



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	<i>Number of Programmes in which Choice Based Credit System (CBCS)/ elective course system has been implemented</i>	University Notification regarding implementation of Elective courses
			Scheme of the Program
			Syllabus structure
			Elective Courses list



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

B.E. / B.Text./ B.Tech.
Semester VII & VIII

Prospectus No. 141712

संत गाडगे बाबा अमरावती विद्यापीठ
SANT GADGE BABA AMRAVATI UNIVERSITY

(Faculty of Engineering & Technology)

PROSPECTUS
Prescribed for
Four Year Degree Course
Bachelor of Engineering / Bachelor of Technology
Semester VII & VIII
(CREDIT GRADE SYSTEM)

BRANCHES

- 1) Production Engineering
- 2) Electronics & Telecommunication Engineering
- 3) Electronics Engineering
- 4) Instrumentation Engineering
- 5) Computer Science and Engineering
- 6) Computer Engineering.
- 7) Textile Engineering
- 8) Chemical Engineering
- 9) Polymer (Plastic) Technology
- 10) Food, Pulp & Paper, Oil & Paint and Petrochemical Technology



2013

Visit us at www.sgbau.ac.in

Price Rs./-

Published by
Dineshkumar Joshi
Registrar,
Sant Gadge Baba
Amravati University
Amravati - 444 602

-
- © "या अभ्यासक्रमिकेतील (Prospectus) कोणताही भाग संत गाडगे बाबा अमरावती विद्यापीठाच्या पुर्वानुमती शिवाय कोणासही पुनर्मुद्रित किंवा प्रकाशित करता येणार नाही. "
- © ðNo part of this prospectus can be reprinted or published without specific permission of Sant Gadge Baba Amravati University.ö

SANT GADGE BABA AMRAVATI UNIVERSITY**SPECIAL NOTE FOR INFORMATION OF THE STUDENTS**

- (1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.
- (2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc., refer the University Ordinance Booklet the various conditions/provisions pertaining to examination as prescribed in the following Ordinances.

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

- Ordinance No. 109 : Recording of a change of name of a University student in the records of the University.
- Ordinance No. 6 of 2008 : For improvement of Division/Grade.
- Ordinance No.19/2001 : An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Dineshkumar Joshi
Registrar
Sant Gadge Baba Amravati University

PATTERN OF QUESTION PAPER ON THE UNIT SYSTEM

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

- (1) Syllabus has been divided into units equal to the number of question to be answered in the paper. On each unit there will be a question either a long answer type or a short answer type.
- (2) Number of question will be in accordance with the unit prescribed in the syllabi for each paper i.e. there will be one question on each unit.
- (3) For every question long answer type or short answer type there will be an alternative choice from the same unit. However, there will be no internal choice in a question.
- (4) Division of marks between long answer and short answer type question will be in the ratio of 40 and 60.
- (5) Each short answer type question shall Contain 4 to 8 short sub question with no internal choice.

DIRECTION

No. 31/2011

Date : 10-06-2011

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

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

AND

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

AND

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

AND

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

AND

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

AND

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

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

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

BRANCH**Appendix No.**

- | | |
|--|---|
| 1) Civil Engineering | A |
| 2) Mechanical Engineering | B |
| 3) Production Engineering | C |
| 4) Electrical Engineering (Electronics & Power) | D |
| 5) Electrical and Electronics Engineering | E |
| 6) Electrical Engineering (Electrical & Power) | F |
| 7) Electrical Engineering | G |
| 8) Electronics & Telecommunications Engineering | H |
| 9) Electronics Engineering | I |
| 10) Instrumentation Engineering | J |
| 11) Computer Science & Engineering | K |
| 12) Computer Engineering | L |
| 13) Architecture | M |
| 14) Textile Engineering | N |
| 15) Chemical Engineering | O |
| 16) Chemical Technology (Polymer) (Plastic) Technology | P |
| 17) Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical Technology) | Q |
| 18) Information Technology | R |
| 19) Biomedical Engineering | S |

sd/-

Dr. Mohan K. Khedkar
Vice Chancellor

DIRECTION

No. : 31/2012

Date : 19 /07/2012

Subject :- Corrigendum to Direction No.31 of 2011

Whereas, the Direction No.31 of 2011 in respect of the Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering & Technology is in existence,

AND

Whereas, the schemes of teaching and examinations of III to VIII/X Semesters as per Credit Grade System for the branches Civil Engineering, Mechanical Engineering, Production Engineering, Electrical Engineering(Electronics & Power), Electrical & Electronics Engineering, Electrical Engineering (Electrical & Power), Electrical Engineering, Electronics & Telecommunication Engineering, Electronics Engineering, Instrumentation Engineering, Computer Science & Engineering, Computer Engineering, Architecture, Textile Engineering, Chemical Engineering, Chemical Technology(Polymer)(Plastic) Technology, Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical Technology), Information Technology, Biomedical Engineering were to be implemented from the session 2011-2012 in phase wise manner by the said Direction No. 31 of 2011 as per respective Appendices i.e. Appendix A,B, C,D, E, F, G, H, I,J, K, L,M, N, O, P, Q, R and S,

AND

Whereas, the Academic Council in its meeting held on 05/05/2012 vide Item No. 53 (1) A-R1, C-R-1, D-R1, E-R1, H-R1 and I-R1 has recommended the revised schemes of teaching and examinations of V to VIII/X Semesters as per Credit Grade System for the branches Production Engineering, Electronics & Telecommunications Engineering, Electronics Engineering, Computer Science & Engineering, Computer Engineering, Textile Engineering, Chemical Engineering, Chemical Technology(Polymer)(Plastic) Technology, Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical Technology),

AND

Whereas, the revised Schemes of examinations as per Credit Grade System for the above mentioned branches in the faculty of Engineering & Technology are to be implemented from the academic session 2012-2013 in phase wise manner ,

AND

Whereas, the Schemes of teaching and examinations of above mentioned branches as per Credit System in the faculty of Engineering & Technology are required to be regulated by the Regulation,

AND

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

AND

Whereas, the syllabi of above mentioned branches along with the revised schemes of examinations in the faculty of Engineering & Technology are to be made available for the students admitted during the Session 2012-2013,

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

- 1) This Direction shall be called "Corrigendum to Direction No. 31 of 2011"
- 2) This Direction shall come into force from the date of its issuance.
- 3) Revised schemes of teaching and examinations of V to VIII/X Semesters as per Credit Grade System of the following branches shall be as per respective Appendices appended with this Direction :-

BRANCH	Appendix No.
1) Production Engineering	A
2) Electronics & Telecommunications Engineering	B
3) Electronics Engineering	C
4) Computer Science & Engineering	D
5) Computer Engineering	E
6) Textile Engineering	F
7) Chemical Engineering	G
8) Chemical Technology(Polymer)(Plastic)Technology	H
9) Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical Technology)	I

sd/-

Date :- 19/07/2012

(Mohan K. Khedkar)
Vice Chancellor

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH : ELECTRICAL ENGINEERING (ELECTRONICS & POWER)- SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER - FIFTH

Appendix - C

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	MAX. MARKS COLLEGE ASSESSMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
EXTERNAL	INTERNAL															
THEORY																
01	5EP01	Control Systems - I	4	-	-	4	4	3	80	20	100	40	-	-	-	-
02	5EP02	Microprocessor & Microcontroller	4	-	-	4	4	3	80	20	100	40	-	-	-	-
03	5EP03	Electrical Machines - II	4	-	-	4	4	3	80	20	100	40	-	-	-	-
04	5EP04	Signals & Systems	4	-	-	4	4	3	80	20	100	40	-	-	-	-
05	5FEPE05	Free Elective-I	3	-	-	3	3	3	80	20	100	40	-	-	-	-
06	5EP06	Communication Skills	2	-	-	2	2	2	40	10	50	20	-	-	-	-
PRACTICALS / DRAWING / DESIGN																
07	5EP07	Control Systems - I -Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
08	5EP08	Microprocessor & Microcontroller -Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
09	5EP09	Electrical Machines - II- Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
10	5EP10	Communication Skills- Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
TOTAL			21	-	8	29	25				550				200	
													TOTAL		750	

Free Elective -I 1) Energy Audit & Management 2) Electrical Drives

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	MAX. MARKS COLLEGE ASSESSMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
EXTERNAL	INTERNAL															
THEORY																
01	6EP01	Electrical Power - I	4	-	-	4	4	3	80	20	100	40	-	-	-	-
02	6EP02	Optimisation Techniques	4	-	-	4	4	3	80	20	100	40	-	-	-	-
03	6EP03	Power Electronics	4	-	-	4	4	3	80	20	100	40	-	-	-	-
04	6EP04	Computer Aided Machine Design	4	-	-	4	4	3	80	20	100	40	-	-	-	-
05	6FEPE05	Free Elective-II	3	-	-	3	3	3	80	20	100	40	-	-	-	-
06	6EP06	Electrical Energy Utilisation	4	-	-	4	4	3	80	20	100	40	-	-	-	-
PRACTICALS / DRAWING / DESIGN																
07	6EP07	Power Electronics - I Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
08	6EP08	Computer Aided Machine Design Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
09	6EP09	Electrical Energy Utilisation Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
TOTAL			23	-	6	29	26				600				150	
													TOTAL		750	

Free Elective -II 1) Electrical Estimating & Costing 2) Power Supply Systems

Note : Students will have to opt the free electives offered from other courses of their College / Institution / University Department

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

TOTAL 650

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

SEMESTER- EIGHTH																
THEORY																
Sr. No.	Subject Code	Subject	HOURS / WEEK			Total HOURS/WEEK	CREDITS	THEORY					PRACTICAL			
			Lecture	Tutorial	P/D			DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESSMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
													EXTERNAL	INTERNAL		
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 Systems 4] Generalised Machine Theory

SEMESTER : FIFTH

Sr. No.	Subject Code	Subject	TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK			L	T	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			T	E	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

Sr. No.	Subject Code	Subject	TEACHING SCHEME				EXAMINATION SCHEME									
			HOURS / WEEK			Total HOURS/WEEK	CREDITS	THEORY				PRACTICAL				
			Lecture	Tutorial	P/D			DURATION OF PAPER (Hrs.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESSMENT	TOTAL	MIN. PASSING MARKS	EXTERNAL	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	7MF04	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	7MF08	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	4	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

Sr. No.	Subject Code	Subject	TEACHING SCHEME				EXAMINATION SCHEME									
			HOURS / WEEK			Total HOURS/WEEK	CREDITS	THEORY				PRACTICAL				
			Lecture	Tutorial	P/D			DURATION OF PAPER (Hrs.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESSMENT	TOTAL	MIN. PASSING MARKS	EXTERNAL	INTERNAL	TOTAL	MIN. PASSING MARKS
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	Operations 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	Operations 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		Total	Min. Passing Marks	
													Int.	Ext.			
THEORY																	
01	5ET1	Analog Electronics-II	4	1	--	5	5	3	80	20	100	40	--	--	--	--	
02	5ET2	Power Electronics & Drives	4	--	--	4	4	3	80	20	100	40	--	--	--	--	
03	5ET3	Micro Processor & Micro Controller	4	1	--	5	5	3	80	20	100	40	--	--	--	--	
04	5ET4	Communication Engg.-II	4	--	--	4	4	3	80	20	100	40	--	--	--	--	
05	5ET5	Free Elective-I	3	--	--	3	3	3	80	20	100	40	--	--	--	--	
PRACTICALS / DRAWING / DESIGN																	
06	5ETp6	Analog Electronics-II Lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25	
07	5ETp7	Power Electronics & Drives Lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25	
08	5ETp8	Micro Processor & Micro Controller Lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25	
09	5ETp9	Skill Development Lab-III (Simulation)	2	--	2	4	2	--	--	--	--	--	50	50	100	25(Int.) 25(Ext)	
Total			21	2	8	31	26	--	--	--	500	--	--	--	250	--	
Total															750		

Free Elective-I:

1. Electronic Test Instruments

2. Satellite & Optical Fiber Communication

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	6ET1	Microcontroller Programming & Applications	4	1	--	5	5	3	80	20	100	40	--	--	--	--	
02	6ET2	Control Systems Engineering	4	--	--	4	4	3	80	20	100	40	--	--	--	--	
03	6ET3	Digital Communication	4	1	--	5	5	3	80	20	100	40	--	--	--	--	
04	6ET4	Digital Signal Processing	4	--	--	4	4	3	80	20	100	40	--	--	--	--	
05	6ET5	Free Elective-II	3	--	--	3	3	3	80	20	100	40	--	--	--	--	
06	6ET6	Communication Skills	2	--	--	2	--	--	40	10	50	20	--	--	--	--	
PRACTICALS / DRAWING / DESIGN																	
07	6ETp7	Digital Communication Lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25	
08	6ETp8	Digital Signal Processing Lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25	
09	6ETp9	Communication Skills Lab	--	--	2	2	1	--	--	--	--	--	15	10	25	12	
10	6ETp10	Skill Development Lab-IV (Hardware)	2	--	2	4	2	--	--	--	--	--	50	50	100	25(Int.) 25(Ext)	
Total			23	2	8	33	26	--	--	--	550	--	--	--	225	--	
Total															775		

Free Elective-II:

1.Consumer Electronics

2. Introduction to Wireless Technology

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	7ET1	VLSI Design	4	1	--	5	5	3	80	20	100	40	--	--	--	--
02	7ET2	Digital Image Processing	4	--	--	4	4	3	80	20	100	40	--	--	--	--
03	7ET3	Satellite & Optical Fiber Communication	4	--	--	4	4	3	80	20	100	40	--	--	--	--
04	7ET4	Industrial Management & Quality Control	4	--	--	4	4	3	80	20	100	40	--	--	--	--
05	7ET5	Professional Elective-I	4	--	--	4	4	3	80	20	100	40	--	--	--	--
PRACTICALS / DRAWING / DESIGN																
06	7ETp6	VLSI Design Lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25
07	7ETp7	Skill Development Lab-V (Signal & Image Processing)	2	--	2	4	2	--	--	--	--	--	50	50	100	25(Int.) 25(Ext)
08	7ETp8	Project	--	--	2	2	--	--	--	--	--	--	--	--	--	--
09	7ETp9	Seminar	--	--	2	2	2	--	--	--	--	--	50	--	50	25
Total			22	1	8	31	26	--	--	--	500	--	--	--	200	--
Total															700	

Professional Elective-I:

- | | | |
|--|----------------------|--------------------------|
| 1. Computer Organization | 2. PLC & Automation | 3. Smart Sensor |
| 4. Fuzzy Logic & Artificial Neural Network | 5. Speech Processing | 6. RF Modeling & Antenna |

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	
THEORY																	
01	8ET1	UHF & Microwaves	4	--	--	4	4	3	80	20	100	40	--	--	--	--	
02	8ET2	Wireless Communication	4	--	--	4	4	3	80	20	100	40	--	--	--	--	
03	8ET3	Data Communication Network	4	--	--	4	4	3	80	20	100	40	--	--	--	--	
04	8ET4	Professional Elective-II	4	--	--	4	4	3	80	20	100	40	--	--	--	--	
PRACTICALS / DRAWING / DESIGN																	
05	8ETp5	UHF & Microwave Lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25	
06	8ETp6	Skill Development Lab-VI (Networking)	2	--	2	4	2	--	--	--	--	--	50	50	100	25(Int.) 25(Ext)	
07	8ETp7	Project	--	--	4	4	6	--	--	--	--	--	75	75	150	75	
Total			18	--	8	26	25	--	--	--	400	--	--	--	300	--	
Total															700		

Professional Elective-II:

- | | | |
|---------------------------|----------------------------------|----------------------------------|
| 1. Embedded System & RTOS | 2. Automotive Electronics | 3. Wireless Sensor Network |
| 4. Biomedical Engineering | 5. Data Compression & Encryption | 6. Ultra Wide Band Communication |

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	7ET1	VLSI Design	4	1	--	5	5	3	80	20	100	40	--	--	--	--	
02	7ET2	Digital Image Processing	4	--	--	4	4	3	80	20	100	40	--	--	--	--	
03	7ET3	Satellite & Optical Fiber Communication	4	--	--	4	4	3	80	20	100	40	--	--	--	--	
04	7ET4	Industrial Management & Quality Control	4	--	--	4	4	3	80	20	100	40	--	--	--	--	
05	7ET5	Professional Elective-I	4	--	--	4	4	3	80	20	100	40	--	--	--	--	
PRACTICALS / DRAWING / DESIGN																	
06	7ETp6	VLSI Design Lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25	
07	7ETp7	Skill Development Lab-V (Signal & Image Processing)	2	--	2	4	2	--	--	--	--	--	50	50	100	25(Int.) 25(Ext)	
08	7ETp8	Project	--	--	2	2	--	--	--	--	--	--	--	--	--	--	
09	7ETp9	Seminar	--	--	2	2	2	--	--	--	--	--	50	--	50	25	
Total			22	1	8	31	26	--	--	--	500	--	--	--	200	--	
Total															700		

Professional Elective-I:

- | | | |
|--|----------------------|--------------------------|
| 1. Computer Organization | 2. PLC & Automation | 3. Smart Sensor |
| 4. Fuzzy Logic & Artificial Neural Network | 5. Speech Processing | 6. RF Modeling & Antenna |

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	8ET1	UHF & Microwaves	4	--	--	4	4	3	80	20	100	40	--	--	--	--	
02	8ET2	Wireless Communication	4	--	--	4	4	3	80	20	100	40	--	--	--	--	
03	8ET3	Data Communication Network	4	--	--	4	4	3	80	20	100	40	--	--	--	--	
04	8ET4	Professional Elective-II	4	--	--	4	4	3	80	20	100	40	--	--	--	--	
PRACTICALS / DRAWING / DESIGN																	
05	8ETp5	UHF & Microwaves Lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25	
06	8ETp6	Skill Development Lab-VI (Networking)	2	--	2	4	2	--	--	--	--	--	50	50	100	25(Int.) 25(Ext)	
07	8ETp7	Project	--	--	4	4	6	--	--	--	--	--	75	75	150	75	
Total			18	--	8	26	25	--	--	--	400	--	--	--	300	--	
Total															700		

