singularity functions. (08 Hrs)

Unit III: Fourier Series representation of periodic signals: Response of LTI systems to complex exponentials, Fourier representation of continuous time periodic signals, convergence of the Fourier series, Properties of continuous time Fourier series, Fourier series representation of discrete ï time periodic signals, properties of discrete time Fourier series, Fourier series and LTI systems, filtering. (08 Hrs)

Unit IV: Continuous ï Time Fourier Transform: Development of the Fourier transform representation of an aperiodic signal, the Fourier transform for periodic signals, properties of the continuous time Fourier transform, the convolution property, multiplication property, Linear constant coefficient differential equations. (08 Hrs)

Unit V: Sampling: Representation of continuous time signals by its samples, reconstruction of a signal from its samples, aliasing, discrete time processing of continuous time signals, sampling of discrete time signals. (08 Hrs)

Unit VI : Z- Transform: Z- transform, the region of convergence for the z-transform, Inverse z- transform, properties of Z transform, analysis and characterization of LTI systems using z transforms, System function algebra and block diagram representations, the unilateral z ï transform. (08 Hrs)

TEXT-BOOK :

Oppenheim, Willsky, Nawab ó Signals and Systemsô, Pearson Education.

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 toï
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 Practitionerôs 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.

Course Outcomes (Expected Outcome): On completion of the course, student will be able toï
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.
4. Perform analytics on data streams.
5. Learn NoSQL databases and management.

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: Bayesô 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 Frequencyð 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, ñBig Data Analytics with Spark A Practitionerôs Guide to Using Spark for Large-Scale Data Processing, Machine Learning, and Graph Analytics, and High-Velocity Data Stream Processingò, First Edition, 2015, Apress Publisher, ISBN-13 (pbk): 978-1-4842-0965-3.
[3] Arshdeep Bahga & Vijay Madisetti, ñBig Data Science & Analytics: A Hands-On Approachò, 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

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, ñSensors and Actuators: Technology and Applicationsò, Library Press, 2017.
[2] D. Patranabis, ñSENSORS AND TRANSDUCERSò, Second Edition, PHI Learning Private Limited, 2003.

Reference Books:

[1] D.A. Hall and C.E.Millar, ñSensors and Actuatorsò, CRC Press, 1999.
[2] Nathan Ida, ñSensors, Actuators, and their Interfaces: A multidisciplinary introduction (Materials, Circuits and Devices)ò, 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 other Algorithms.

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, ñ Cryptography and Network Securityò, McGraw Hill, Second Edition.

Reference Books:

[1] William Stallings, ñCryptography and Network Security, Principles and Practiceò, PHI Fourth Edition.
[2] Behrouz A. Forouzan and Debdeep Mukhopadhyay, ñCryptography and Network Securityò, McGraw Hill, Second Edition.
[3] Matt Bishop, ñComputer Security Arts and Scienceò, Pearson Education.
[4] Douglas R Stinson, ñCryptography, Theory and Practiceò CRC Press.
[5] Keith M Martin, ñEveryday Cryptography, Fundamental Principles and Applicationsò, 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.

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 ï 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, U.S. Laws on Cyber Crimes, U.S. Case-law on Cyber Evidences and Related Issues

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, ñLaws on Cyber Crimes [Along with IT Act and Relevant Rules]ò Book Enclave Jaipur India.

Reference Books:

[1] Craig B, ñCyber Law: The Law of the Internet and Information Technologyò. Pearson Education.
[2] Pawan Duggal, ñCyber Lawsò Universal Law Publishing.
[3] K.Kumar,ò Cyber Laws: Intellectual property & E Commerce, Securityò, First Edition, Dominant Publisher, 2011.
[4] Rodney D. Ryder, ñGuide to Cyber Lawsò, 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., ñDimensions of Cyber Crimeò, Annual Publications Pvt. Ltd., First Edition, 2004.
[8] Augastine, Paul T., ñCyber Crimes and Legal Issuesò, 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 ï 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.

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 ï Govt. of India step towards promoting IPR ï Govt. Schemes in IPR ï Career Opportunities in IP - IPR in current scenario with case studies.