Professional Elective-II :

- | | | |
|---------------------------|----------------------------------|----------------------------------|
| 1. Embedded System & RTOS | 2. Automotive Electronics | 3. Wireless Sensor Network |
| 4. Biomedical Engineering | 5. Data Compression & Encryption | 6. Ultra Wide Band Communication |

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									
Sr. No.	Subject Code	Subject	HOURS / WEEK			Total HOURS/WEEK	CREDITS	THEORY					PRACTICAL				
			Lecture	Tutorial	P/D			DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS	
													EXTERNAL	INTERNAL			
THEORY																	
01	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																	
Sr. No.	Subject Code	Subject	HOURS / WEEK			Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS	
			Lecture	Tutorial	P/D								EXTERNAL	INTERNAL			
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 : Computer Science & Engineering- Semester Pattern (Credit Grade System)

SEMESTER : FIFTH

APPENDIX - D

Semester :FIFTH																
			TEACHING SCHEME				EXAMINATION SCHEME									
Sr. No.	Subject Code	Subject	HOURS / WEEK			Total HOURS/WEEK	CREDITS	THEORY				PRACTICAL				
			Lecture	Tutorial	P/D			DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
				EXTERNAL	INTERNAL											
THEORY																
01	5KS01	Data Communication	4	—	—	4	4	3	80	20	100	40	—	—	—	—
02	5KS02	File Structures & Data Processing	4	1	—	5	5	3	80	20	100	40	—	—	—	—
03	5KS03	System Software	4	—	—	4	4	3	80	20	100	40	—	—	—	—
04	5KS04	Switching Theory & Logic Design	4	1	—	5	5	3	80	20	100	40	—	—	—	—
05	5FEKS05	Free Elective I*	3	—	—	3	3	3	80	20	100	40	—	—	—	—
06	5KS06	Communication Skills	2	—	—	2	2	2	40	10	50	20	—	—	—	—
PRACTICALS / DRAWING / DESIGN																
07	5KS07	System Software Lab	—	—	2	2	1	—	—	—	—	—	25	25	50	25
08	5KS08	Switching Theory & Logic Design Lab	—	—	2	2	1	—	—	—	—	—	25	25	50	25
09	5KS09	Communication Skills Lab	—	—	2	2	1	—	—	—	—	—	25	25	50	25
TOTAL			21	2	6	29	26			550				150		
												TOTAL		700		

Free Elective I* (i) Data Structures & Algorithms (ii) Data Communication & Networking

Semester :SIXTH																
THEORY																
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	EXTERNAL	INTERNAL	TOTAL	MIN. PASSING MARKS
01	6KS01	Operating Systems	4	1	—	5	5	3	80	20	100	40	—	—	—	—
02	6KS02	Database Systems	4	—	—	4	4	3	80	20	100	40	—	—	—	—
03	6KS03	Computing Resources Management	4	—	—	4	4	3	80	20	100	40	—	—	—	—
04	6KS04	Computer Architecture	3	1	—	4	4	3	80	20	100	40	—	—	—	—
05	6FEKS05	Free Elective II*	3	—	—	3	3	3	80	20	100	40	—	—	—	—
06	6KS06	Professional Ethics	2	—	—	2	2	2	40	10	50	20	—	—	—	—
PRACTICALS / DRAWING / DESIGN																
07	6KS07	Operating Systems Lab	—	—	2	2	1	—	—	—	—	—	25	25	50	25
08	6KS08	Database Systems Lab	—	—	2	2	1	—	—	—	—	—	25	25	50	25
09	6KS09	Computer Lab-II (Hardware Lab)	1	—	2	3	2	—	—	—	—	—	25	25	50	25
TOTAL			21	2	6	29	26			550				150		
												TOTAL		700		

Free ElectiveII* (i) Database Management System (ii) Software Project Management

Note : Students will have to opt the free electives offered from other courses of their college / Institution / University Department.

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

Appendix - H

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	MAX. MARKS COLLEGE ASSESSMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
										EXTERNAL	INTERNAL					
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																
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	MAX. MARKS COLLEGE ASSESSMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
										EXTERNAL	INTERNAL					
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

B.E. / B.Text./ B.Tech.
Semester VII & VIII

Prospectus No. 141712

संत गाडगे बाबा अमरावती विद्यापीठ
SANT GADGE BABA AMRAVATI UNIVERSITY

(Faculty of Engineering & Technology)

PROSPECTUS
Prescribed for
Four Year Degree Course
Bachelor of Engineering / Bachelor of Technology
Semester VII & VIII
(CREDIT GRADE SYSTEM)

BRANCHES

- 1) Production Engineering
- 2) Electronics & Telecommunication Engineering
- 3) Electronics Engineering
- 4) Instrumentation Engineering
- 5) Computer Science and Engineering
- 6) Computer Engineering.
- 7) Textile Engineering
- 8) Chemical Engineering
- 9) Polymer (Plastic) Technology
- 10) Food, Pulp & Paper, Oil & Paint and Petrochemical Technology



2013

Visit us at www.sgbau.ac.in

Price Rs./-

Published by
Dineshkumar Joshi
Registrar,
Sant Gadge Baba
Amravati University
Amravati - 444 602

-
- © "या अभ्यासक्रमिकेतील (Prospectus) कोणताही भाग संत गाडगे बाबा अमरावती विद्यापीठाच्या पुर्वानुमती शिवाय कोणासही पुनर्मुद्रित किंवा प्रकाशित करता येणार नाही. "
- © ðNo part of this prospectus can be reprinted or published without specific permission of Sant Gadge Baba Amravati University.ö

SANT GADGE BABA AMRAVATI UNIVERSITY**SPECIAL NOTE FOR INFORMATION OF THE STUDENTS**

- (1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.
- (2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc., refer the University Ordinance Booklet the various conditions/provisions pertaining to examination as prescribed in the following Ordinances.

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

- Ordinance No. 109 : Recording of a change of name of a University student in the records of the University.
- Ordinance No. 6 of 2008 : For improvement of Division/Grade.
- Ordinance No.19/2001 : An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Dineshkumar Joshi
Registrar
Sant Gadge Baba Amravati University

PATTERN OF QUESTION PAPER ON THE UNIT SYSTEM

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

- (1) Syllabus has been divided into units equal to the number of question to be answered in the paper. On each unit there will be a question either a long answer type or a short answer type.
- (2) Number of question will be in accordance with the unit prescribed in the syllabi for each paper i.e. there will be one question on each unit.
- (3) For every question long answer type or short answer type there will be an alternative choice from the same unit. However, there will be no internal choice in a question.
- (4) Division of marks between long answer and short answer type question will be in the ratio of 40 and 60.
- (5) Each short answer type question shall Contain 4 to 8 short sub question with no internal choice.

DIRECTION

No. 31/2011

Date : 10-06-2011

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

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

AND

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

AND

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

AND

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

AND

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

AND

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

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

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

BRANCH**Appendix No.**

- | | |
|--|---|
| 1) Civil Engineering | A |
| 2) Mechanical Engineering | B |
| 3) Production Engineering | C |
| 4) Electrical Engineering (Electronics & Power) | D |
| 5) Electrical and Electronics Engineering | E |
| 6) Electrical Engineering (Electrical & Power) | F |
| 7) Electrical Engineering | G |
| 8) Electronics & Telecommunications Engineering | H |
| 9) Electronics Engineering | I |
| 10) Instrumentation Engineering | J |
| 11) Computer Science & Engineering | K |
| 12) Computer Engineering | L |
| 13) Architecture | M |
| 14) Textile Engineering | N |
| 15) Chemical Engineering | O |
| 16) Chemical Technology (Polymer) (Plastic) Technology | P |
| 17) Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical Technology) | Q |
| 18) Information Technology | R |
| 19) Biomedical Engineering | S |

sd/-

Dr. Mohan K. Khedkar
Vice Chancellor

DIRECTION

No. : 31/2012

Date : 19 /07/2012

Subject :- Corrigendum to Direction No.31 of 2011

Whereas, the Direction No.31 of 2011 in respect of the Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering & Technology is in existence,

AND

Whereas, the schemes of teaching and examinations of III to VIII/X Semesters as per Credit Grade System for the branches Civil Engineering, Mechanical Engineering, Production Engineering, Electrical Engineering(Electronics & Power), Electrical & Electronics Engineering, Electrical Engineering (Electrical & Power), Electrical Engineering, Electronics & Telecommunication Engineering, Electronics Engineering, Instrumentation Engineering, Computer Science & Engineering, Computer Engineering, Architecture, Textile Engineering, Chemical Engineering, Chemical Technology(Polymer)(Plastic) Technology, Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical Technology), Information Technology, Biomedical Engineering were to be implemented from the session 2011-2012 in phase wise manner by the said Direction No. 31 of 2011 as per respective Appendices i.e. Appendix A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R and S,

AND

Whereas, the Academic Council in its meeting held on 05/05/2012 vide Item No. 53 (1) A-R1, C-R-1, D-R1, E-R1, H-R1 and I-R1 has recommended the revised schemes of teaching and examinations of V to VIII/X Semesters as per Credit Grade System for the branches Production Engineering, Electronics & Telecommunications Engineering, Electronics Engineering, Computer Science & Engineering, Computer Engineering, Textile Engineering, Chemical Engineering, Chemical Technology(Polymer)(Plastic) Technology, Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical Technology),

AND

Whereas, the revised Schemes of examinations as per Credit Grade System for the above mentioned branches in the faculty of Engineering & Technology are to be implemented from the academic session 2012-2013 in phase wise manner ,

AND

Whereas, the Schemes of teaching and examinations of above mentioned branches as per Credit System in the faculty of Engineering & Technology are required to be regulated by the Regulation,

AND

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

AND

Whereas, the syllabi of above mentioned branches along with the revised schemes of examinations in the faculty of Engineering & Technology are to be made available for the students admitted during the Session 2012-2013,

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

- 1) This Direction shall be called "Corrigendum to Direction No. 31 of 2011"
- 2) This Direction shall come into force from the date of its issuance.
- 3) Revised schemes of teaching and examinations of V to VIII/X Semesters as per Credit Grade System of the following branches shall be as per respective Appendices appended with this Direction :-

BRANCH**Appendix No.**

- | | |
|---|---|
| 1) Production Engineering | A |
| 2) Electronics & Telecommunications Engineering | B |
| 3) Electronics Engineering | C |
| 4) Computer Science & Engineering | D |
| 5) Computer Engineering | E |
| 6) Textile Engineering | F |
| 7) Chemical Engineering | G |
| 8) Chemical Technology(Polymer)(Plastic)Technology | H |
| 9) Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical Technology) | I |

sd/-

Date :- 19/07/2012

(Mohan K. Khedkar)
Vice Chancellor

Reference Books :-

1. S. Rao – “EHV A.C. and HVDC Transmission Engineering and Practice”, Khanna Publishers, New Delhi.
2. Narain G. Hingorani and Lazlo Gyugyi – “Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems.
3. Yong Hua Song and Allan T. Johns - “Flexible AC transmission Systems (FACTS), T and D reference book” Westing house.

FREE ELECTIVE - I**5FEEP05/ 5 FEEX05/ 5FEEL05 / 5FEEE05****(1) ENERGY AUDIT & MANAGEMENT****SECTION - A****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-Energy–production relationship, specific energy consumption, Sankey diagram, CUSUM Technique, Bench marking energy performance, Recommendations for energy conservation, Action plan, Executive Summary.

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

SECTION - B

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.

UnitVI: 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, Locating harmonic sources, Power quality monitoring.

Reference Books:

1. Electrical Energy Utilization & Conservation Dr. S.C. Tripathi, TMC
2. Energy Coservation and Audit Thumman
3. Energy Audit and Conservation TERI
4. Guide book for national certification examination for Bureau of Energy Efficiency energy managers and energy auditors.
5. Electrical power system quality systems Surya Santoso/ H. W. Beaty, TMH Publication.

FREE ELECTIVE - I**5FEEP05/ 5 FEEX05 / 5FEEL05 / 5FEEE05****(2) ELECTRICAL DRIVES****SECTION - A****Unit-I : Concept of Electrical Drives:**

Electric Drives: Definition, Advantages, components, Selection. Latest trends in DC & AC Drives, Dynamics. Equivalent values of drive parameters. Load Torque: Components, Natures and classification. Steady state stability: Speed torque characteristics, criteria. Load equalization.

Unit-II: Electrical Braking:

Electrical braking methods, characteristics of DC Motors: Rheostatic, Plugging, and Regenerative. Electrical braking method of three phase induction motor: DC Dynamic Braking, Plugging, Regenerative Braking, AC Rheostatic braking.

Unit-III: Solid State Controlled D.C. Motors:

Fully controlled converter: Single phase, three phase and effect on performance of separately excited DC Motor. Chopper control converter: Close loop control of DC series motor in a drive.

SECTION B**Unit-IV: Solid State Controlled Induction Motors:**

Steady State Analysis, Thyristorised stator voltage control, Transistorised stator frequency control: V/f control, voltage source inverter (VSI) control, current source inverter (CSI) control, Steady State Analysis, Relative merits and demerits of VSI and CSI for induction motor drive.

Unit-V: Energy Saving in starting of Induction Motor Drive: Types, rotor resistance, reduced voltage, use of magnetic amplifier. Energy Saving in running of induction motor driving pump and blower: Consideration of load torque characteristics and energy saving calculations. Power Rating: Load diagram, Heating and cooling, Thermal Resistance, Selection of motor power capacity, Derating of motor, effect of harmonic current, short time rating.

Unit-VI: Industrial Applications and Latest trends in Drives:

Industrial Applications: Drives for Rolling mills (Four Quadrant Operation), Machine tools (Constant Torque Application), Textile mills (Synchronized operation of Drive in Tandem), Sugar Mills: Centrifuged Drive. Latest trends in Drives: Commutatorless DC Motor, Servo Drives, Stepper motors.
Energy Saving Techniques and Power Rating of Drive Motor:

Reference Books :-

1. G. K. Dubey, "Fundamentals of Electric Drives", 2nd Edition, Narosa Publishing House
2. N. K. De, P. K. Sen, "Electric Drives", Prentice Hall of India Eastern Economy Edition
3. S. K. Pillai, "Analysis of Thyristor Power Conditioned Motors", University Press
4. V. Subrahmanyam, "Electric Drives: Concepts & Application", Tata Mc-Graw Hill
5. K. Bose, "Modern Power Electronics and AC Drives", Pearson Education
6. R. Krishanan, "Electric Motor Drives – Modeling Analysis and Control", PHI India

5EP06 /5 EX 06/5EL06/5EE06 COMMUNICATION SKILLS

Unit I : Comprehension over an unseen passage. Comprehension – A - word study :- Synonym, antonym, meanings, matching words, adjectives, adverbs, prefix and suffix, correct forms of commonly misspelled words, understanding of the given passage. Comprehension - B - Structure study :-Simple and compound sentences, types of conjunctions, singular and plural, tenses and their effect on verb forms. Use of - not only - but also, if clause, since, may, can, could,would, too etc. Active and passive forms, negative and interrogative, punctuation and capitalization.

Unit II : Theoretical background - importance of communication, its process, model of communication its components & barriers. Verbal communication, its significance, types of written communication, organization of a text (Titles, summaries, headings,

sequencing, signaling, cueing etc.), Important text factors (length of paragraph, sentences, words, clarification and text difficulty). Evaluation of written communication for its effectivity and subject content. Non-verbal communication, types of graphics and pictorial devices.

Unit III:Specific formats for written communication like – business correspondence, formal reports, technical proposals, research papers and articles, advertising and graphics. Format for day-to-day written communication like applications, notices, minutes, quotations, orders, enquiries etc. Oral communications - Important objectives of interpersonal skills, (verbal and non-verbal), face to face communications, group discussion and personal interviews. Methodology of conduction of meetings, seminars, symposia, conference and workshop.

BOOKS RECOMMENDED:

- 1) Krishna Mohan, Meera Banerjee : Developing Communication Skills, MacMillan India Limited.
- 2) Chrissie Wright (Editor) : Handbook of Practical Communication Skills, Jaico Publishing House.
- 3) Raman Sharma "Technical Communication", Oxford University Press..
- 4) F.Frank Candlin : General English for Technical Students, University of London Press Ltd.

5EX 07 CONTROL SYSTEM LAB.

Any TEN experiments based on contents of
5EX01 CONTROL SYSTEM - I

5EX08 DIGITALELETRONICSLAB

Any TEN experiments based on contents of
5EX02DIGITALELECTRONICS

5EP09/5EX09/5EL09/5EE09 ELECTRICAL MACHINES - II - LAB

Any TEN experiments based on contents of
5EP03 /5EX03/5EL03/5EE02 ELECTRICAL MACHINES - II

**5EP10/5EX10 /5EL10 /5EE10
COMMUNICATION SKILLS LABORATORY**

Objective : On completion of this laboratory the candidate should be able to demonstrate adequate skills in oral and written communication for technical English language, actively participate in group discussions and interviews and exhibit the evidence of vocabulary building. Candidates should be assessed through continuous monitoring and evaluation. The sample list of experiments is given below. This list can be used as guideline

Unit V: Microprocessors applications : hardware & software developments : signal conditioning & data acquisition system components. Measurement of pulse width using parallel port, SID lines, interrupts and timer and counter. Magnitude measurement techniques : rectification, sampling etc. Measurement of fundamental quantities (voltage, current, frequency, speed) and derived quantities (resistance, inductance, capacitance, phase angle, power factor).

Unit VI: Introduction to microcontroller: 8051 architecture , 8051 Internal resources, pin diagram, I/O pins, ports and their internal logic circuits, counters, serial ports, interrupt structure, SFRs and their addressing, watch-dog timer, internal code memory, data memory, stack pointer, flags, bit addressable memory, comparative study 8051 families by different manufacturers, study of instruction set of 8051.

TEXT BOOKS :

- 1) Microprocessor Architecture, Programming, and Applications with the 8085 , Romesh Gaonkar PHI Publication -2006
- 2) Introduction to Microprocessor L.Gibson, Prentice-Hall 2003
- 3) The 8051 Microcontroller Scott MacKenzie Prentice-Hall, Inc -2006

REFERENCE BOOKS :

1. An Introduction to Microcomputers Volume 1 Basic Concepts, Adam Osborne Osborne-McGraw Hill, Berkely California, 1980
2. The 8051 Family of Microcontrollers Richard Barnett Prentice-Hall, Inc -2005
3. <http://www.nptel.iitm.ac.in/>
4. www.ocw.mit.edu

PRACTICALS: Uniformly distributed Minimum 10 practicals based on above syllabus.

FREEELECTIVE-II

6FEEP05/ 6FEEX 05/ 6FEEL05/ 6FEEE05

(i) ELECTRICAL ESTIMATING & COSTING

SECTION -A

Unit I: Drawing and IE rules : Classification of Electrical Installation, General requirement of Electrical Installation. Reading and Interpretation of Electrical Engineering Drawings. Various diagrams, plans and layout, Important definitions related to Installation, IE rules related to Electrical Installation & Testing.
Service Connection : Concept of service connection.Types of service connection & their features. Methods of Installation of service connection.Estimates of under ground & overhead service connections.

Unit II: Residential Building Electrification : General rules guidelines for wiring of Residential Installation and positioning of equipments. Principles of circuit design in lighting and power circuits. Procedures for designing the circuits and deciding the number of circuits.

Method of drawing single line diagram.Selection of type of wiring and rating of wires & cables. Load calculations and selection of size of conductor.Selection of rating of main switch, distributions board,protective switchgear ELCB and MCB and wiring accessories. Earthing of Residential Installation. Sequence to be followed for preparing Estimate Preparation of detailed estimates and costing of Residential Installation.

Unit III:Electrification of commercial Installation : Concept of commercial Installation. Differentiate between electrification of Residential and commercial Installation. Fundamental considerations for planning of an electrical Installation system for commercial building. Design considerations of electrical Installation system for commercial building. Load calculations & selection of size of service connection and nature of supply. Deciding the size of cables, busbar and busbar chambers. Mounting arrangements and positioning of switchboards, distribution boards main switch etc. Earthing of the electrical Installation Selection of type wire, wiring system & layout. Sequence to be followed to prepare estimate.Preparation of detailed estimate and costing of commercial Installation.

SECTION - B

Unit IV: Electrification of factory unit Installation : Concept of Industrial load.Concept of Motor wiring circuit and single line diagram. Important guidelines about power wiring and Motor wiring. Design consideration of Electrical Installation in small Industry/ Factory/ workshop. Motor current calculations. Selection and rating of wire, cable size & conduct. Deciding fuse rating, starter, distribution boards main switch etc.Deciding the cable route, determination of length of wire, cable, conduit, earth wire, and earthing. 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, Design of feeders & distributors, Estimates for different feeders & distributors, Distribution transformer, Deciding Size & location, Estimate for outdoor & indoor type distribution substation.

Testing of Installation: Testing of wiring Installation for verification of current; earthing, insulation resistance and continuity as per IS

Unit VI: Contracts, Tenders and Execution : Concept of contracts and Tenders Contracts, types of contracts, contractors. Valid Contracts, Contract documents. 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.

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

FREE ELECTIVE-II

6FEEP05/6FEEX 05/6FEEL05/6FEEO5

(ii) POWER SUPPLY SYSTEMS

SECTION A

Unit I: Structure of Power System – Generation, transmission and distribution. Power generating stations – different types. Steam power stations: Main parts and working, types of boilers and their characteristics. Characteristics of steam turbines and alternators. Main flow circuits of steam power station. Power station auxiliaries, cooling system of alternators. Starting up and shut down procedures of thermal units.

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: Hydroelectric stations: Arrangement and location of hydroelectric stations, principles of working, types of turbines and their characteristics, Pumped storage plants. Coordination of operation of different power stations .

SECTION - B

Unit IV: Substation - Classification of substations, Major equipments in Substation ,Selection & location of site for substation, Main

Electrical connections, Graphical symbols for various apparatus & circuit elements in substation, connection diagram, Key diagram for typical substation, Busbar layouts. Auxillary supply, substation earthing.

Unit V: Power distribution system: Primary and secondary distribution, types of conductors in istribution system, comparison of distribution systems. Distributor design, radial and ring main, current and voltage profiles along a distributor, economics of feeder design.

Unit VI: Electrical wiring and installation - Domestic, commercial and industrial wiring, estimation of main, submain and subcircuit wiring. Earthing practice. Testing of installation. Special lighting connections. Conductors, Fuse and disconnecting devices.

Reference Books:

1. Powerplant Technology by M.M.El-Wakil, McGraw Hill
2. Power Station Engineering & Economy by B.G.A. Skrotzki & W.A.Vopat, Tata McGraw Hill
3. A Course in Power Plant Engineering, by Arora & Domkundwar, Dhanpat Rai
4. Elements of Electrical Power Station Design, by M.V.Deshpande, Wheeler
5. Electrical Installation Estimating & Costing by J.B.Gupta
6. Transmission & Distribution ,by H.Cotton

6EP04/6EL04/6EE04 COMPUTERAIDED MACHINE DESIGN

SECTION-A

Unit I: Introduction : transformers and three phase induction motors - types, specifications, constructional features, magnetic and insulating materials used; design approaches - analysis, synthesis and hybrid methods; design - variables, constraints and objectives; magnetization, loss and carter's coefficient curves - applications, representation using Piecewise Lineariasation and Least Square Error methods.

Unit II: Transformer Design - Magnetic Circuit Specific electric and magnetic loadings selection, output equation, core and yoke cross sections, main dimensions design, core loss from design data.

Unit III: Transformer Design :

- A) Electric circuit : Winding types and design, magnetizing current calculation, primary and secondary winding resistances and leakage reactances from design data; mechanical forces - types, causes and calculations.

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

TOTAL 650

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

SEMESTER- EIGHTH																	
THEORY																	
Sr. No.	Subject Code	Subject	HOURS / WEEK			Total HOURS/WEEK	CREDITS	THEORY					PRACTICAL				
			Lecture	Tutorial	P/D			DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESSMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS	
				EXTERNAL	INTERNAL												
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 Systems 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 of overcurrent, directional, differential and distance relay. Microprocessor based relay introduction.

TEXT BOOK:-

1. Sunil S. Rao of "Switchgear and Protection" Khanna Publications New Delhi

REFERENCE BOOKS:-

1. R. T. Lythall of "Switchgear Handbook" J and P Newness Butterworth, London.
2. C. R. Mason of "The Art and Science of Protective Relaying"
3. A. R. Van and C Warrington of "Protective Relaying", Vol 1 and 2, Chapman Hall, London.
4. Geosonoviz of "High Voltage Circuit Breakers"
5. V. A. Slabikov of "Generation Protection and Switchgear" CIT, Coimbatore.
6. Badri Ram and B. N. Vishwkarma of "Power System Protection and Switchgear" Tata Mc-Graw Hill Publishing Company Limited, New Delhi.
7. B. Ravindranath and M Chander of "Power System Protection and Switchgear" 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 display, universal counter, Digital readout 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 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, 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 of "Electronic Instrumentation", - Tata Mc-Graw Hill Publishing Company, New Delhi.
2. Cooper, Helfrick of "Electronic Instrumentation and Measurement Techniques, A Prentice Hall of India. New Delhi.

REFERENCE BOOKS:-

1. B.R. Gupta-Electronics and Instrumentation of Wheeler Publishing.
2. Rangan, Sharma & Mani of "Instrumentation of devices & Systems." 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 of "A course in Electrical & Electronics Instrumentation, Dhanpat Rai & Sons, New Delhi.

**7EP05/ 7 EX 03 PROFESSIONAL ELECTIVE - I
(2) COMPUTER ORGANISATION**

Unit-I: Basic structure of computer: Hardware & software. Addressing methods. Program sequencing. concept of memory locations & address. Main memory operation. Instructions & instruction sequencing. Addressing modes. Basic I/O operations. Stacks. Queues & subroutines.

- Unit-II: Processing Unit:** fundamental concepts. execution of a complete instruction. hardwired control, performance consideration. Microprogrammed control; microinstructions, microprogram sequencing, microinstruction prefetching, emulation.
- Unit-III:** I/O organization: accessing I/O devices, interrupts, direct memory access: bus arbitration. I/O hardware: processor bus and interfacing circuits, 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, Booth's algorithm, Integer division. Floating-point numbers and related operations.
- Unit-VI: Computer Peripherals:** Input-output devices like video displays, video terminals, graphics input devices, printers. Online storage devices: magnetic disks, magnetic tape systems, CD-ROM systems. Communication devices: Modems.

TEXT BOOK:

V. Carl Hamacher & S. Zaky - Computer Organization (4/e) McGraw-Hill (ISE).

REFERENCES BOOKS:

1. Stallings. W. - Computer Organization & Architecture (5/e) (Pearson Education).
2. Tanenbaum A.S. - Structured Computer Organization (5/e) (Pearson Education).
3. Hayes J.P. - Computer Architecture & Organization (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** - Network Graphs , Incidence matrices, fundamental loop and cutset 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** - Modification of bus impedance and admittance matrix to account for change in networks. Derivation of loop impedance matrix.
Three phase network elements - transformation matrix - incidence and network matrices for three phase networks . Algorithm for formulation of 3 phase bus impedance matrix.

SECTION-B

- Unit IV: Short circuit studies :** Three phase networks , Symmetrical components. Thevenin's theorem and short circuit analysis using bus impedance matrix . Short circuit calculations for balanced three phase networks using bus impedance matrix.
- Unit V: Load flow studies :** formation of load flow problem - Gauss Seidel method - Newton Raphson method - decoupled method, fast decoupled methods - sparsity technique.
- Unit VI: Stability studies of power system** - Development of mathematical model for multimachine system stability analysis - Formation of equations and methods of solutions . Transient stability analysis including synchronous machines , system networks and loads . Solution of state equation by modified Euler method and Runge Kutta 4th order Approximation method.

TEXT BOOKS:

- 1) L.P. Singh : Advanced Power System Analysis and Dynamics, WEL.
- 2) Y. Wallach : Calculations and programs for Power System Network.
- 3) G.W. Stage and A.H. El-Abiad : Computer Methods in Power System Analysis, McGraw Hill.

REFERENCE BOOKS:

- 1) R.N. Dhar : Computer Aided Power System Operation and Analysis, TMC.
- 2) Computer Techniques in Power System Analysis, by M.A. Pai TMH 10th reprint 2011

7EP05/7EL05/7EE05 PROFESSIONAL ELECTIVE -I
(4) ARTIFICIAL INTELLIGENCE

SECTION-A

UNIT I: Introduction

Biological Neurons and their artificial models, introduction to neural computing
 Components of neuron, input and output weight, threshold, weight factors, transfer
 Functions, concepts of supervised and unsupervised learning.

UNIT II: Supervised Learning :

Single Layer network, perceptron, Linear Separability, Training algorithm and limitations .
 Multilayer Network : Architecture of feed forward network , learning rule, generalized
 Delta rule, learning function . Back propagation algorithm.

UNIT III: Unsupervised Learning:

Introduction, Counter propagation networks, Kohonen's self organizing maps.
 Hopfield 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

UNIT VI: 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.

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

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 Park's 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, Clarke's 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.

8EP03/8EL03/8EE03 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, -Digital Signal Processingø PHI Publication
2. Oppenheim & Scheffer, -Discrete Time Processingø John Wiley Publication
3. Digital Signal Processing, P Ramesh Babu, SCITECH Publications, Chennai, 4th edition, 2010

4. Mitra S.K, -Digital Signal Processingø 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, singleø 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, variable frequency control, Rotor resistance control, slip-power recovery scheme, Synchronus motor drive, Microprocessor controlled AC Drive.

UNITV: 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 ø EKF method

UNITVI: Direct torque & adoptaive controlled Drive Torque Expression ø& control strategy self tuning control MRAC sliding mode control self commissioning 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) ø Mohan/ Undeland/ Rossing- John wiley
2. Power Electronics : M.D. Singh, K.B. Khan Chardalli ø TMH

3. Power Electronics : M.H. Rashid ó 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 ó Concepts & Applications by V.Subrahmanyam, 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) EMBEDDED 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 Architecture (ISA) architecture model, internal processor design and its performance.

Unit-III: Memory: ROM, RAM and auxiliary memory, Memory Management of External 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 ÷Embedded Systems Architectureö Elsevier Newnes Publication.

REFERENCE BOOKS:

1. Rajkamal , ÷Embedded Systems, Architecture, Programming & Designö TMH.
2. Jane W. S. Liu ÷Real Time Systemsö, Pearson Education
3. Vahid & Givargis ÷Embedded System Designö John Wiley & Sons P Ltd.
4. Peter Marwedel ÷Embedded Systems Designö 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**

- UNIT VI:** I) Gear :-
Introduction, terminology, gear tooth profiles, involumetry, interference, spur, gears, spiral gears, and its efficiency,
II) Gear Trains:- Types of gear trains, speed ratio applications.
(8 Hrs)

Books Recommended:

Text Books:

- 1) Theory of Machines, S.S.Ratan, Published by Tata Mc Graw Hill.
- 2) Theory of Machines and Mechanisms, J.E.Shigley, Uicker and Gordon, Published by Oxford University press-New York.
- 3) Theory of Machine, R.S.Khurmi and Gupta J.K., Published by Eurasia Publishing house-N Delhi.

Reference Books:

- 1) Theory of Machines, V.P.Singh, Published by Dhanpat Rai-N Delhi.
- 2) Theory of Machines, P.L.Ballaney, Published by Dhanpat Rai and sons-N Delhi.
- 3) Theory of Machines and Mechanisms, Rao J.S. and Gupta K.N., Published by Wiley Eastern-N Delhi.
- 4) Machines and Mechanisms (applied kinematic analysis), David H. Myszka, Published by Pearson Education –Asia.
- 5) Mechanisms Design (analysis and synthesis), Arthur G.Erdman and George N.Sandoor, Published by Prentice Hall Inc.
- 6) Theory of Machines and Mechanisms, Ghosh and Amitabh, Published Affiliated East West Press, N-Delhi.

**5FEME05 FREEELECTIVE-I
(1) MANUFACTURING TECHNIQUES**

Section A

- Unit I:** Overview of manufacturing: Manufacturing science, Introduction to various activities in manufacturing, Properties and application of common ferrous and non-ferrous metals, Common methods of manufacturing, Selection of manufacturing process, Selection of material. (6Hrs)
- Unit II:** Various Machining operations – Turning, planning, shaper, milling, drilling, boring and grinding process. Introduction to tools and equipments required to perform various operations. (8Hrs)
- Unit III:** 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)

Section B

- Unit IV:** 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 V:** Joining process with its types, advantages and disadvantages of riveting, soldering, brazing. Arc welding, gas welding, resistance welding, friction welding. (6Hrs)
- Unit VI:** Powder metallurgy: Methods of production of metal powder, steps in powder metallurgy, mixing and blending, compaction, sintering and finishing. Plastic part manufacturing: Process of extrusion, injection molding, blow molding, compression molding, transfer molding, advantages and disadvantages. (7Hrs)

Books Recommended:

Text Books:

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

References:

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.

**5FEME 05 FREE ELECTIVE - I
(2) ERGONOMICS
Section – A**

- Unit I:** Introduction to Ergonomics , Man machine system, brief history of ergonomics, introduction to human anatomy, posture and body mechanics, musculoskeletal problems in seating and standing (8)
- Unit II:** Anthropometry and Work Place Design, Anthropometric data, applying engineering anthropometry to work station design, work place design for standing and seated workers (7)
- Unit III:** Design of Manual Handling Task , Assessment of Work Load, Anatomy and biomechanics of manual handling & design of manual handling task , lifting , lowering and carrying, grasping and pinching, physiology , workload and work capacity. (7)

Section – B

- Unit IV :** Environmental Factors, Auditory environment- basic principles, Noise & vibration, measurement of sound, noise

exposure and hearing loss, annoyance & distraction, interference with communication, structure of ear, Thermal environment-basic principle, factors affecting the human comfort, physical work and heat stress, visual environment-basic principle, main factors in visual environment, illumination and color, lighting, glare Whole body vibration , segmental vibration, sources of vibration, discomfort
(8)

Unit V: Design of controls and tools, Design of controls, symbols, labels, visual displays of dynamic information, design and selection of tools (7)

Unit VI: Applications of ergonomics in various fields, Human errors, accidents & safety. (7)

Books recommended

Text books –

1. Introduction to Ergonomics by R S Bridger, Edition 1995, Mc Graw Hill International.

Reference books –

1. Human Factors in Engineering & Design by Mark S Sanders and Ernest J. Mc Cormick, Seventh Edition, Mc Graw Hill International
2. Ergonomics in manufacturing , Edited by Waldemar Karwowski & Gavriel Salvendy, Engineering Management Press (EMP), Georgia
3. Industrial Ergonomics; M.I. Khan; PHI.