Text Books:

[1] K. V. Nithyananda (2019), ñIntellectual Property Rights: Protection and Managementò, IN: Cengage Learning India Private Limited.
[2] P. Neeraj and D. Khusdeep (2014), ñIntellectual Property Rightsò, PHI learning Private Limited.

Reference Books:

[1] Deborah E. Bouchoux, ñIntellectual Property for Paralegals ï The law of Trademarks, Copyrights, Patents & Trade secretsò, 4th Edition, Cengage learning, 2012.
[2] N. S. Gopalakrishnan and T. G. Agitha, ñPrinciples of Intellectual Propertyò, Eastern Book Company, Lucknow, 2009.
[3] M. M. S. Karki, ñIntellectual Property Rights: Basic Conceptsò, Atlantic Publishers, 2009.
[4] Ganguli Prabuddha, ñIntellectual Property Rights--Unleashing the Knowledge Economyò, Tata McGrawHill, 2001.
[5] V. K. Ahuja, ñLaw relating to Intellectual Property Rightsò. India, IN: Lexis Nexis, 2017.
[6] P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi, 2010.
[7] Ajit Parulekar and Sarita Dô Souza, Indian Patents Law ï 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, ñGearing up for Patentsé The Indian Scenarioò, 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 Primôs algorithm.
[10]Implement Primôs 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.

Unit-V: Symbolic Reasoning Under Uncertainty Introduction to Non Monotonic Reasoning, Logics for Non Monotonic Reasoning, Semantic Nets, Statistical Reasoning, Fuzzy logic: fuzzy set definition and types, membership function. Probability and Bayesô theorem, Bayesian Networks.

Unit-VI: 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.

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. Introduction to Artificial Intelligence ï Rajendra Akerkar
3. Nils Nilson: ñ Principles of Artificial Intelligenceò.(Addison-Wesley)
4. R. J. Winston: ñ Artificial Intelligenceò.(Wiley)
5. Patterwson ñIntroduction to Artificial Intelligence and Expert Systemsò (PHI).
6. Rolston ñPrinciples of Artificial Intelligence and Expert Systemsò, McGraw Hill.

6IT04 PROFESSIONAL ELECTIVE – II (I) CRYPTOGRAPHY AND NETWORK SECURITY

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

ÅTo understand the fundamental concepts of Cryptography & Network Security.
ÅTo familiarize the students with basic taxonomy and terminology of Cryptography & Network Security.
ÅTo understand various protocols for network security to protect against the threat in the network.
ÅTo understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.

Course Outcomes:
On completion of the course learner will be able to

- Understand the principles and fundamental concept of Cryptography & Network Security.
- To learn Encryption and Decryption Techniques.
- Evaluate various Key Encryption Algorithms.
- Understand IP Security system and protocols.
- Identify and understand Network Security controls.
- Explore web and system security and its applications to digital world.

Unit I: Introduction : OSI Security Architecture, Security Attacks: Threats, Vulnerability and Controls, Security Services: Confidentiality, Integrity, Availability, Introduction to Cryptography, Conventional Encryption: Conventional encryption model - classical encryption techniques.

Unit II: Encryption and Decryption: Characteristics of Good Encryption Technique: Properties of Trustworthy Encryption Systems; Types of Encryption Systems: Based on Key, Based on Block; Confusion and Diffusion; Cryptanalysis.

Unit III: Symmetric Key Encryption and Public Key Encryption: Data Encryption Standard (DES) Algorithm: Double and Triple DES, Security of the DES; Advanced Encryption Standard (AES) Algorithm, DES and AES Comparison, RSA Technique, Digital Signature.

Unit IV IP Security: Overview of IP Security (IPSec); IP Security Architecture; Modes of Operation; Security Associations, Security Parameter Index (SPI), SA Management, Security Policy: Authentication Header (AH); Encapsulating Security Payload (ESP); Internet Key Exchange.

Unit V Network Security: Network Concepts; Threats in Networks, Threats in Transit: Eavesdropping and Wiretapping, Protocol Flaws, Impersonation; Network Security Controls: Architecture, Encryption, Virtual Private Networks, Public Key Infrastructure (PKI) and Certificates.