5FEME05 FREE ELECTIVE-I (3) PRODUCTION MANAGEMENT

Section -A

UNIT I: Designing products, services and processes; Historical evolution of productions and operations management, new product designs, manufacturing process technology. Flexible manufacturing systems(FMS) and computer integrated manufacturing(CIM), design of services and service processes, tools for product development. Standardization, simplification, specialization, diversification, product analysis.

UNIT II: Forecasting & Facility Location: Types of forecasting models, selection of the forecasting model, need for facility location planning, procedures for facility location planning, facility

location planning, facility location models & facility payout planning.

UNIT III : Job Design & Capacity Planning: effective job design, production and operations standards, method study, work measurement, capacity measuring , capacity planning modeling, capacity strategies.

Section -B

UNIT IV: Aggregate Planning for Production & Scheduling: Operation planning and scheduling systems, the aggregate planning process, strategies for developing aggregate planning, master scheduling and rough cut capacity planning, aggregate planning for service organizations, loading sequencing, expediting.

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.

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

Books Recommended

Text Books:

1. Production and operations management- concepts models and Behaviour by Everett E. Adam, Jr., & Ronald J. Ebert (Prentice- Hall of India)
2. Production and operations management – Total Quality and responsiveness by Hamid Noori & Russell Radfort (Mc Graw Hill, Inc.)

References Books

1. Industrial engineering & production Management by M. Mahajan (Dhanpat Rai & Co.)
2. Industrial engineering & management by O.P.Khanna(Dhanpat Rai & Co.)
3. Production and Operations Management; J.P. Saxena; McGraw Hill

5FEME05 FREE ELECTIVE-I (4) PROJECT MANAGEMENT

Section -A

UNIT I : Concepts of Project & Project Selection : Project & development, concept of a project, external causes of delay, Internal constraints, criteria for project selection models,

Types of project selection models, Analysis under high uncertainty, project proposals.

UNIT II: Project organization and planning: organizational form, strategic variables, need for planning, project coordination, negotiation and conflict resolution.

UNIT III: Budgeting and Cost Estimation: estimating project budgets, improving the process of cost estimation, Life-cycle-costing, project cost reduction methods.

Section -B

UNIT IV: Scheduling and resource allocation ; Network Techniques CPM and PERT, Gantt Charts, resource constraints, resource loading, resource leveling, integrated resource management.

UNIT V: Project Control: monitoring and information systems MIS, purposes of control, types of control processes, project cost overruns and cost control, project audit.

UNIT VI: Issues in project Management: Multicultural, issues, project cost escalation, conflict zones in project management, appraisal processes, concepts and techniques, managing project resources flow, project feasibility study.

Text Books:

1. Text Book of Project Management by P. Gopalkrishnan & VE Rama Moorthy (MacMillan India Ltd)
2. Project Management – A Managerial Approach by Jack R. Meredith & Samuel J. Mantel, Jr.(John Wiley & Sons Inc.)

Reference Books:

1. Project Management by Clifford F. Gray/Erik W. Larson (Mc Graw Hill).
2. Project Management by Prassana Chandra.

SME06 PRODUCTION TECHNOLOGY-LAB.

Practicals : At least six from the below list.

Minimum Six experiments from the following list:

1. Determination of Linear/Angular dimensions of a given specimen/part using Precision/Non-Precision Measuring instruments.
2. Precision Angular Measurement using Sine Bar/Sine Centre, Autocollimator/Angle Dekkor.
3. Measurement of Gear Tooth Thickness by Gear Tooth Vernier Caliper/Constant Chord/Span Micrometer.
4. Measurement of Circularity/Roundness of a given specimen.
5. Measurement of Screw Thread Element by Floating Carriage Micrometer.
6. Testing of Surfaces by using Optical Flat.

7. Measurements of various angles of single point cutting tool by using Profile Projector and Tool Maker's Microscope.
8. Preparation of X and R chart for the given lot of sample.
9. Preparation of process chart.

Practical Examination :-

The practical examination shall consist of oral on term work and syllabus taken jointly by Internal and External examiner.

SME07 HEAT TRANSFER-LAB.

List of Practical (Any six of the following):-

1. Determination of thermal conductivity of a metal bar.
2. Determination of thermal conductivity of insulating powder.
3. Study of heat transfer through composite wall.
4. Study of heat transfer through composite cylinders.
5. Determination of fin efficiency.
6. Verification of Stefan-Boltzman's law.
7. Determination of emissivity of grey body.
8. Determination of heat transfer coefficient for forced convection.
9. Determination of heat transfer coefficient for natural convection.
10. Study of pool & nucleate boiling.
11. Trial on double pipe heat exchanger.
12. Determination of efficiency of cross flow heat exchanger.
13. To write a computer program for conduction heat transfer problem.

Practical Examination:- The practical examination shall consist of oral on the term work and syllabus.

SME08 MEASUREMENT SYSTEMS-LAB.

List Of Practical :

Atleast of eight practicals from the following list.

1. Measurement of strain using strain gauges.
2. Calibration of pressure gauge with pressure gauge tester.
3. Measurement of linear displacement by LDR and inductive pick-up transducers.
4. Performance of capacitance transducer as a angular displacement measuring device.
5. Performance of inductive Transducers.
6. Flow measurement.
7. Speed measurement by a stroboscope.
8. Speed measurement by magnetic pick up or phot electric pick up tachometer.
9. Pressure measurement by strains gauge type transducer.
10. Vibration measurement.
11. Liquid level measurement.

6FEME05 FREE ELECTIVE-II
(1) AUTOMOBILE ENGINEERING

SECTION - A

UNIT I: Classification of automobiles, chassis types, Power Unit-Functions, basic working of SI and CI engines, engine parts-types, construction and functions, Multiple cylinder engines, Firing order **(7 Hrs)**

UNIT II: Fuel feed systems- fuel feed systems for petrol and diesel engines, Fuel pumps, fuel filters, Air filters, Basic principles of MPFI and CRDI. Multipoint Fuel Injection Systems (MPFI), Common Rail Diesel Injection Systems(CRDI). Cooling system: purpose, types of cooling system, liquid cooling system-water jacket and ports, water pump and radiators, by pass recirculation system, temperature indicator, 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)**

SECTION - B

UNIT IV: Transmission system:- Layout, single plate friction clutch and multiplate clutch, clutch troubles and remedies. 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, steering gear ratio, wheel balancing, wheel alignment, camber, castor, king pin inclination, toe-in & toe-out & their effects, Introduction to power steering. **(7 Hrs)**

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

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

Reference Books:-

1. Automotive Mechanics; Crouse & Anglin; TMH.
2. Automotive Mechanics; J.Heitner; East West Press
3. Automotive Mechanics; S. Srinivasan; TMH.

6FEME05 FREE ELECTIVE-II
(2) NON-CONVENTIONAL ENERGY SYSTEMS

Section - A

UNIT I: Introduction :- Renewable & Nonrenewable sources. Solar **Radiation :** Solar constant, basic earth-sun angles. Spectral distribution of extra terrestrial radiations & its variation. Solar time, Direction of beam radiation, computation of radiation on inclined surfaces. **(7 Hrs)**

UNIT II: Radiation Transmission through covers:- Reflection and absorption of radiation, optical properties of cover systems transmittance effects of surface layers on transmittance, transmittance absorptance product. Solar Energy collections:- Heat transfer for solar energy utilization, flat plate collectors such as liquid & air collector. Introduction to various systems of concentrating collectors. **(7 Hrs)**

UNIT III: Solar energy Utilization:- Application of solar energy in heating, cooling, pumping, power production, distillation, drying, solar cookers, solar pond, solar furnace. Solar Energy Storage :- Methods of storage such as sensible, latent heat & thermo-chemical storage, selection of method of storage, properties of storage materials and different arrangements of storages. (No analytical treatment) **(7 Hrs)**

Section - B

UNIT IV: Energy from Ocean:- Tidal Power:- types of tidal plants such as single and two basin plants, power developed & operation of tidal power plant. Ocean thermal energy conversion system. Ocean temp. profile, OTE power plant development, controlled flash evaporation, indirect vapour cycle. Wind Power:- Wind speed data, power in the wind, wind power development, types of wind mills, application for pumping and power generation. (No numerical) **(7 Hrs)**

UNIT V: Biomass Energy Resources: Mechanism of green plant photosynthesis. efficiency of conversion, solar energy plantation, biogas – Types of biogas plants, factors affecting production rates. Pyrolysis, Gasifiess : Types & classification. Straight vegetable oils as a liquid fuels and their properties. Introduction to bio-diesel as a diesel engine fuel. **(7 Hrs)**

UNIT VI: Direct Energy Conversion:- Photo voltaic cells : Principle, concept of energy conversion, conversion efficiency, power output and performance, storage. Fuel Cells: Principles types of fuel cells, conversion efficiency. Geothermal Energy Resources, power generation methods like vapour dominated, water dominated, flash steam, binary fluid and total flow concept of power generation. (7 Hrs)

Books Recommended:

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, Transmission and Storage; Bent Sorensen; 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

**6FEME05 FREE ELECTIVE-II
(3) ENERGY MANAGEMENT**

Section-A

UNIT-I: Introduction to energy, Sources of energy, Forms of energy, Energy reserves, renewable energy sources, Units of energy. Energy consumption and GDP. Need and importance of energy conservation and management (7 Hrs)

UNIT-II: Energy audit concepts, Mass and Energy balances, Energy Auditing-methodology, analysis and reporting, Evaluation of energy conserving opportunities, Economic analysis and life cycle costing. (7 Hrs)

UNIT-III: Energy conservation in steam generation and supply system. Boiler performance, Boiler efficiency (direct and indirect method), excess air, flue-gas monitoring. (7 Hrs)

Section - B

UNIT-IV: Energy conservation Energy conservation in compressed air systems, refrigeration and air-conditioning systems and water systems. Elementary coverage of energy conservation in pumps and fans. Opportunities in Process Industries for Energy conservation. (7 Hrs)

UNIT-V: Electrical energy conservation in building lighting, heating, ventilating and air conditioning, Energy efficient motor, power factor improvement in power systems. (9Hrs)

UNIT-VI: Energy environment interaction, Environmental issues, Global warning, Carbon dioxide emissions, Depletion of ozone layer, Government's regulations, Energy economy interaction. (7 Hrs)

Books Recommended

Text Books:

1. P.H. Henderson; India – The Energy Sector; Oxford University Press.
2. D. A. Ray; Industrial Energy Conservation; Pergamon Press.

Reference Books:

1. W.S. Turner; Energy Management Handbook (Wiley)..
2. Rajan; Optimizing Energy Efficiency in the Industry, Tata McGraw Hill Publishers.
3. C.L Capehart; Guide to Energy Management, Fairmont Press.

6ME06 COMMUNICATION SKILLS

Unit I : Comprehension over an unseen passage.
Comprehension - A - word study :- Synonym, antonym, meanings, matching words, adjectives, adverbs, prefix and suffix, correct forms of commonly misspelled words, understanding of the given passage, reading
Comprehension - B - Structure study :- Simple and compound sentences, types of conjunctions, singular and plural, tenses and their effect on verb forms. Use of - not only - but also, if clause, since, may, can, could, would, too etc.
Active and passive forms, negative and interrogative, punctuation and capitalization. Summary, Precise & abstract writing. (10 Hours)

Unit II: Theoretical background - importance of communication, its process, model of communication its components & barriers. Verbal communication, its significance, types of written communication, organization of a text (Titles, summaries, headings, sequencing, signaling, cueing etc.), Important text factors (length of paragraph, sentences, words, clarification and text difficulty). Evaluation of written communication for its effectivity and subject content.
Non-verbal communication, types of graphics and pictorial devices. (10 Hours)

Unit III: Specific formats for written communication like – business correspondence, formal reports, technical proposals, research papers and articles, advertising and graphics. Format for day-to-day written communication like writing applications, Resume, notices, minutes, quotations, orders, enquiries etc. Claim letter.

- c) Depreciation Analysis :- Causes and significance, methods of calculation of depreciation. (7 Hrs)

TEXT BOOKS:

1. Management-principles, processes and practicals, Anil Bhat, Aryakumar; Oxford University Press
2. Management Accounting; Pares 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, Automation 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 analysis 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.)

UNIT III: 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. Application of Robots in manufacturing, casting, welding, painting, m/c loading, handling, heat treatment, assembly, inspection, etc. Technical 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, Components 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), Automated Guided Vehicle (AGV) etc. (08 Hrs)

UNIT VI: Computer Integrated Manufacturing; Introduction, Sequence of functions 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 & Subramaniam; New age International.

PROFESSIONAL ELECTIVE – I

7ME05 (1) NON-CONVENTIONAL ENERGY SYSTEMS

SECTION – A

Unit I :- Introduction :- Renewable & Non-renewable resources. Solar Radiation- Solar Constant basic earth-sun angles spectrum distribution of extra terrestrial radiations and its variation, Solar time, Direction of beam radiation, computation of radiation inclined surfaces, solar charts, measurements of diffuse & 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 transmittance effects of surface layers on transmittance,

transmittance absorptance product. Solar Energy collections;- Heat transfer for solar energy utilization, flat plate collections such as liquid & air collector, collector overall heat transfer coefficient, temperature distribution between the tubes & the collector efficiency 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 furnaces, 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. Ocean thermal energy conversion system. Ocean temp. profile, OTE Power plant development, controlled flash evaporation, indirect vapour cycle, Salinity differences conversion of salinity gradient resources, osmotic pump, dytanic battery, etc.

Wind power :- Wind speed data, power in the wind, wind power development, types of wind mills, application for pumping and power generation. (8 Hours)

Unit V: Biomass Energy Resources; Mechanism of green plant photosynthesis, efficiency of conversion, solar energy plantation, Biogas- Types of Biogas plants, factors affecting production rates, Pyrolysis, Gasification Types & Classification of vegetable oils as 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: Direct Energy Conversion :- Photo voltage cells: Principle, concept of energy conversion, conversion efficiency, power output and performance, storage, Fuel Cells : Principles types of fuel cells, conversion efficiency, Geothermal energy resources, power generation 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, Transmission and Storage, Bent Siresen; Elsevier Publication
3. Renewable Energy; Godfrey Boyle, 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 relations, undeformed chip thickness, Force relations, Merchant circle, energy consideration in metal cutting, Tool wear tool life, tool life criterion, machinability, 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 ó Geometry types, cutting forces, Numerical on Power & torque. (09 Hours)

Unit III: i) Broaches ó Geometric elements of broach teeth, classification of broaches, design of broaches, cutting forces.
ii) Milling cutters- Geometry elements of broach teeth, classification 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, problems of chip & dust in location, use of dowel, 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 Compound, 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 of Metal Cutting & M/c Tools - Juneja (Age Internatioal).

PROFESSIONAL ELECTIVE -I

7ME05 (3)ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

SECTION – A

Unit-I: Introduction to Artificial 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 engineering, basis expert system terminology, human experts and artificial experts, algorithmic and heuristic methods, difference between conventional programmes and expert systems, Architecture of expert systems. (8)

Unit III : Knowledge Representation & Rule based methods, rule execution, forward chaining and backward chaining, 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 facilities, explanation 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 & Development phased in expert system building, development constraints, reliability, maintainability, examples of expert systems, difficulties in development of expert systems (7)

Unit VI: Fuzzy Engineering- Fuzzy logic, fuzzy expert systems, fuzzy sets, membership functions, fuzzy rules for approximate reasoning, fuzzy inference generation, defuzzification, 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 & Theory & Practice, By Ermine, Jean Louis, PHI
- 2) Expert systems in Engineering , By D.T.Pharm. JFS Pub.
- 3) Expert system application by Sumit Vadera, Sigma press
- 4) Artificial Intelligence by Winston P.H., Pearson

7ME05

PROFESSIONAL ELECTIVE –I

(4) MECHATRONICS

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, Electromagnetic Principles, Solenoids and Relays, working of DC motors and stepper motors, hydraulic and pneumatic actuators, (6 Hrs.)

Unit II: Data Acquisition: Analog signal processing using operational amplifier- Introduction, types of amplifiers, sample and hold circuits, introduction to data acquisition, sampling theorem, 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 circuits, digital circuits, Design of logic networks, sequential logic, flip-flops, application of flip-flops, micro-controllers, Programmable logic controller. (6 Hrs)

SECTION - B

Unit IV: Control Valves –

Study of different control components and pneumatic & Hydraulic system- Construction, working 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 and analysis of Hydraulic systems- Sequencing, pneumohydraulic, regeneration circuit, circuit to control tool movement on lathes, 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 Hydraulics by H.L.Stewart.

REFERENCE BOOKS:

- 1) Introduction to Mechatronics by Appus Kuttan K.K.- Oxford Univesity Press.
- 2) Mechatronics ó A multidisciplinary approach 4/e by W.Bolton- Pearson Publication,
- 3) Automation, Production systms and CIM by M.PGroover- Pearson Publication.

7ME06 PROJECT & SEMINAR

7ME07 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 syllabus)
- 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 safety valve ó 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 direct radiation.
8. Study of testing of a flat plate controller
9. Study of Solar still and trial on it.
10. Study of a photovoltaic system.

Practical Examination shall consist of viva voce based on above term work.

7MEO9 AUTOMATION ENGINEERING – 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 Manual part program for two-axis CNC turning operation.
3. Study of working & Programming of XY plotter.
4. Programming Examples on APT.
5. Study of performance of Robots.
6. Simulation 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 Pyrheliometer and measurement of direct radiation.
2. Study of pyranometer and measurement of global and diffuse radiation.
3. Study of sunshine recorder and measurement of sunshine hours.
4. Study and testing of a flat plate recorder.

multidegree of freedom systems, Experimental determination of dynamic characteristics of m/c tool, dynamic characteristics of cutting process, stability analysis, single degree, multidegree (8 Hrs)

SECTION – B

Unit IV: Vibrations of machine tools :- Effects vibration on m/c tool on cutting conditions, workpiece, Sources of vibrations, types of vibrations (forced, chatter, stickup vibrations) and its minimization.

Shock absorber, isolated tool holder, chatter in milling lathe, grinding, reduction of chatter in design & production stages. (8 Hrs)

Unit V : a) Machine tool guideways & slideways :- Functions, shapes of guideway, materials, methods of adjusting clearance in guideways, design of slideways for wear resistance, determination of maximum and average pressure, on slide way, Hydraulic guideway, antifriction guideway, protecting devices for slideway. (8 Hrs)

Unit VI: machine tool spindle and bearings :- Functions, requirement, types and materials of spindle, machine 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 ó Base & Pal
2. M/c Tool Design ó N.K.Mishra.

REFERENCE BOOKS:

1. Machine Tool Design Vol. I,II,III,IV, N. Acherkar (Mir Pub.)
2. Principles of Machine Tools ó Sen & Bhattacharya
3. Design Principles of Metal ó Kondsberger Cutting Machine Tools
4. Machine Tool Design Vol. I to VI ó CMIT, Bangalore.

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, Galerkin's Method, stiffness (Displacement) Method. (7 Hrs)

Unit II: Matrix Algebra & Gaussian Elimination : Matrix Multiplication, Transposition, Diagonal Matrix, Symmetric Matrix, Upper Triangular Matrix, Determinant of Matrix, Matrix Inversion Eigen values & Eigenvectors, Gaussian elimination. (7 Hrs)

Unit III: ID Problems : Finite Element modeling, coordinate Shape function, The potential Energy approach, The Galerkin's Approach, assemblies of the global stiffness matrix and load 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 approach, element stiffness, Galerkin's 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 strain, derivation of the CST stiffness matrix and equations Treatment of body and surface forces. (7 Hrs)

Unit VI: Heat Transfer : Derivation of the basic 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 (preprocessing, post processing, input data file, mesh generation)

BOOKS RECOMMENDED:

TEXT BOOKS:

1. Introduction to Finite Element Engineering ó 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, Elsevier Pub., 4th Edition.
2. Fundamentals of Finite Element Method analysis ó D.V.Huttan, Tata Mcgraw Hill

3. Concept & Applications of Finite Element Analysis ó Robert D.Cook
4. Finite & Boundary Element Method in Engineering ó 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 grippers, 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 Engines. (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 ó 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 .

8ME05 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 ó Viva voce on the term work and syllabus.

**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 ó Laplace transformation, Canonical transformation and Cayley Hamilton theorem; Time response ó SISO Systems.

Unit III : State Space Techniques II:

Concept - controllability and observability; SISO/MIMO Linear systems -Gilbert's method and Kalman's 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 ó 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, Jury's Test and Bi-Linear Transformation, Root and root locus method.

Unit V : Non-Linear System Analysis I :

Non-linear system behavior ó types and characteristics; Describing functions - typical non-linearity and their

Subject (Th): FE5ET5(1) - ELECTRONIC TEST INSTRUMENTS**Course Objectives:**

1. To introduce students to the use of various electrical/electronic testing and measuring instruments.
2. To provide students with opportunities to develop basic skills in the use of electronic equipments.

Course Outcomes:

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

1. Understand the basic techniques of electronic testing and measuring equipments.
2. Identify electronic instruments, their use and errors associated with the instruments.
3. Explain the use of electronic instruments for testing and measurement in various applications.

	Subject: ELECTRONIC TEST INSTRUMENTS	L
Unit-1	Analog meters, digital meters, dc voltmeter, ac voltmeters, RF probes, ammeters, ac ammeters, ohm-meters, 4-wire ohm measurements, multi-meters, meter range, other multi-meter functions: continuity indicators, diode tests, frequency counters, minimum, maximum, average read-outs, capacitance and temperature measurements, specifications	08
Unit-2	Floating and grounded outputs, sine wave sources, imperfections in sine wave sources, frequency accuracy, frequency stability, amplitude accuracy, distortion, spurious responses, close-in-sidebands, Function Generators: Arbitrary waveform generators, arbitrary waveforms, AM and FM modulation, bursts, Frequency Shift Keying, Frequency sweep, sync output, phase locking, pulse generators, RF signal generators	08
Unit-3	Oscilloscopes: the concept of oscilloscope, digital scope block diagram, sample rate, real time and repetitive sampling, triggering, acquisition/sweep control, vertical amplifier, vertical resolution, ac and dc coupling, bandwidth limit, X-Y display mode, High impedance inputs, 50 ohm inputs, digital acquisition and display techniques, specifications of oscilloscopes, mixed signal oscilloscope, oscilloscope probes, probe compensation, active probes, differential measurements, high voltage probes, current probes	08
Unit-4	Oscilloscope measurements, basic waveform measurements, voltage gain measurements, phase measurements, frequency measurements, digital signal measurements, frequency response measurements, square wave tests, linearity measurements, curve tracer measurement techniques, diode I-V and resistor I-V characteristics, amplitude modulation measurements, power measurements, FFT measurements, basic time domain reflectometry	08
Unit-5	Spectrum and network analyzers: spectrum analyzer, bank-of filters spectrum analyzers, FFT spectrum analyzers, wavemeters, resolution bandwidth, narrow-band and broadband measurements, swept spectrum analyzers, spectrum analyzer measurements, Network Analyzers, distortion analyzers, RF power measurements, RF power meter	08
Unit-6	Logic Analyzers: logic probes, oscilloscope logic measurements, logic analyzers, timing analyzers, glitch detect, state analyzers, data formats, state displays, timing displays, microprocessor measurements, trigger events and sequencing, microprocessor program flow, logic analyzer probing, combined scope and logic analyzer, PC-hosted logic analyzers	08
	Total	48

Text Books:

1. Robert A. Witte, Electronic Test Instruments: Analog and Digital, Second Edition, Pearson Education.

Subject (Th): FE5ET5(2) - SATELLITE AND FIBER OPTIC COMMUNICATION

Course Objectives:		
<ol style="list-style-type: none"> 1. To understand basics of orbital mechanism, the types of satellite orbits and orbital aspects of satellite communication. 2. To understand the various services of satellite. 3. To introduce and understand optical fiber communication system. 4. To understand and elaborate different components of fibre optic communication system. 		
Course Outcomes:		
Upon successful completion of this course, the student will be able to:		
<ol style="list-style-type: none"> 1. Understand orbital aspects of satellite communication. 2. Know orbital effects in communication system performance. 3. Elaborate the satellite link model. 4. Describe satellite services; GPS. 5. Understand functioning of optical sources and detectors. 6. Describe optical fiber communication system and its performance measures. 		
	Subject: SATELLITE AND FIBER OPTIC COMMUNICATION	L
Unit-1	Introduction: Satellite frequency bands, Satellite types-LEO, MEO, GEO, HEO, Kepler's laws, Satellite orbits, Geo-stationary Satellite. Orbital Aspects of Satellite Communication: Orbital period and velocity, Effect of orbital inclination, Azimuth and Elevation, Converge angle and Slant range, Orbital effect in communication system performance. [T1,R1]	08
Unit-2	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. [R1]	08
Unit-3	Satellite Services: 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. [T1]	08
Unit-4	Optical Fiber Communication System: Basic optical laws and definitions, Optical fiber modes and configurations, N.A. Attenuation: Units, absorption, scattering losses radioactive losses, core and cladding losses. Material dispersion, wave guide dispersion, intermodal dispersion. [T2,R2]	08
Unit-5	Optical Sources: Light Emitting Diodes: Structure, Light source materials. Laser Diodes: Structure, threshold conditions, Modulations of laser diodes. Light source linearity, reliability considerations. [T2,R2]	08
Unit-6	Optical Detectors: Physical principles of photodiodes, Photo detector noise, Detectors response time, Avalanche multiplication noise, Temperature effect on avalanche gain. [T2,R2]	08
	Total	48

Text Books:

1. Pratt Timothy and Bostian W.Charles, "Satellite Communication", Willey Int. Pub., New York.
2. G. Keiser, "Optical Fibre Communication", McGraw Hill International.

References:

1. Robert M Gagliardi, "Satellite Communication", CBS Pub.
2. Seniors J. M., "Optical Fibre Communication and Applications", Prentice Hall of India Pvt. Ltd., New Delhi.

Subject (Th): FE6ET5 (1) - CONSUMER ELECTRONICS**Course Objectives:**

1. To gain knowledge and competencies regarding various electronics devices /systems used in field of consumer electronics.

Course Outcomes:

At the end of the course the student will be able to:

1. Understand audio and video systems commonly used in consumer electronics.
2. Explain the working of commonly used electronic appliances.
3. Describe recording and reproduction systems.
4. Acquire knowledge of working principle of calculator and In-Car-Computers
5. Observe occupational and safety practices in consumer electronics.

	Subject (Th): CONSUMER ELECTRONICS	L
Unit-1	Audio Systems: Microphones, Loudspeakers, Speaker baffle and enclosure, Acoustics, Mono, Stereo, Quad, Amplifying Systems, Equalizers and Mixers, Electronic Music Synthesizers, Commercial Sound, Theater Sound System.	08
Unit-2	Video Systems and Displays: Colour TV standards and systems, TFT, Plasma, HDTV, Digital TV, Remote Controls, Video Telephone and Video Conferencing.	08
Unit-3	Domestic Appliances: Washing machines, Microwave ovens, Air-conditioners and Refrigerators, Computers Office System: FAX, Xerox, Telephone Switching System, Mobile Radio System.	08
Unit-4	Recording and Reproduction Systems: Disc recording and reproduction, Magnetic recording and reproduction, Video disc recording and play back, Distortion and Noise reduction in Audio and Video System.	08
Unit-5	Power Supplies and other systems: SMPS, UPS and Preventive Maintenance, Set Top Boxes, Remote controls, Bar codes, ATM, Dish washers	08
Unit-6	Calculators: Structure, internal organization, servicing; In-Car-Computers: electronic ignition, electronic ignition lock system, Antilock Braking System (ABS), Electronically controlled Suspension (ECS), Instrument panel displays, ultrasonic car safety belt system, Air Bag System, Vehicle proximity detection system, car navigation system.	08
	Total	48

Text Books:

1. S.P.Bali, "Consumer Electronics", Pearson Ed 2005.

Subject (Th): FE6ET5 (2) - INTRODUCTION TO WIRELESS TECHNOLOGY

Course Objectives:		
<ol style="list-style-type: none"> To be aware of evolution in wireless technology. To study the fundamentals of cellular radio system. To understand operation of various 2nd and 3rd generation cellular systems; GSM, IS95, CDMA2000, WCDMA. To study wireless data communication networks. 		
Course Outcomes:		
Upon successful completion of this course, the student will be able to:		
<ol style="list-style-type: none"> Describe evolution of wireless networks. Understand fundamentals of cellular radio system. Demonstrate various 2nd and 3rd generation wireless cellular and data communication networks. 		
	Subject (Th): INTRODUCTION TO WIRELESS TECHNOLOGY	L
Unit-1	Overview of Wireless Networks: Evolution of voice oriented and data oriented wireless networks, different generations of wireless networks (1G, 2G, 3G & beyond), comparison of wired and wireless media, radio propagation mechanism, Effects of multipath and Doppler: multipath fading, multiple delay spread, Doppler spectrum. [T1]	08
Unit-2	Cellular Technology: Cellular Topology- cellular concept, cellular hierarchy, cell fundamentals, Evolution of Mobile Systems (1G, 2G, 3G), Signal-to-interference ratio. Capacity Expansion: cell splitting and cell sectoring. Channel allocation techniques: Fixed, Dynamic & Hybrid channel allocation, channel borrowing technique. Handoff Management: Architectural issues in handoff, types of handoff, handoff algorithms. [T1]	08
Unit-3	GSM System: GSM Network Architecture, GSM Call Procedures: Registration procedure, call establishment, Handoff in GSM, GSM Signaling Protocol Architecture: Physical layer: power and power control, physical packet burst, frame hierarchy in GSM, Hand Off Procedures, Logical channels in GSM. [T1]	08
Unit-4	CDMA Digital Cellular Standard (IS-95): IS-95 Forward Channel, IS-95 Reverse Channel, packet and frame formats, mobility and radio resource management: soft handoff and power control. CDMA2000 and WCDMA: Forward and Reverse Channel in CDMA2000 and WCDMA, Hand Off and Power Control in CDMA2000 and WCDMA. [T1]	08
Unit-5	Wireless Local Area Network (WLAN): IEEE 802 architecture, IEEE 802.11 architecture and Services, IEEE 802.11 medium access control, MAC frame format, 802.11 physical layer, 802.11 standards. [T2]	08
Unit-6	Wireless PAN (WPAN-802.15): Overview of 802.15, Bluetooth, Bluetooth protocol stack, usage models, piconets and scatternets, radio specification, baseband specifications: physical links, packets, payload format, error correction, logical channels, channel control, link manager specification. [T2]	08
	Total	48

Text Books:

- K. Pahlavan and P. Krishnamurthy, "Principles of Wireless Networks", Pearson Education Asia Publication (2002).
- William Stallings, "Wireless Communications & Networks", Prentice-Hall India, Second Edition.

Text Books:

1. O.P.Khanna, "Industrial Engineering and Management", Dhanpat Rai Publications.
2. Telsang Martand.T., "Industrial and Business Management", S.Chand Publications.
3. Anil Bhat, Arya Kumar, "Management: Principles, Processes and Practices", Oxford University Press.
4. Bharat Wakhlu, "Total Quality", S. Chand Publications.
5. Armand V. Feigenbaum, "Total Quality Control", Tata Mc-Hill Education.

References:

1. Virendra Sherlekar, S.A. Sherlekar, "Principles of Business Management", Himalaya Publishing House.
2. Bose D. Chandra, "Fundamentals of Financial Management", PHI Learning Publications.
3. Abdul Matheen, "Project Management", Laxmi Publications.

Subject (Th): (7ET5-1) COMPUTER ORGANIZATION

<p>Course Requisite:</p> <ol style="list-style-type: none"> 1. (4ET4) Digital Electronics 2. (5ET3) Microprocessor & Microcontroller
<p>Course Objectives:</p> <p>To understand and gain complete knowledge about:</p> <ol style="list-style-type: none"> 1. Understand the computer components, bus interconnections and different types of memories. 2. Learn the different types of data transfer techniques. 3. Understand the different types of instruction formats and addressing modes. 4. Aware of the difference between the RISC and CISC architecture. 5. Learn the concepts of microinstruction its sequencing and execution. 6. Understand the multiple processor organizations.
<p>Course Outcomes:</p> <p>On completion of this module the student should be able to:</p> <ol style="list-style-type: none"> 1. Design different types of memory systems. 2. Perform different types of floating point arithmetic operations. 3. Design ALU as per the requirement. 4. Understand difference between the Pentium and power PC. 5. Design Micro-programmed control unit as per the requirement. 6. Design multiprocessor based systems.

	Subject: COMPUTER ORGANIZATION	L
Unit-1	Computer components & functions. Interconnection structures, Bus Interconnection, PCI, Computer memory system overview, semiconductor main memory, chip logic, error correction, cache memory, elements of cache design, Associative mapping, Advanced DRAM organization, magnetic disk, RAID, CD-ROM.	09
Unit-2	External devices, I/O modules, Programmed I/O, DMA, Interrupt I/O, I/O channels & IOPs, SCSI & firewire interfaces. Operating system overview, Integer representation and arithmetic, Booths's algorithm, Floating point representation and arithmetic, Precision considerations, guard bits, rounding, quiet and signaling NaNs, denormalised numbers, Little, Big and Bi-Endian.	09
Unit-3	ALU: Machine instruction characteristics, operand types, operation types, Addressing modes, Instruction formats, CPU structure, processor organization, register organization, instruction cycle, instruction pipelining, Branch prediction.	09
Unit-4	RISC machine, Instruction Execution characteristics, Register file concept, Compiler based register optimization, RICS architecture, RISC pipelining, RISC v/s CISC, Case study SPARC, superscalar overview, Design issues in instruction level parallelism and machine parallelism, Case study of PowerPC.	08
Unit-5	Control unit operation: Micro-operations, control of the processor, Hardwired implementation. Micro-programmed control: Concepts, microinstruction sequencing and execution, Applications of microprogramming.	09
Unit-6	Multiple processor organizations, Symmetric processors, Mainframe SMP, Cache coherence and MESI protocol, clusters, Non-uniform Memory access, vector computation.	08
	Total	52

<p>Text Books:</p> <ol style="list-style-type: none"> 1. William Stallings, "Computer Organization & Architecture", 5/e (Pearson Education). 2. A. S. Tanenbaum, "Structured Computer Organization", 4/e, McGrawHill (ISE).
<p>References:</p> <ol style="list-style-type: none"> 1. C. Hamacher, R Zaky, "Computer Organization", 5/e, McGraw Hill (ISE). 2. J.P.Hayes, "Computer Architecture & Organization", 4/e, McGraw Hil (ISE). 3. M.Mano & C. Kime, "Logic & Computer design fundamentals", (2 e), Pearson Education.

Subject (Th): (7ET5-2) PLC AND AUTOMATION

Course Requisite: <ol style="list-style-type: none"> (3ET4) Instrumentation and Sensors. (5ET2) Power Electronics & Drives.
Course Objectives: <ol style="list-style-type: none"> To understand Basic Architecture of PLC. To study Different input/output peripherals and communication standards used with PLC. To study Basic Instructions used for Ladder programming. To develop skills to write basic PLC programs. To know SCADA and its application in industrial automation.
Course Outcome: By the end of this course, the students shall be able to: <ol style="list-style-type: none"> Describe working of various blocks of basic industrial automation system. Interface the peripherals with PLC. Develop PLC programs for various Applications. Application of SCADA in industrial automation.