Unit VI Web and System Security: Web Security: Secure socket layer and transport layer security, Secure Electronic transaction, System Security: Intruders, Viruses and related threads; Network Security Controls: Architecture, Public Key Infrastructure (PKI) and Certificates, Security Features of Trusted Operating Systems.

Text Book: William Stallings, ñCryptography and Network security Principles and Practicesò, Pearson/PHI.

Reference Books:
1. W. Mao, ñModern Cryptography ï Theory and Practiceò, Pearson Education.
2. Wade Trappe, Lawrence C Washington, ñIntroduction to Cryptography with coding theoryò, Pearson.
3. Charles P. Pfleeger, Shari Lawrence Pfleeger ñSecurity in computingò, Prentice Hall of Ind

6IT04 PROFESSIONAL ELECTIVE – II (II) BIG DATA ANALYTICS

Course Objectives:

1. To make the students aware about the basics concepts of big data analytics.
2. To introduce the tools required to manage and analyze big data like Hadoop and NoSql
3. To discuss the basic concepts and operations of map-Reduce
4. To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
5. To introduce several new algorithms for big data mining like classification, clustering and finding frequent patterns
6. To introduce to the students several types of big data like social media, web graphs and data streams and help them to solve real world problems in for decision support.

Course Outcomes:

On completion of the course the student(s) will be able to

1. Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.
2. Acquire fundamental enabling techniques like Hadoop, and NO SQL in big data analytics.
3. Achieve basic knowledge and operations of Map-Reduce
4. Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.

5. Implement algorithms for Clustering, Classifying and finding associations in Big Data 6. Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications.

UNIT I: Introduction to Big Data:

Introduction to Big Data, Big Data characteristics, types of Big Data, Traditional vs. Big Data business approach, Case Study of Big Data Solutions.

UNIT II: Introduction to big data frameworks: Hadoop and NoSQL:

Introduction to Hadoop, Hadoop Components; Hadoop Ecosystem; Overview of : Apache Spark, Pig, Hive, Hbase, Sqoop ,Introduction to NoSQL, NoSQL data architecture patterns: Key-value stores, Graph stores, Column family (Bigtable) stores, Document stores, Mongo DB.

UNIT III: MapReduce Paradigm:

MapReduce: The Map Tasks, Grouping by Key, The Reduce Tasks, Combiners, Details of MapReduce Execution, Coping With Node Failures. Algorithms Using MapReduce: Matrix-Vector Multiplication by MapReduce , Relational-Algebra Operations, Computing Selections by MapReduce, Computing Projections by MapReduce, Union, Intersection, and Difference by MapReduce, Computing Natural Join by MapReduce, Grouping and Aggregation by MapReduce, Matrix Multiplication, Matrix Multiplication with One MapReduce.

UNIT IV: Mining Big Data Stream:

The Stream Data Model: A DataStream-Management System, Examples of Stream Sources, Stream Queries, Issues in Stream Processing. Sampling Data in a Stream : Sampling Techniques. Filtering Streams: The Bloom Filter. Counting Distinct Elements in a Stream : The Count-Distinct Problem, The Flajolet-Martin Algorithm, Combining Estimates, Space Requirements . Counting Ones in a Window: The Cost of Exact Counts, The Datar-Gionis-IndykMotwani Algorithm, Query Answering in the DGIM Algorithm.

UNIT V: Big Data Mining Algorithms:

Frequent Pattern Mining : Handling Larger Datasets in Main Memory Basic Algorithm of Park, Chen, and Yu. The SON Algorithm and MapReduce. Clustering Algorithms: CURE Algorithm. Canopy Clustering, Clustering with MapReduce. Classification Algorithms: Parallel Decision trees, Overview SVM classifiers, Parallel SVM, K-Nearest Neighbor classifications for Big Data, One Nearest Neighbour.

UNIT VI: Big Data Analytics Applications

Link Analysis : PageRank Definition, Structure of the web, dead ends, Using Page rank in a search engine, Efficient computation of Page Rank, PageRank Iteration Using MapReduce, Topic sensitive Page Rank, link Spam, Hubs and Authorities, HITS Algorithm, Mining Social- Network Graphs : Social Networks as Graphs, Types , Clustering of Social Network Graphs, Direct Discovery of Communities, Counting triangles using Map-Reduce. Recommendation Engines: Content based Recommendation, Collabrative Filtering.

Text Books:

1. Radha Shankarmani, M Vijayalakshmi, òBig Data Analyticsò, Wiley Publications
2. Anand Rajaraman and Jeff Ullman ñMining of Massive Datasetsò, Cambridge University Press.

Reference Books:

1. Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, Bart Baesens , WILEY Big Data Series.
2. Alex Holmes ñHadoop in Practiceò, Manning Press, Dreamtech Press.
3. Professional NoSQL Paperback, by Shashank Tiwari, Dreamtech Press
4. MongoDB: The Definitive Guide Paperback, Kristina Chodorow (Author), Michael Dirolf,O'Reilly Publications
5. Big Data Analytics with R and Hadoop by Vignesh Prajapati Paperback, Packt Publishing Limited Hadoop: The Definitive Guide by Tom White, O'Reilly Publications.

6IT04 PROFESSIONAL ELECTIVE – II (III) SENSORS & ACTUATORS

Course Learning Objectives:

- To learn concept behind working of various types of Sensors.
- To understand available sensor to measure each physical parameters used in Industry and normal measurement applications.
- To interface real sensors for meaningful output in Electrical form.

Course Outcomes:

- Concept behind working of measurement systems and different types of sensors and actuators.
- Understanding of electric and magnetic sensors and actuators and their applications.
- Understanding of optical sensors and other sensors and their applications.
- Understanding of smart sensors and their uses.

UNIT I: Introduction:
Definitions, Classification of Sensors and Actuators, General Requirements for Interfacing, Measuring Units. Performance Characteristics of Sensors and Actuators, Input and Output characteristics.

UNIT II: TEMPERATURE SENSORS AND THERMAL ACTUATORS:

Introduction, Thermosensitive Sensors: Thermistors, Resistance Temperature Sensors
and Silicon Resistive Sensors, Thermoelectric Sensors, P-N junction Sensors. Optical and Acoustical Sensors, Thermomechanical Sensors and Actuators.

UNIT III: OPTICAL SENSORS AND ACTUATORS:

Introduction, Optical Units, Materials, Effects of Optical Radiation, Quantum Based Optical Sensors, Photoelectric Sensors, Coupled Charge (CCD) Sensors and Detectors, Thermal-Based Optical Sensors, Optical Actuators.

UNIT IV: ELECTRIC AND MAGNETIC SENSORS AND ACTUATORS:

Introduction, Units, The Electric Field: Capacitive Sensors and Actuators, Magnetic Fields: Inductive Sensors and Hall Effect Sensors, MHD Sensors and Actuators, Magnetic Actuators, Voltage and Current Sensors.

Unit V: MECHANICAL / ACOUSTIC SENSORS AND ACTUATORS :

Introduction, Definitions/Units, Force Sensors, Accelerometers, Velocity Sensing.
Microphones, Acoustic Actuators, Ultrasonic Sensors and Actuators. Piezoelectric Actuators, Resonators and SAW Devices.

Unit VI: MEMS AND SMART SENSORS:
Introduction, MEMS Sensors and Actuators with Applications, Smart Sensors/Actuators Issues. Wireless Sensors and Actuators, Modulation/Demodulation, Encoding/Decoding Sensor Networks.

Text Book: Nathan Ida, ñSensors, Actuators, and their Interfaces: A Multidisciplinary Introductionò, SciTech Publishing.

Reference Books:

1. Patrick F Dunn, ñFundamentals Of Sensors For Engineering And Scienceò CRC Press, Taylor & Francis Group, 2014
2. Patranabis D., "Sensors and Transducers", Prentice-Hall India, 2nd Ed., 2004.
3. Shawhney A. K., "Electrical and Electronics Measurements and Instrumentation", Dhanpat Rai & Sons, 1994.
4. J. Fraden, Handbook of Modern Sensors: Physical, Designs, and Applications, AIP Press,

6IT05 OPEN ELECTIVE II (I) ECONOMIC POLICY IN INDIA

Course Objectives:

1. Student will be able explain and elaborate fundaments Indian economy
2. Student will be able to explain, elaborate and identify the role of agriculture in Indian economy
3. Student will be able to explain elaborate and identify the role of industrial sector in Indian economy.