	Subject: PLC AND AUTOMATION	L
Unit-1	PLC Basic: Introduction to PLC, Need of PLC, Types of PLC, Block diagram, processor section, solid state memory, Input modules & output module (Analog, Digital, Discrete). Advantages and limitations of Automation.	09
Unit-2	Input/Output Devices: Mechanical switches, proximity switches, encoders, Transducer and Sensor- RTD, Thermistors, Thermocouple, Displacement, position, motion sensor, pressure, liquid level detector, fluid flow measurement, optical sensors. Relays, directional control valve, motors, stepper motors.	09
Unit-3	PLC Functions: Symbols of ladder diagram, Symbols of I/O Devices, PLC Timer functions, PLC Counter functions, Comparison functions, data handling functions, Bit functions, data move functions, skip & bypass IO functions.	08
Unit-4	PLC Programming for Electronic Application: Types of programming language, Development of ladder diagrams: Various types for ladder programming, flowchart, ladder programming for logic gets, flip- flop (JK, RS, D, T), Up down counters, ladders programming for various industrial process.	08
Unit-5	PLC Programming for Industrial Automation: Design and development of ladder logic diagram of DOL starter, star delta converter, forward reverse of motor, temperature control of motor, switching appliance using sensor, on delay timer, ladders programming for various industrial process.	08
Unit-6	SCADA: Introduction to supervisory control: Introduction, Block diagram, what is real time, scan interval, Communications in SCADA- types & methods used, Remote Terminal Unit (RTU), and Industrial Application of SCADA system.	08
	Total	50

Text Books : <ol style="list-style-type: none"> “Programmable logic controllers principle and application”, John W. Webb, PHI publication. “Process Control Instrumentation Technology”, Curtis Johnson PHI publication. “SCADA supervisory control and data acquisition”, Stuart A. Boyer, ISA Publication.
Reference Books <ol style="list-style-type: none"> “PLCs & SCADA: Theory and Practice”, Rajesh Mehra and Vikrant Vijay, Laxmi Publications, “Programmable Logic Controllers”, John R Hackworth, Pearson education “Introduction to programmable logic controllers”, Gary A Dunning. “Mitsubishi FX programmable logic controllers Application and programming” by John Ridley

Subject (Th): (7ET5-3) SMART SENSORS

Course Requisite: <ol style="list-style-type: none"> (3ET4) Instrumentation and Sensors (5ET3) Micro Processor & Micro Controller
Course Objectives: <ol style="list-style-type: none"> To acquire fundamental knowledge of Smart Sensors. Understand the nature of sensors, their operation & some aspects related to noise and interference. Study the interfacing of different sensors with microcontroller unit (MCU). Understand use of MCUs/DSPs to Increase Sensor Intelligence. To identify applications of smart sensors in various fields.
Course Outcomes: After successful completion the course, the students will be able to: <ol style="list-style-type: none"> Recognize different types of sensors. Describe the characteristics and operation of smart sensors. Interface the sensors with MCU. Analyze MCUs/DSPs to improve the sensor IQ. Discriminate various control techniques for smart sensors

	Subject: SMART SENSORS	L
Unit-1	Smart Sensor and the Nature of Semiconductor Sensor Output: Mechanical-Electronic Transitions in Sensing, Nature of Sensors, Integration of Micromachining and Microelectronics, Sensor Output Characteristics, Wheatstone bridge, Piezoresistivity in Silicon, Semiconductor Sensor Definitions, Static versus Dynamic Operation, Noise/Interference Aspects.	08
Unit-2	Sensing Technologies: Capacitive Sensing, Piezoelectric Sensing, Hall Effect, Chemical sensors, Improving Sensor Characteristics, Digital Output Sensors, Incremental Optical Encoders, Digital Techniques, Low-Power, Low-Voltage Sensors, combined Solution: Micromachining and Microelectronics.	09
Unit-3	Getting Sensor Information into the MCU: Amplification and Signal Conditioning, Instrumentation Amplifiers, Switched-Capacitor Amplifier, Barometer Application Circuit, 4-20 mA Signal Transmitter, Inherent Power Supply Rejection, Separate Versus Integrated Signal Conditioning, Digital Conversion, A/D Converters, Performance of A/D Converters, Implications of A/D Accuracy and Errors.	09
Unit-4	MCUs/DSPs to Increase Sensor IQ: MCU Control, MCUs for Sensor Interface Peripherals, Memory, Input/output, Onboard A/D Conversion, Power-Saving Capability, Local Voltage or Current Regulation, Modular MCU Design, DSP Control, Algorithms Versus Lookup Tables, Linearization, PWM Control, Auto zero and Auto range, Diagnostics, Indirect (Computed, Not Sensed) Versus Direct Sensing, Sensor Integration.	09
Unit-5	Control Techniques: Programmable Logic Controllers, Open Versus Closed-Loop Systems, PID Control, State Machines, Fuzzy Logic, Neural Networks, Combined Fuzzy Logic and Neural Networks, Adaptive Control, Observers for Sensing, Other Control Areas, RISC Versus CISC, Combined CISC, RISC and DSP, The Impact of Artificial Intelligence.	09
Unit-6	Transceivers, Transponders, and Telemetry: The RF Spectrum, Spread Spectrum, Wireless Data and Communications, Wireless Local Area Networks, FAX/ Modems, Wireless Zone Sensing, Optical Signal Transmission, RF Sensing Surface Acoustical Wave Devices, Radar, Remote Emissions Sensing, Remote Keyless Entry, Intelligent Transportation System, RF-ID, Telemetry, RF MEMS.	08
	Total	52

Text Books:

- “Understanding Smart Sensors”, Randy Frank, 2nd Edition, House Boston, London.

Subject (Th): (7ET5-4) FUZZY LOGIC AND NEURAL NETWORKS

Course Requisite : 1. (6ET2) Control Systems Engineering
Course Objectives:: 1. To study fundamental concepts of Artificial Neural Network (ANN). 2. To understand various learning rules for ANN and different supervised and unsupervised learning networks. 3. To study fundamental concepts of Fuzzy Logic(FL), fuzzification and defuzzification. 4. To understand different supervised and unsupervised learning networks. 5. To learn applications of FL for pattern recognition and control.
Course Outcomes: After successful completion the course the student will be able to: 1. Develop algorithms for supervised and unsupervised ANN. 2. Implement the ANN concepts to solve real life problems. 3. Analyze the ANN network. 4. Develop algorithms in fuzzy logic for applications such as pattern recognition. 5. Implement the fuzzy logic concepts to solve real life problems.

	Subject : FUZZY LOGIC AND NEURAL NETWORKS	L
Unit-1	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.	07
Unit-2	Supervised Learning: Linear separability, Single layer network. Perceptron: Training algorithm and limitations. Multilayer Network: Architecture of feed forward network, Learning rule, generalized delta rule, learning function. Error Back propagation algorithm (EBPA), Learning factors.	09
Unit-3	Unsupervised Learning: Introduction, Clustering and similarity measures, Winner Take all learning, recall mode, outstar learning rule , Self organizing map, Counter propagation networks. Recurrent associative memories: basic concepts, discrete time Hopfield network, storage and retrieval algorithm.	09
Unit-4	Introduction: Uncertainty in information, basic concepts of Fuzzy sets, operations on fuzzy sets, properties. Fuzzy relations : operations, properties, fuzzy Cartesian product and composition, tolerance and equivalence relations .	08
Unit-5	Membership functions: Features, fuzzification, membership value assignments methods: intuition, inference, rank ordering, Fuzzy Rule based systems: linguistic hedges , rulebased systems, graphical technique of inference. Defuzzification: Lambda-cuts for Fuzzy sets and Fuzzy relations, Defuzzification methods.	10
Unit-6	Fuzzy pattern Recognition: feature analysis, partitioning of feature space, single sample identification, multifeature pattern recognition. Simple Fuzzy logic controller (FLC): Assumptions in a Fuzzy control system design, simple FLC, general FLCs, simple examples.	08
	Total	51

Text Books: 1. J.M. Zurada, "Introduction to Artificial Neural Systems", Jaico Publishing House. 2. Timothy Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill International Edition.
References: 1. Meherotra Kishan, Mohan C.K., Ranka Sanjay, "Elements of artificial neural networks", Penram Int. Pub., Mumbai. 2. G. J. Klir and Bo Yoan, "Fuzzy Sets and Fuzzy Logic: Theory and Applications", PHI publications.

Subject (Th): (7ET5-5) SPEECH PROCESSING.

Course Requisite : 1. (4ET1) Signals & Systems. 2. (6ET4) Digital Signal Processing.
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: After successfully completing the course students 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. Compare the techniques involved in speech and speaker detection. 4. Summarize the various speech coding techniques. 5. Apply techniques/methods used for speech enhancement and speech recognition.

	Subject : SPEECH PROCESSING	L
Unit-1	Speech Production and Acoustic Phonetics: The process of speech production, Acoustic theory of speech production, Digital models of speech signals of speech signal, Articulator phonetics, Acoustic Phonetics, Co- articulation, Prosody.	08
Unit-2	Speech Analysis: Time and frequency domain analysis of speech, Linear predictive coding (LPC) analysis, Cepstral analysis, Speech parameter (pitch) estimation.	09
Unit-3	Speech Synthesis: Principles of speech synthesis, Articulatory synthesis, Formant synthesis and LPC synthesis.	09
Unit-4	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, Filter bank analysis, Phase vocoders and Channel vocoders.	10
Unit-5	Speech Enhancement: Introduction, Nature of interfering sounds, speech enhancement techniques, spectral subtraction and filtering, harmonic filtering, Spectral subtraction, Adaptive noise cancellation	09
Unit-6	Speech Recognition: Introduction, Baye's rule, Segmental feature extraction, MFCC, DTW, HMM approaches for speech recognition.	07
	Total	52

Text Books: 1. "Speech Communications: Human & Machine", Douglas O'Shaughnessy, Universities Press. 2. "Digital Processing of Speech Signals", Rabiner and Schafer, Prentice Hall, 1978.
References: 1. "Discrete-Time Speech Signal Processing: Principles and Practice", Thomas F. Quatieri, Publisher: Prentice Hall. 2. "Speech and Audio Signal Processing: Processing and Perception of Speech and Music", Nelson Morgan and Ben Gold, John Wiley & Sons. 3. "Speech Analysis Synthesis and Perception", J. L. Flanagan, Second edition, Springer-Verlag (1972). 4. "Speech and Audio Signal Processing", Gold & Morgan, 1999, Wiley and Sons.

Subject (Th) - (7ET5-6) RF MODELING & ANTENNA

Course Requisite : 1. (3ET5) Electromagnetic fields. 2. (8ET1) UHF & Microwave.
Course Objectives: 1. To impart the knowledge in modeling of RF system design. 2. To acquire knowledge of fundamental principles and techniques of antenna theory. 3. To study characteristics of different antenna types.
Course Outcomes: After successful completion of the course the student will be able to: 1. Acquire the concepts of active and passive components in RF domain. 2. Understand design of RF Filters. 3. Analyze the radiation mechanisms of commonly used antennas. 4. Demonstrate knowledge of antennas commonly used in Communication Engineering. 5. Discriminate antennas on the basis of their electrical characteristics.

	Subject: RF MODELING & ANTENNA	L
Unit-1	Behavior of Active and Passive Components in RF range: Frequency Spectrum, hazards of Electromagnetic Radiations, and fundamentals of radio frequency design, High Frequency behavior, equivalent circuit and frequency response of resistor, capacitor, inductor, diode, BJT, and FET, Characteristics, structure and applications of coaxial line, stripline, microstrip line, and coplanar lines.	09
Unit-2	Filter Design: Analysis of infinite periodic structures terminated Periodic structures, $k-\beta$ diagrams and wave velocities, Image Parameter Method: Image impedances and transfer functions for two port networks, constant-k filter sections, m-derived filter sections, and composite filters, Insertion Loss Method: Characterization by power loss ratio, maximally flat, equal ripple, and linear phase low pass filter prototype, Filter transformations: impedances, frequency scaling, and band pass and band stop, Richard's transformation, Kuroda's identity, impedance, and admittance inverters.	09
Unit-3	Fundamentals of Antenna: Conceptual understanding and radiation mechanism, Fundamental Parameters of Antennas: Radiation pattern, radiation power density, radiation intensity, beam width, directivity, antenna efficiency, gain, beam efficiency, bandwidth, input impedance, antenna radiation efficiency, antenna vector effective length and equivalent areas, maximum directivity and maximum effective areas, Friss transmission equation, antenna temperature, Vector potential A for an electric current source J, vector potential F for an magnetic current source M, electric and magnetic fields for electric J and Magnetic M current sources and concept of near and far field radiation.	10
Unit-4	Wire Antennas: Infinitesimal dipole and small dipole: Radiation field, near field, far field directivity, region separation, Finite Length dipole: Basic parameters of half wavelength dipole, folded dipole, Monopole antenna, Ground Effects, Linear elements near or on infinite perfect conductors, Loop antennas: Basic parameters.	08
Unit-5	Antenna Arrays: Linear arrays, planar arrays, and circular arrays, Array of two isotropic point sources, non-isotropic sources, Principle of pattern multiplication, Linear arrays of n elements, broadside, radiation pattern, directivity, beam width and null directions, array factor, Antenna analysis using Binomial, Dolph-Tschebyscheff, Yagi Uda antenna.	08
Unit-6	Special types of antennas: Frequency Independent Antennas: Log periodic and helical antennas Microstrip Antennas: Characteristics, applications and limitations, Reflector Antennas and Horn Antennas: Characteristics, applications and limitations.	08
	Total	52

Text Books:

1. Costantine A. Balanis, "Antenna Theory Analysis And Design", John Wiley Publication
2. John D. Kraus, " Antennas", Tata McGraw Hill publication
3. David M Pozar, "Microwave Engineering", John Wielely and Sons, Inc. Hobokenh, New Jersey, Fourth Edition, 2012

References:

1. Annapurna Das and Sisir K Das, "Microwave Engineering", Tata McGraw Hill,New Delhi, Second Edition, 2009
2. Reinhold Ludwig and Pavel Bretchko, "RF Circuit Design", Pearson Education Asia.

Subject (Th): (8ET4-1) EMBEDDED SYSTEM AND RTOS**Course Requisite :**

1. (4ET4) Digital Electronics.
2. (5ET3) Microprocessor and Microcontroller.

Course Objectives:

1. To acquaint students with knowledge of embedded processor, its hardware and software.
2. To provide skills in embedded C programming.
3. To understand real time operating systems, inter-task communication and embedded software development tools.
4. To learn concurrent system on a real-time operating system.

Course Outcomes:

After completion of the course the students will be able to:

1. Distinguish real-time embedded systems from other systems.
2. Describe fundamentals of embedded based firmware design.
3. Evaluate the need for real-time operating system.
4. Develop real-time algorithm for task scheduling.
5. Summarize technique used for product enclosure design and development.
6. Specify, design and implement a small embedded system.

	Subject: EMBEDDED SYSTEM AND RTOS	L
Unit-1	Introduction to Embedded Systems: Definition of Embedded System, Comparison between Embedded Systems and General Computing Systems, History of Embedded Systems, Classification of Embedded Systems, Purpose of Embedded System. Building Blocks of Embedded System: Core of the Embedded System, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, PCB and Passive Components. Characteristic and Quality Attributes of Embedded Systems.	09
Unit-2	Hardware Software Co-Design and Program Modules: Fundamental issues in hardware software Co-Design, Computational models in Embedded Design, Introduction to UML, Hardware Software trade-Off. Embedded Hardware Design and Development: Analog and Digital Electronic components, VLSI and Integrated Circuit Design EDA tools.	08
Unit-3	Embedded Firmware Design and Development: Embedded firmware design approaches, Embedded Firmware Development languages, Programming in Embedded C.	09
Unit-4	RTOS based Embedded System Design: Operating System basic, Types of Operating Systems, Task, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication and Synchronization, Device Driver, How to Choose an RTOS.	10
Unit-5	Integration and Testing of Embedded Hardware and Firmware: Integration of Hardware and Firmware. Product Enclosure Design and Development: Product Enclosure Design tools, Product Enclosure Development techniques.	09
Unit-6	Embedded Product Development Life Cycle: Objectives, Phases of EDLC, Modeling of EDLC, Design Case Studies: Digital Camera, Battery Operated Smart Card Reader.	07
	Total	52

Text Books:

1. Shibu. K. V, "Introduction to Embedded Systems", Tata Mcgraw Hill,2009.
2. Frank Vahid, "Embedded System Design Unified Hardware and Software".

References:

1. Steve Heath, "Embedded System Design", Elsevier, 2005.
2. David E. Simon, "An Embedded Software Primer", Pearson Education, 2003.

Subject (Th): (8ET4-2) AUTOMOTIVE ELECTRONICS**Course Requisite:**

1. (3ET4) Instrumentation and Sensors.
2. (5ET3) Microprocessor & Microcontroller.
3. (7ET2) Data Communication Network.

Course Objectives:

1. To gain the fundamental knowledge of electrical and electronics components used for vehicle operations.
2. To study applications of sensors and actuators used in vehicle systems.
3. To understand use of microprocessors/microcontrollers in vehicle control systems.
4. To study various communication protocols used in automotive electronics.
5. To study fundamentals of diagnostics procedures of electronic systems in automobiles.
6. To gain information on modern safety system for vehicles.

Course Outcomes:

After completion of the course students will be able to:

1. Demonstrate the knowledge of automotive systems for vehicles.
2. Illustrate the use of sensors and actuators in vehicles.
3. Identify the use of microcontrollers/microprocessor for automotive applications.
4. Summarize communication protocols used in automotive electronics.
5. Use diagnostic procedures and sequence for fault finding to give corrective measures.
6. Demonstrate the knowledge of system safety in automobiles.

	Subject: AUTOMOTIVE ELECTRONICS	L
Unit-1	Automotive Systems: Introduction to modern automotive systems and need for electronics in automobiles and application areas of electronic systems in modern automobiles, Ignition systems, Fuel delivery systems, Engine control functions, Fuel control, Automotive Transmission fundamentals, Vehicle braking fundamentals, Steering Control and Steering system basics, Fundamentals of electronically controlled power steering & its types.	09
Unit-2	Automotive Sensors and Actuators: Sensors: characteristics, response, error, Redundancy of sensors in ECUs, Examples of sensors for: Accelerometers, wheel speed, brake pressure, Vehicle speed, Throttle position, Temperature, Mass air flow (MAF), Airbag system, and lambda sensor. Actuators: Solenoids, motors, and piezoelectric force generators, Relays, Automatic transmission control system.	08
Unit-3	Microcontrollers/Microprocessors in Automotive domain & ECU Design Cycle: Introduction to Microcontrollers/Microprocessors in Automotive Domain, Criteria to choose the right microcontroller/processor for various automotive applications, ECU Design Cycle: V-Model development cycle, Components of ECU, Examples of ECU on Chassis, Infotainment, Body Electronics.	09
Unit-4	Automotive Communication protocols, Infotainment systems: Overview of Automotive communication protocols: CAN, LIN, Flex Ray, MOST Ethernet, Communication interface with ECUs and with infotainment gadgets, Infotainment Systems: Application of Telematics in Automotive domain, GPS, GPRS.	09
Unit-5	Diagnostics Fundamentals, Basic wiring system and multiplex wiring system, Preliminary checks and adjustments, Self-diagnostic system. Fault finding and corrective measures, Diagnostic procedures and sequence, On board and off board diagnostics in Automobiles, OBDII.	08
Unit-6	Safety Systems in Automobiles: Active Safety Systems: ABS, TCS, ESP, Brake assist etc. Passive Safety Systems: Airbag, Advanced Driver Assistance (ADAS), Examples of assistance applications: Lane Departure Warning, Collision Warning, Automatic, Cruise Control, Pedestrian Protection, headlight Control.	09
	Total	52

Text Books:

1. Tom Denton, "Automobile Electrical and Electronics Systems", 3rd Edition, Elsevier, 2004.
2. Allan Bonnick, "Automotive Computer Controlled Systems Diagnostic Tools and Techniques", Elsevier Science, 2001.
3. Tom Denton, "Advanced Automotive Fault Diagnosis", 2nd Edition, Elsevier, 2006.

References:

1. A K Babu, "Automotive Electrical and Electronics", Khanna publication, 2001.
2. Iqbal Husain, "Electric and Hybrid Vehicles: Design fundamentals", CRC Press, 2003.
3. Ronald K Jurgen, "Automotive Electronics Handbook", 2nd Edition, McGraw-Hill, 1999.
4. Terence Rybak, Mark Stefika, "Automotive Electromagnetic Compatibility (EMC)", Springer 2004.

Subject (Th): - (8ET4-3) WIRELESS SENSOR NETWORK**Course Requisite:**

1. (8ET2) Wireless Communication
2. (7ET2) Data Communication Network

Course Objectives:

1. To study architecture and environment for wireless sensor network.
2. To understand the mutual relationships and dependencies between different protocols and architectural decisions by offering an in-depth investigation of relevant protocol mechanisms.
3. To study principle and architecture of existing Middleware for sensor networks.
4. To understand the design issues and requirements of network management.
5. To review various sensor network platforms, operating systems for wireless sensor network.

Course Outcome:

By the end of this course, the students shall be able to:

1. Understand wireless sensor technology and its architecture.
2. Identify and review various sensor network protocols.
3. To understand various types of Middleware used in WSN.
4. Understand the network management design issues and differentiate various operating systems used in wireless sensor network.

	Subject: WIRELESS SENSOR NETWORK	L
Unit-1	Introduction and overview of Wireless Sensor Networks, Commercial and Scientific applications of Wireless Sensor Networks, Basic Wireless Sensor Technology, Sensor Taxonomy, Wireless Network environment, Wireless Network trends	08
Unit-2	Radio technology primer, Available wireless technologies, Wireless Sensors Networks Protocols, Physical Layer, Fundamentals of Medium Access Control Protocols for Wireless Sensor Networks, MAC protocols for WSN, Case Study, IEEE 802.15 4LR WPAN, Standard case study.	08
Unit-3	Sensors Network Protocols, Data dissemination and gathering, Routing challenges and design issues in wireless sensor, Routing strategies in WSN.	08
Unit-4	Protocols: Transport control protocols for wireless sensors Networks, Traditional transport control protocol, transport protocol design issues, examples of existing transport control protocol, performance of TCP.	08
Unit-5	Middleware for Sensors Networks, WSN middleware principles, Middleware architecture, existing middleware. Network Management for wireless sensor Networks, Requirements, Design issues, Examples of management Architecture	08
Unit-6	Operating Systems for WSN: Operating System Design Issues, Examples of Operating Systems, TinyOS, Mate, MagnetOS, MANTIS, OSPM, EYES OS, SenOS, EMERALDS, PicOS. Performance and Traffic Management: Design issues, Performance Metrics and Modeling.	08
	Total	48

Text Books :

1. "Wireless sensor Networks: Technology, Protocols, and Application", Kazem Sohraby, Daniel Minoli, Taieb Znati, Wiley Interscience Publication.

Reference Books :

1. "Wireless Sensor Networks" C.S. Raghavendra, Krishna M. Sivalingam, Taieb F. Znati, Springer Edition.
2. "Computer Network", Andrew Tanenbaum, 4th ed, Pearson Education.

Subject (Th): (8ET4-4) BIOMEDICAL ENGINEERING**Course Objectives:**

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

Course Outcome:

By the end of this course, the students shall be able to:

1. Understand the importance and association of engineering with medical field.
2. Understand the significance of various human signals and recording techniques.
3. Familiarize with various medical imaging systems, various life saving equipments.
4. Conceptualize patient care & safety requirements and its importance.

	Subject: BIOMEDICAL ENGINEERING	L
Unit-1	Introduction to Biomedical Engineering: Physiological system of heart, Man instrument system, 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: skin contact impedance measurement of skin contact impedance, motion artifacts, Nernst Equation.	09
Unit-2	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, Square wave electromagnetic Blood flow meter, Measurement of Heart rate, Measurement of pulse rate.	09
Unit-3	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, Real-time ultrasonic imaging systems.	08
Unit-4	Therapeutic Equipments: Need of Physiological and electrotherapy equipments. Cardiac pacemakers, Cardiac Defibrillators, Nerve and Muscle stimulators. Diathermy Machines: Short wave, Microwave, Ultrasonic.	08
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, telephonic data transmission 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.	08
Unit-6	*Anaesthesia Machines & Ventilators: Anaesthesia Machines: Need for anaesthesia, Delivery of anaesthesia, anaesthesia machine & patient breathing circuit Ventilators: Mechanics of respiration, Artificial ventilation, Ventilators, Ventilator Terms, Microprocessor controlled Ventilators.	08
	Total	50

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. Webster J.G., "Medical Instrumentation", Third ed. John Wiley & Sons.
2. Carr & Brown, "Introduction to Biomedical Equipment Technology", Prentice Hall.

Subject (Th): (8ET4-5) DATA COMPRESSION & ENCRYPTION**Course Requisite:**

1. (6ET3) Digital Communication.

Course Objectives:

1. To familiarize students with different data compression techniques for text, audio, image and video compression.
2. To equip students with fundamental knowledge of various data encryption and authentication techniques.

Course Outcomes:

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

1. Demonstrate the knowledge of lossy and lossless data compression techniques commonly used.
2. Develop the statistical basis and analyze performance metrics for lossy and lossless data compression.
3. Demonstrate use of various private and public key encryption techniques used in cryptosystems.
4. Identify need of digital signatures and authentication protocols.
5. Categorize various intruders and intrusion detection techniques.
6. Classify various viruses, related threats and countermeasures.

	Subject: DATA COMPRESSION & ENCRYPTION.	L
Unit-1	Text Compression: Shannon Fano Coding, Huffmann coding, Arithmetic coding and dictionary techniques- LZW, family algorithms, Entropy measures of performance and Quality measures.	08
Unit-2	Audio Compression: Digital Audio, Lossy sound compression, μ -law and A-law companding, DPCM and ADPCM audio compression, MPEG audio standard, frequency domain coding, format of compressed data.	09
Unit-3	Image And Video Compression: Lossless techniques of image compression, gray codes, Two dimensional image transforms, JPEG, JPEG 2000, Predictive Techniques PCM and DPCM. Video compression and MPEG industry standard.	09
Unit-4	Conventional Encryption: Introduction, Types of attacks, Steganography, Data Encryption Standards, Block Cipher Principle, S-box design, triple DES with two three keys.	09
Unit-5	Public Key Encryption and Number Theory: Euler's theorem, Chinese remainder theorem, Principle of public key cryptography, RSA algorithm, Diffie-Hellman Key Exchange. Elliptic curve cryptology, message authentication and Hash functions, Hash and Mac algorithms, Digital signatures.	09
Unit-6	System Security & Case Studies: Intruders, Viruses, Worms, firewall design, antivirus techniques, digital Immune systems, Certificate based & Biometric authentication, Secure Electronic Payment System.	08
	Total	52

Text Books:

1. "Data Compression", David Salomon, Springer Publication, 4th Edition.
2. "Introduction to Data Compression", Khalid Sayood, Morgan Kaufmann Series, 3rd Edition
3. "Cryptography and Network Security", William Stallings, Pearson Education Asia Publication,
4. "Cryptography and Network Security", Behrouz Forouzan, McGraw-Hill, 1st Edition.

References:

1. "The Data Compression Book", Mark Nelson, BPB publication, 2nd Edition.
2. "Applied Cryptography", Bruce Schneier, John Wiley & Sons Inc. Publication, 2nd Edition.
3. "Cryptography & Network Security", Atul Kahate, Tata McGraw Hill, 2nd Edition.
4. "Cryptography and Network Security", Behrouz A. Forouzan , Special Indian Addition, SIE.
5. "Network Security & Cryptography", Bernard Menezes, Cenage Learning.

Subject (Th): (8ET4-6) ULTRA WIDE BAND COMMUNICATION**Course Requisite:**

1. (6ET3) Digital Communication
2. (8ET2) Wireless Communication

Course Objectives:

1. To equip students with fundamental knowledge of UWB Technology.
2. To acquire knowledge of UWB signal propagation in wireless channel.
3. To focuses on the basic techniques that concerns the UWB communication systems and its existence with other communication system.

Course Outcomes:

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

1. Understand the advantages of wireless communication systems in ultra high frequency band.
2. Understand UWB signal propagation characteristics and the required signal processing at transmitter and receiver.
3. Understand the UWB channel modeling and analysis.
4. Identify UWB Communication Standards and its application.

	Subject: ULTRA WIDE BAND COMMUNICATION	L
Unit-1	UWB Definition, FCC Mask, Gaussian pulse and its higher derivatives, Hermite Pulses, Legendre Pulses. Modulation Schemes: Impulse Radio Scheme, Multi-Carrier Schemes. Data Modulation: Pulse Amplitude Modulation, On–Off Keying, Pulse Position Modulation.	08
Unit-2	Rake Receive, Rake Receiver Types, Detection Techniques, Synchronization in UWB Systems. UWB Antennas, UWB Antenna Characteristics, Antenna Types.	08
Unit-3	UWB wireless Channel: Impulse Response Modeling of UWB Wireless Channels, The IEEE UWB Channel Model, Frequency Modeling of UWB Channels, Comparison of Time and Frequency Models.	08
Unit-4	UWB Communication Standards and Systems, UWB standardization in wireless personal area networks, DS-UWB proposal, MB-OFDM UWB proposal.	08
Unit-5	Beam forming for UWB signals: radar UWB array systems, Wireless positioning and location: GPS techniques, Positioning techniques time resolution issues, UWB positioning and communications.	08
Unit-6	UWB Interference, IEEE802-11.a Interference, Method of Signal to Interference Ratio Calculation, Interference of UWB to Existing OFDM System, Interference of UWB to Narrowband Systems, Interference to WiMAX, Interference Reduction.	08
	Total	48

Text Books:

1. Ian Oppermann, Matti Hamalainen and Jari Iinatti, “UWB Theory and Applications”, John Wiley & Sons Ltd, 2004.
2. Homayoun Nikookar and Ramjee Prasad, “Introduction to Ultra Wideband for Wireless Communications”, Springer Book e-ISBN: 978-1-4020-6633-7.

References:

1. M. Ghavami, L. B. Michael and R. Kohno, “Ultra Wideband Signals and Systems in Communication Engineering”, 2nd Edition, John Wiley & Sons, NY, USA, 2007.
2. Jeffrey H. Reed, “An Introduction to Ultra Wideband Communication Systems”, Prentice Hall Inc., NJ, USA, 2005.

Subject (Pr): 8ETp5- UHF & MICROWAVE LAB**Course Requisite:**

1. (3ET5) Electromagnetic fields.
2. (8ET1)UHF & Microwave

Course Objectives:

1. To study various microwave components and devices.
2. To understand transmission characteristics of microwave.
3. To understand measurement of various microwave parameters.
4. To study and analyze performance metric of microwave antenna .

Course Outcomes:

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

1. Identify various microwave components.
2. Demonstrate characteristics of microwave generated by various microwave sources and propagated through rectangular/circular waveguide.
3. Measure transmission parameters of microwave propagation through rectangular/circular waveguide.
4. Measure various parameters of microwave antenna.

	Experiment List
Expt-1	Study of Microwave components commonly used in Microwave systems.
Expt -2	Measurement of guide wavelength of microwave signal in a rectangular/circular waveguide.
Expt -3	To determine the characteristics of Reflex Klystron.
Expt -4	To find the characteristics of Gunn Diode Oscillator.
Expt -5	To measure directivity and coupling factor of directional coupler.
Expt -6	To determine the microwave power measurement of Reflex Klystron.
Expt -7	Measurement of gain of Horn antenna.
Expt -8	To verify measurement of impedance of Horn antenna with that obtained using smith chart.
Expt-9	Measurement of VSWR using slotted line with open / short load conditions.
Expt-10	Measurement of insertion loss and isolation loss of circulator.
Expt-11	Measurement of dielectric constant of a given substrate.

* Minimum 08 experiments based on/relevant to the above list.

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

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

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

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

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

1. Describe the Cognitive computing and principles of cognitive systems.
2. Identify role of Natural Language Processing in cognitive system.
3. Outline application of advanced analytics in cognitive computing.
4. Justify role of Cloud and Distributed Computing in Cognitive Computing.
5. Assess the process of building a Cognitive Application.
6. Identify the Emerging Areas and Future Applications of Cognitive Computing.

Unit I: Foundation of Cognitive Computing & Design Principle of Cognitive Systems Hours: 07

The Foundation of Cognitive Computing: Cognitive Computing as a New Generation, The Uses of Cognitive Systems, What Makes a System Cognitive, Gaining Insights from Data, Domains Where Cognitive Computing Is Well Suited, Artificial Intelligence as the Foundation of Cognitive Computing, Understanding Cognition, Two Systems of Judgment and Choice, Understanding Complex Relationships Between Systems, The Elements of a Cognitive System, Infrastructure and Deployment Modalities.

Design Principles for Cognitive Systems: Components of a Cognitive System, Building the Corpus, Bringing Data into the Cognitive System, Machine Learning, Hypotheses Generation and Scoring, Presentation and Visualization Services.

Unit II: NLP and Big Data in Cognitive System

Hours: 07

Natural Language Processing in Support of a Cognitive System: The Role of NLP in a Cognitive System, Semantic Web, Applying Natural Language Technologies to Business Problems.

The Relationship Between Big Data and Cognitive Computing: Dealing with Human-Generated Data, Defining Big Data, The Architectural Foundation for Big Data, Analytical Data Warehouses, Hadoop, Data in Motion and Streaming Data, Integration of Big Data with Traditional Data.

Unit III: Knowledge Representation and Advance Analytics in Cognitive Computing Hours: 06

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

Unit IV: Role of Cloud and Distributed Computing in Cognitive Computing

Hours: 07

The Role of Cloud and Distributed Computing in Cognitive Computing: Leveraging Distributed Computing for Shared Resources, Why Cloud Services Are Fundamental to Cognitive Computing Systems, Characteristics of Cloud Computing, Cloud Computing Models, Delivery Models of the Cloud, Managing Workloads, Security and Governance, Data Integration and Management in the Cloud.

The Business Implications of Cognitive Computing: Preparing for Change, Advantages of New Disruptive Models, What Does Knowledge Mean to the Business?, The Difference with a Cognitive Systems Approach, Meshing Data Together Differently, Using Business Knowledge to Plan for the Future, Answering Business Questions in New Ways, Building Business Specific Solutions, Making Cognitive Computing a Reality, How a Cognitive Application Can Change a Market.

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

Hours: 07

IBM's Watson as a Cognitive System: Watson Defined, Advancing Research with a Grand Challenge, Preparing Watson for Jeopardy, Preparing Watson for Commercial Applications, The Components of DeepQA Architecture.