Course Outcomes:

1. Student will be able to explain, elaborate and indentify the impact of external sector on Indian economy
2. Student will be able to explain, elaborate and indentify the impact monetary and fiscal policies in India
3. Student will be able to explain ,elaborate and analyze the issues of Indian economy.

UNIT - I : Indian Economy and Development Basic characteristics of the Indian economy - Major issues of development - The determinants of economic development - sustainable development - Demographic features of Indian population - Rural Urban Migration - poverty and Inequality.

UNIT - II : The Agricultural Sector The Role of Agriculture in Economic development - Place of Agriculture in the Economy of India - Land Reforms in India - Inter dependency of Agriculture and Industry - Agricultural Finance - Agricultural prices, polices and Food problem - Agricultural development.

UNIT - III : The Industrial Sector A review on Industrial Policy - Role of large scale and small scale Industries in development. Private Sector and public sector - Industrial sickness - Industrial Finance - Industrial monopoly and Multinational corporations - Role of Information Technology in Industrial development.

UNIT - IV : External Sector Structure and Direction of Foreign trade, Balance of Trade & Balance of payments - composition of Trade - Important of Foreign trade for developing economy - Exchange rate - Foreign capital and MNCs in India - Globalisation and its impact on Indian economy - WTO and its impact on the different sectors of the economy.

UNIT V: Monetary and Fiscal Policies in India, Credit and Monetary Policy, Capital Market and its Regulation, Public Finance and Fiscal Policy, Fiscal Federalism in India.

UNIT VI: Some Issues of Indian Economy: National Institution for Transforming India (NITI Aayog), National Development Council (NDC); Developing Grass-Root Organizations for Development: Panchayatiraj; Role of Non Government Organizations (NGOs) and Pressure Groups in Indiaגs Economy. Public Private Partnership (PPP).

Text Books:

1. Ahluwalia, IJ and IMD Little (Eds) (1999), Indian Economic Reforms and Development. (Essays in Honour of Manmohansingh) Oxford University, Press, New Delhi.
2. Bardhan, P.K (9th edition) (1999), The political economy of development in India, Oxford University, Press, New Delhi.

Reference Books:

1. Bawa, R.S and P.S.Raikhy (Ed) (1997) structural changes in Indian economy, Guru Nanak Dev University Press, Amritsar.
2 Brahmananda, P.R. and V.R Panchmukhi (Eds) (2001) Development Experience in the Indian economy: Interstate Perspectives, Bookwel Delhi.
3. Chakravartym .S (1987), Development Planning : The Indian Experience, Oxford University, Press, New Delhi.
4. Government of India, Econimic Survey (Animal) Ministry of Finance, New Delhi.
6. Jaban. B,(1992) The Indian Economy ð problems and prospects, Viking New Delhi.
7. Parikh.K.S (1999) India Development Report ð 1999 ð 2000 Oxford University, Press, NeW Delhi.
8. Reserve Bank of India, Report on currency and finance (Annual) 10. Sri R.K. and B. Chatterjee (2001) Essays in Honour of Prof.P.R.Brahmanandha), Deep & Deep Publications, New Delhi.

6IT05 OPEN ELECTIVE II (II) HUMAN RESOURCE DEVELOPMENT & ORGANIZATION BEHAVIOR

Course Objective:

The objective of the course is to familiarise the students about the different aspects of managing people in the organisations from the stage of acquisition to development and retention.

Course Outcome:

1. To have an understanding of the basic concepts, functions and processes of human resource management
2. To be aware of the role, functions and functioning of human resource department of the organizations.
3. To Design and formulate variours HRM processes such as Recruitment, Selection, Training, Development, Performance appraisals and r Reward Systems, Compensarion Plans and Ethical Behaviour.
4. Develop ways in which human resources management might diagnose a business strategy and then facilitate the internal change necessary to accomplish the strategy.
5. Evaluate the developing role of human resources in the global arena.

UNIT I: Introduction: Conceptual foundations; Human aspect of management, Human Relations; Human Resource Management- Concept, Scope and Importance; Competencies of HR Manager: Employer branding and Competency mapping; Changing role of HRM- Workforce diversity, Technological change, Restructuring and rightsizing, Empowerment; TQM, Managing ethical issues.

UNIT II: Human Resource Planning, Job Analysis, and Job Design: Assessing Human Resource requirements; Human resource forecasting; Work load analysis ; Job analysis; Job description and specifications; Job design; Job characteristic approach to job design

UNIT III: Recruitment, Selection, Training, and Development: Factors affecting recruitment; Sources of recruitment (internal and external); Basic selection model; Psychological tests for selection; Interviewing; Placement and Induction; Job Changes- Transfers, Promotions, and Separations; An overview of Training and Development; Emerging trends in Recruitment, Selection, and development.

UNIT IV: Understanding Organisation: Significance of Scientific Study of Human Behaviour, Hawthorn Studies itגs importance & implication, Approaches-Cognitive, Behaviourstic & Social learning framework Human Need, theory, Maslow & Herzberg Motivation Process.

UNIT V: Perspectives of Organisation: Perception & Impression, Personality & Attitudes, Learning Values. Group Dynamics, Group formation, Group interaction, Conflict Management, Team Management ñMoraleò

UNIT VI: Leadership: Managerial styles Managerial effectiveness, Indian Manager & His effectiveness, Delegation, Decision Making.

Text Books:

1) D'Cenzo, David A., Stephen P. Robbins, and Susan L. Verhulst, *Human Resource Management,* JohnWiley and Sons, NewDelhi.

2) Keith Devis Human Behaviour at Work.

3) Kundson&Fleeror Management of Organizational Behaviour.

Reference Books:

1. Gomez-Mejia, Luis R., D. B. Balkin, and R. L. Cardy, Managing Human Resources, Prentice Hall NewJersey.
2. Ian, Beardwell, and Len Holden, Human Resource Management, Prentice Hall.
3. Dessler, Garry, Human Resource Management, Prentice Hall of India.
4. Saiyadain, Mirza S., Human Resource Management, Tata McGraw-Hill Pub. Co. Ltd., New Delhi.
5. 6. Noe, Raymond A., John R. Hollenbeck, BarryGerhart and Patrick M. Wright , Human Resource Management, Tata McGraw Hill.
6. Korman A.K. Organizational Behaviour.
7. Prasad Organization Theory & Behaviour.

6IT05 OPEN ELECTIVE II (III) INTELLECTUAL PROPERTY RIGHT

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:

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:

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:

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:

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 ï Related Rights - Distinction between related rights and copyrights.

UNIT IV: Trademarks:

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.

UNIT V: Design & Geographical Indication:
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: India`s New National IP Policy, 2016 ï Govt. of India step towards promoting IPR ï Govt. Schemes in IPR ï Career Opportunities in IP - IPR in current scenario with case studies.

Text Books:
1. K. V. Nithyananda (2019), ñIntellectual Property Rights: Protection and Managementò, IN: Cengage Learning India Private Limited.
2. P. Neeraj and D. Khusdeep (2014), ñIntellectual Property Rightsò, PHI learning Private Limited.

Reference Books:
[1] Deborah E. Bouchoux, ñIntellectual Property for Paralegals ï The law of Trademarks, Copyrights, Patents & Trade secretsò, 4th Edition, Cengage learning, 2012.
[2] N. S. Gopalakrishnan and T. G. Agitha, ñPrinciples of Intellectual Propertyò, Eastern Book Company, Lucknow, 2009.
[3] M. M. S. Karki, ñIntellectual Property Rights: Basic Conceptsò, Atlantic Publishers, 2009.
[4] Ganguli Prabuddha, ñIntellectual Property Rights--Unleashing the Knowledge Economyò, Tata McGrawHill, 2001.
[5] V. K. Ahuja, ñLaw relating to Intellectual Property Rightsò. India, IN: Lexis Nexis, 2017.
[6] P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi, 2010.
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[9] Ganguli Prabuddha, ñGearing up for Patentsé The Indian Scenarioò, Universities Press,1998.

6IT06 COMPILER DESIGN LAB

Suggested List of Experiments:

Experiment No.	*EXPERIMENT DESCRIPTION*
01	Design a lexical analyzer for given language and the lexical analyzer should ignore redundant spaces, tabs and new lines.
02	Write a C program to identify whether a given line is a comment or not.
03	Write a C program to recognize strings under 'a*', 'a*b+', 'abb'.
04	Write a C program to test whether a given identifier is valid or not.
05	Write a C program to simulate lexical analyzer for validating operators.
06	Implement the lexical analyzer using JLex, flex or other lexical analyzer generating tools.
07	Write a LEX Program to scan reserved word and Identifiers of C Language.
08	Design Predictive Parser for the given language.
09	Implement SLR(1) Parsing algorithm.
10	Design a LALR bottom up parser for the given language.
11	Write a C program to generate three address codes.
12	Write a LEX Program to convert the substring abc to ABC from the given input string.
13	Write a lex program to find out total number of vowels, and consonants from the given input sting.

6IT07 DESIGN & ANALYSIS OF ALGORITHM LAB

Suggested List of Experiments:

1. To study various algorithm designing strategies.
2. Implement Multiplication algorithm using divide and conquer technique and analyze time complexity.
3. Implement Knapsack problem using greedy method
4. Implement Dijkstras Shortest Path Algorithm.
5. Implement Primôs algorithm using greedy method.
6. Implement travelling salesman problem using dynamic programming.
7. Implement search and traversal using backtracking approach.
8. To study polynomial time and non-polynomial time algorithms.

6IT08 PROFESSIONAL ELECTIVE – II (I) CRYPTOGRAPHY & NETWORK SECURITY- LAB.

Concerned faculty member should suitably frame at least 8 laboratory assignments from the following list or can design suitably 1 or 2 practical from each unit. Study practical are highly discouraged instead of that you can add comparison between different algorithms.

Shri Sant Gajanan Maharaj College of Engineering, Shegaon
Session: 2021-22 (Autumn Semester)

The List of **Open Elective-I** floated by various departments (Semester V)

S. N.	Code	Name of Subject	Department
1.	5ETC05	Sensors and Transducers	Electronics & Telecommunication Engineering
2.		Introduction to Java	
3.	5IT05	Cyber Law & Ethics	Information Technology
4.	5KS05	Principles of e-Marketing for Engineering	Computer Sciences & Engineering
5.	5EP05	Power Supply System	Electrical Engineering (Electronics & Power)
6.	5ME05	Manufacturing Techniques	Mechanical Engineering

The List of **Professional Elective-I** floated by various departments (Semester V)

S. N.	Code	Name of Subject	Department
	5ETC04	Fiber Optic Communication	Electronics & Telecommunication Engineering
1.	5IT04	Data Science & Statistics	Information Technology
2.	5KS04	Data Science& Statistics	Computer Sciences & Engineering
3.		Introduction to Cyber Security	
4.	5EP04	Signal & System	Electrical Engineering (Electronics & Power)

The List of **Professional Elective-I** floated by various departments (Semester VII)

S. N.	Code	Name of Subject	Department
1	7ET5	Fuzzy Logic & ANN	Electronics & Telecommunication Engineering
2		PLC & Automation	
3	7IT05	Distributed DBMS	Information Technology
4	7KS05	Web Engineering	Computer Sciences & Engineering
5	7EP05	Computer Methods in Power System Analysis	Electrical Engineering (Electronics & Power)
6		Artificial Intelligence	
7	7ME05	Tool Engineering.	Mechanical Engineering
8		Mechatronics	

Prof. D. L. Bhombe
Dean (Academics)

SHRI SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING SHEGAON 444203

Dr. S. B. Somani
Principal

Shri Sant Gajanan Maharaj College of Engineering, Shegaon
Session: 2021-22 (Spring Semester)

The List of **Open Elective-I** floated by various departments (Semester VI)

S. N.	Code	Name of Subject	Department
1.	6ETC04	Introduction to Python	Electronics & Telecommunication Engineering
2.	6IT05	Intellectual Property Right	Information Technology
3.	6KS05	Cyber Laws & Ethics	Computer Sciences & Engineering
4.	6FEEP05	Energy Audit & Management	Electrical Engineering (Electronics & Power)
5.	6ME05	Automobile Engineering	Mechanical Engineering

The List of Professional Elective-II floated by various departments (Semester VI)

S. N.	Code	Name of Subject	Department
1	6ETC03	Satellite Communication	Electronics & Telecommunication Engineering
2	6IT04	Big Data Analytics	Information Technology
3	6KS04	Big Data Analytics	Computer Sciences & Engineering
		Cryptography	
4	6EP04	Advanced Control Systems	Electrical Engineering (Electronics & Power)
5	6ME04	Computer Aided Design & Simulation	Mechanical Engineering

The List of Professional Elective-II floated by various departments (Semester VIII)

S. N.	Code	Name of Subject	Department
1	8ET4	BIOMEDICAL ENGINEERING	Electronics & Telecommunication Engineering
2	8IT04	Web Commerce	Information Technology
3	8KS04	Network Security	Computer Sciences & Engineering
4	8EP04	Power Quality	Electrical Engineering (Electronics & Power)
		Electric Drives & Control	
5	8ME01	Automobile. Engg	Mechanical Engineering
6	8ME02	Refrigeration & Air Conditioning	

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SHRI SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING, SHEGAON

NOTICE

Session: 2021-22 (Autumn Semester)

Date: **07/12/2021**

All the Third Year students are informed that details regarding the open elective-I subject for the academic year 2021-22 (Autumn Sem.) are as mentioned in the following table.

S. N.	Dept.	Name of Subject	Code	Name of Faculty	Class Room	Students opting respective free elective
1.	EXTC	Sensors and Transducers	5ETC05	Prof. Lopamudra Samal	Online Class	3N, 3S, 3M
2.		Introduction to Java		Prof. T. P. Marole		3N, 3M
3.	IT	Cyber Law & Ethics	5IT05	Prof. A. G. Sharma		3R, 3S
				Prof. A. K. Shahade		3U1, 3U2
4.	CSE	Principles of e-Marketing for Engineering	5KS05	Prof. P. M. Kuchar		3N, 3S, 3M, 3U2
5.	ELPO	Power Supply System	5EP05	Prof. G. N. Bonde		3M,3U1, 3U2

Note: 1. Students who opt for open elective-I Manufacturing Technique and Electrical Drives can change their elective as these elective subjects are not offered due to insufficient strength.

2. Open elective-I Introduction to Java is not opened for 3N and 3R students.

Prof. D. L. Bhombe
Dean (Academics)

SHRI SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING SHEGAON 444203

Dr. S. B. Somani
Principal

Copy To:

1. Hon. Principal sir for kind information.
2. All HOD for information and circulation among faculty.
3. Time Table Coordinators (Departmental).
4. All Class Counselor for circulation on students WhatsApp group.

SHRI SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING, SHEGAON

NOTICE FOR **B.E. THIRD YEAR** STUDENTS

Session 2021-22

(Spring Semester)

Date: 16/02/2022

Open Electives-II, B.E. Sixth Semester

The list of Open elective-II.

Sr. No.	Department	Code	Subject	Name of Faculty	Branch	Class Room
01	Electronics & Telecomm.	6ETC04	Introduction to Python	Prof. T. P. Marode	3S	A3
				Dr. D. D. Nawgaje	3M	E3
02	Information Technology	6IT05	Intellectual Property Right	Prof. S. S. Muddalkar	3M, 3R	B4
				Prof. H. M. Deshmukh	3U1	C1
				Prof. P. A. Dalke	3U2	C2
03	Computer Engineering	6KS05	Cyber Laws & Ethics	Prof. Ms. R. A. Zamare	3N, 3S	B3
04	Mechanical Engineering	6ME05	Automobile Engineering	Dr. N. H. Khandare	3S	E4
05	Electrical Engineering	6FEEP05	Energy Audit & Management	Prof. M. R. Chavan	3M	A4

Prof. D. L. Bhombe
Dean (Academics)

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Dr. S. B. Somani
Principal

Copy to:
1. Hon'ble Principal sir for kind information.
2. All HODs for necessary action and display on student notice board.
3. Class Counselor (Third Year) to circulate on WhatsApp group.