The Process of Building a Cognitive Application: The Emerging Cognitive Platform, Defining the Objective, Defining the Domain, Understanding the Intended Users and Defining their Attributes, Defining Questions and Exploring Insights, Creating and Refining the Corpora, Training and Testing.

Building a Cognitive Healthcare Application: Foundations of Cognitive Computing for Healthcare, Constituents in the Healthcare Ecosystem, Learning from Patterns in Healthcare Data, Building on a Foundation of Big Data Analytics, Cognitive Applications across the Healthcare Ecosystem, Starting with a Cognitive Application for Healthcare, Using Cognitive Applications to Improve Health and Wellness, to Enhance the Electronic Medical Record and to Improve Clinical Teaching.

Unit VI: Emerging Areas and Future Application

Hours: 06

Smarter Cities: Cognitive Computing in Government: How Cities Have Operated, The Characteristics of a Smart City, The Rise of the Open Data Movement Will Fuel Cognitive Cities, The Internet of Everything and Smarter Cities, Understanding the Ownership and Value of Data, Smarter Approaches to Preventative Healthcare, Building a Smarter Transportation Infrastructure, Using Analytics to Close the Workforce Skills Gap, Creating a Cognitive Community Infrastructure, The Next Phase of Cognitive Cities.

Emerging Cognitive Computing Areas: Characteristics of Ideal Markets for Cognitive, Computing Vertical Markets and Industries.

Future Applications for Cognitive Computing: Requirements for the Next Generation, Technical Advancements That Will Change the Future of Cognitive Computing, What the Future Will Look Like, Emerging Innovations.

Text Book:

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

Reference Books:

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

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

Course Prerequisite: Basic knowledge of Mathematics

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

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

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

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

Unit I: Data Science and Statistical Learning

Hours: 6

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

Unit II: Linear Regression

Hours: 7

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

Unit III: Classification and Cross Validation

Hours: 7

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

Unit IV: Linear Model Selection and Regularization

Hours: 6

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

Unit V: Nonlinearity and Tree Based Methods

Hours: 7

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

Unit VI: SVM and Unsupervised Learning

Hours: 7

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

Text Books:

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

Reference Book:

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

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

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

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

- To learn and understand fundamental of IoT
- To study the design methodology and different IoT platform
- To understand usefulness of IoT for society
- To design and implement application of IoT using various sensor

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

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

Unit I:

Hours: 6

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

Unit II:

Hours: 7

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

Unit III:

Hours: 7

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

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

Unit V:

Hours: 7

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

Unit VI:

Hours: 7

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

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

Reference Books:

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

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

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

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

- Understand basics of Cybercrime and Information Security.
- To familiarize various cyber threats, attacks, Cyber offenses.
- Understand Cybercrime on Mobile and Wireless devices.
- Understand tools and methods used in Cybercrime.
- Understand Access Control and Authentication.
- Understand Intrusion Detection and Prevention.

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

1. Know fundamentals of Cybercrimes and Cyber offenses
2. Realize the Cyber threats, attacks and Vulnerabilities.
3. Explore the industry practices and tools.
4. Comprehend the Access Control and Authentication Process.
5. Implement Intrusion Detection and Prevention.

Unit I:

Hours:6

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

Unit II:

Hours: 6

Cyber offenses: Introduction, Attacks, Social Engineering, Cyberstalking, Cybercafe and Cybercrime, Botnets, Attack Vector, Cloud Computing.

Unit III:

Hours: 6

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

Unit IV:

Hours: 6

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

Unit V:

Hours:6

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

Unit VI: (Hours: 6) System Intrusion Detection and Prevention: Definition, Intrusion Detection, Intrusion Detection Systems (IDSs), Types of Intrusion Detection Systems, The Changing Nature of IDS Tools, Response to System Intrusion, Challenges to Intrusion Detection Systems, Implementing an Intrusion Detection System, Intrusion Prevention Systems (IPSs), Intrusion Detection Tools

Disaster Management: Introduction, Disaster Prevention, Disaster Response, Disaster Recovery, Make your Business Disaster Ready, Resources for Disaster Planning and Recovery.

Text Books:

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

Reference Books:

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

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

Course Pre-requisite: Basic knowledge of Computers.

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

- To provide students with the knowledge about business advantages of the digital marketing and its importance for marketing success;
- To develop a digital marketing plan; to make SWOT analysis;
- To define a target group; to introduced to various digital channels, their advantages and ways of integration;
- To integrate different digital media and create marketing content to manage a digital marketing performance efficiently.

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

1. Identify the importance of the digital marketing for marketing success,
2. Manage customer relationships across all digital channels and build better customer relationships,
3. Create a digital marketing plan, starting from the SWOT analysis and defining a target group,
4. Identify digital channels, their advantages and limitations, to perceiving ways of their integration taking into consideration the available budget

Unit I: Introduction to e-Marketing:

Hours: 7

Introduction, Wired-up world, B2C, B2B, C2B and C2C Model, Objectives: Sell, Serve, Speak, Save, Sizzle, Introduction to e-strategy.

Unit II: Remix and e-Models

Hours: 7

Introduction to Remix: Product, Price, Place, Promotion, People, Process. Introduction to e-Models, e-Marketplace, Digital Communication market, Web & Social Network Models, Customer buying models, Loyalty models

Unit III: e-Customers

Hours: 7

Introduction to e-Customers, Motivations, Expectations, Fears & Phobias, Online Buying Process, information processing, relationship & royalty, Communities & social networks, Customer profiles

Unit IV: e-Tools & Site Design

Hours: 7

Introduction to e-Tools, Technology development & customer impact, Interactive digital TV, Digital Radio, Mobile Devices, Interactive self-service kiosks, Convergence, Integrated Campaigns, Web-site design, Integrated design, online value proposition, Dynamic & aesthetics design

Unit V: Traffic Building

Hours: 7

Search Engine Marketing, Online PR & Partnerships, Interactive Advertising, e-mail & viral marketing, Online traffic building, Control, Resourcing

Unit VI: e-CRM & e-Business

Hours: 7

Introduction to e-CRM, Database marketing, e-CRM, Profiling, Personalization, Introduction to e-Business, e-Business Architecture & framework, e-business security.

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

Reference Books:

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

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

Course Prerequisite: Basic Knowledge of Mathematics

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

- Know and apply accounting and finance theory
- Critically evaluate financial statement information
- Evaluate and compare different investments

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

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

Unit I: The basics of Accounting I

Hours: 7

The Assets, Liabilities and Balance Sheets, Procedure for creating a Balance Sheet, Different forms of Balance Sheet, Basic concepts of Accounting

Unit II: The basics of Accounting II

Hours: 7

The Profit & Loss Account, Cash Flow Statement, Creating Profit & Loss Account, Creating Cash Flow Statement, Book Keeping Basic terminology, Debt & Credit Convention

Unit III: Interpretation of Accounts

Hours: 8

Accounting Rules, Reports, Assets, Liabilities, ShareholdersøEquity, P&L Statement,

Unit IV: Introduction to Financial Management

Hours:6

What is Finance, Forms of Business Organization, Stock Price & Shareholder Value, Intrinsic Value, Stock Price, Business trends and ethics, Conflicts management.

Unit V: Financial Markets and Institutions

Hours: 7

Financial Markets, Capital Allocation, Financial Institutions, Stock Market, Market for Common Stock, Stock Market Returns, Stock Market Efficiency

Unit VI: Financial Statements & Analysis

Hours: 7

Financial Statements & Reports, Stockholdersø Equity, Free Cash Flow, Income Taxes, Analysis of Financial Statements: Ratio Analysis, Liquidity Ratios, Asset & Debt Management Ratio, Profitability Ratio, Trend Analysis

Text Books:

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

Reference Books:

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

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

Course Prerequisite:

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

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

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

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

Unit I:

Hours:6

Introduction to Entrepreneurship: Introduction, Common Myths About Entrepreneurs, Types of Start- Up Firms, Changing Demographics of Entrepreneurs, Entrepreneurship Importance.

Recognizing Opportunities and Generating Ideas: Identifying and Recognizing Opportunities, Finding Gaps in the Marketplace, Techniques for Generating Ideas, Encouraging and Protecting New Ideas.

Unit II:

Hours:6

Feasibility Analysis: Product/Service Feasibility Analysis, Industry/Target Market Feasibility Analysis, Organizational Feasibility Analysis and Financial Feasibility Analysis.

Writing A Business Plan: The Business Plan, Outline of the Business Plan, Presenting the Business Plan to Investors.

Unit III:

Hours:6

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

Unit IV:

Hours: 6

Ethical and Legal Foundation: Initial Ethical and Legal issues facing a New Firm, Drafting a Founders Agreement, Avoiding Legal Disputes, Business Licenses and Permits, Choosing a Form of Business Organization.

Assessing A New Venture's Financial Strength and Viability: Introduction to Financial Management, Financial Statements and Forecasts, Pro forma Financial Statements.

Unit V:

Hours: 6

New Venture Team: Creating a New-Venture Team, Rounding out the Team: The Role of Professional Advisers.

Getting Financing or Funding: The Importance of Getting Financing or Funding, Sources of Equity Funding, Sources of DEBT Financing, Creative Sources of Financing and Funding.

Unit VI:

Hours:6

Unique Marketing Issues: Selecting a Market and Establishing a Position, Key Marketing issues for New Ventures, The 4Ps of Marketing for New Ventures.

The Importance of Intellectual Property: The Importance of Intellectual Property, Patents, Trademarks, Copyrights, Trade Secrets, Conducting an Intellectual Property Audit.

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

Reference Books:

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

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

Course Prerequisite: Basic concept of programming, Basic concepts of data structures

Course Objectives:

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

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

1. Design ER model for any kind of application.
2. Design and develop database.
3. Apply normalization.
4. Query the database.
5. Apply various integrity constraints
6. Build indices, views
7. Implement triggers, assertions

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

Practical 1: To Study a Database Modeling Tool.

Study of Data Modeling Tools:

É Take a description of the enterprise, create its corresponding ER Diagram and build a database model using any modeling tool. The following basic features of the modeling should be covered while building the model:

É Logical / Physical Modeling

É Adding an entity / its attributes, relationships (all kinds of relationships viz., parent-child, foreign key references, one to many, many to many etc)

É Forward / reverse engineering

É Details of forward engineering / schema generation

É Steps to generate the schema

Practical 2: To Study and implement DDL Commands

Implement the model created in Practical 1, in any of the DBMS like Oracle, MySQL, or Microsoft SQL Server database software.

- Creating the proper tables
- Insert the data into it.
- Study Dropping and Altering the Tables. Study the cascaded deletes.

Reference Books:

1. Fairly R: Software Engineering (McGraw Hill)
2. Davis A: Principles of Software Development (McGraw Hill)
3. Shooman, M.L: Software Engineering (McGraw-Hill)

5IT04 PROFESSIONAL ELECTIVE - I (i) INFORMATION SECURITY SYSTEM

Course Objectives:

1. Understand the basics of Information Security
2. Know the legal, ethical and professional issues in Information Security
3. Know the aspects of risk management
4. Become aware of various standards in this area
5. Know the technological aspects of Information Security

Course Outcomes:

The learning outcomes are:

1. Study the foundational theory behind information security.
2. Discuss the basic information security.
3. Illustrate the legal, ethical and professional issues.
4. Discuss the aspects of risk management.
5. Summarize various standards for information security.
6. Explain the security techniques.

Course Contents:

UNIT I: Introduction to Information Security: History, What is Information Security?, Critical Characteristics of Information, NISTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

UNIT II : Security Investigation: Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues.

UNIT III : Legal, Ethical, and Professional Issues in Information Security: Law and Ethics in Information Security, International Laws and Legal Bodies, Ethics and Information Security.

UNIT IV : Security Analysis: An Overview of Risk Management, Risk Identification, Risk Assessment, Risk Control Strategies.

UNIT V : Planning for Security: Information Security Planning and Governance. Information Security Policy, Standards, and Practices, the Information Security Blueprint, Security Education, Training, and Awareness Program. Continuity Strategies .

UNIT VI : Cryptography: Foundations of Cryptology, Cipher Methods, Cryptographic Algorithms, Cryptographic Tools, Protocols for Secure Communications, Attacks on Cryptosystems.

TEXT BOOK : Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Vikas Publishing House, New Delhi, 2003.

REFERENCE BOOKS:

1. Micki Krause, Harold F. Tipton, "Handbook of Information Security Management", Vol 1-3 CRC Press LLC, 2004.111
2. William Stallings, "Cryptography and Network Security: Principles and Practice", 6th Edition, Prentice Hall
3. M. Stamp, "Information Security: Principles and Practice", 2nd Edition, Wiley, ISBN: 0470626399, 2011.
4. Nina Godbole, "Information Systems Security", Wiley India Pvt. Ltd, ISBN -978-81-265-1692-6
5. Mark Merkow, "Information Security-Principles and Practices", Pearson Ed. 978-81-317-1288- 7.

5IT04 PROFESSIONAL ELECTIVE - I (ii) DATA SCIENCE & STATISTICS

Course Objectives:

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

1. Organize, manage and present data.
2. Understand basic theoretical and applied principles of statistics.
3. Analyze statistical data using measures of central tendency, dispersion and location.
4. Introduce students to the basic concepts and techniques of Data Science.
5. Acquire knowledge of regression methods and classification methods.

Course Outcomes:

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

1. Gain knowledge about basic concepts of Data Science & Statistics.
2. Demonstrate proficiency with statistical analysis of data.
3. Analyze statistical data graphically using frequency distributions and cumulative frequency distributions.
4. Develop the ability to build and assess data-based models.
5. Evaluate models generated from data

UNIT I Python for Data Science :

Mean, Median, Mode, Variance, Standard Deviation Numpy: The Basics of NumPy Arrays, Universal Functions, Aggregators, Broadcasting, Fancy Indexing; Pandas: Introducing Pandas Objects, Operating on Data in Pandas, Handling Missing Data, Hierarchical Indexing, Combining Datasets: Concat, Append, merge and join, aggregation and grouping , pivot Tables.

UNIT II Exploratory Data Analysis and Statistics:

EDA: Matplotlib and Seaborn: Simple Line Plots, Simple Scatter Plots, Density and Contour Plots, Histograms, Binnings, and Density ,Random Sampling, Distributions: Uniform Distribution, Normal Distribution, Poisson Distribution, Binomial Distribution.

UNIT III Statistical Experiments and Significance Testing:

Hypothesis Test: The Null Hypothesis, Alternative Hypothesis, One way, Two way Hypothesis Test; Statistical Significance and P-Values: P-value, alpha, type 1 error , type 2 error; t-Tests, Degrees of Freedom, ANOVA: F statistics, Two-way Anova; Chi-Square Test: A Resampling Approach.

UNIT IV Regression Techniques:

Introduction to Machine Learning, Hyper parameter and Model Validation, Feature engineering, Assumptions in Regression, Simple Linear Regression, Multiple Linear Regression.

UNIT V Classification: Logistic regression:

Logistic Response Function and Logit, Predicted Values from Logistic Regression, Interpreting the Coefficients and Odds Ratios; Evaluating Classification Models: Confusion Matrix, Precision, Recall, and Specificity, ROC Curve, AUC

UNIT VI Decision Tree and Radom Forest:

A Simple Example, The Recursive Partitioning Algorithm, Measuring Homogeneity or Impurity, Stopping the Tree from Growing, Predicting a Continuous Value; Random Forest

Text Books:

- [1] Practical Statistics for Data Scientists By Peter Bruce, Andrew Bruce, O'Reilly Media, Inc.
- [2] Python Data Science Handbook By Jake VanderPlas O'Reilly Media, Inc

Reference Books:

- [1] Introduction to Machine Learning with Python By Andreas C. Müller, Sarah Guido, O'Reilly Media, Inc.
- [2] Think Stats By Allen B. Downey O'Reilly Media, Inc.

5IT04 PROFESSIONAL ELECTIVE - I (III) INTERNET OF THINGS

Course Objectives:

The educational objectives of this course are:

- To explore various components of Internet of things
- To Recognize various devices, sensors and applications
- To build a couple of applications that will communicate with IoT hardware and software.
- To understand the IoT Reference Architecture and Real World Design Constraints.

Course Outcomes:

At the end of this course, the student would be able:

- To design small scale as well as sophisticated embedded system.
- To implement standalone application and GUI based application for real life projects.
- To recognize the role of professional societies in providing solution for real world problem.

Unit I: Introduction to IoT:

Sensing, Actuation, Networking basics, Communication Protocols, Sensor Networks, Machine-to-Machine Communications, IoT Definition, Characteristics. IoT Functional Blocks, Physical design of IoT, Logical design of IoT, Communication models & APIs.

Unit II: M2M to IoT:

From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics. Definitions, M2M Value Chains, IoT Value Chains.

Unit III: M2M vs IoT An Architectural Overview:

Main design principles and needed capabilities, An IoT architecture outline, standards considerations. Reference Architecture and Reference Model of IoT.

Unit IV: IoT Reference Architecture:

Getting Familiar with IoT Architecture, Various architectural views of IoT such as Functional, Information, Operational and Deployment, Constraints affecting design in IoT world- Introduction, Technical design Constraints.

Unit V: Developing IoT solutions:

Introduction to Python, Introduction to different IoT tools, Introduction to Arduino and Raspberry Pi. Implementation of IoT with Arduino and Raspberry, Cloud Computing, Fog Computing, Connected Vehicles, Data Aggregation for the IoT in Smart Cities

Unit VI: Security, Privacy & Trust:

IoT security challenge, Spectrum of security considerations, Unique security challenges of IoT devices, Internet of things privacy background, Unique privacy aspects of internet of things, Trust for IoT.

Text Books:

- [1] Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014
- [2] Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM & MUMBAI

Reference Books:

- [1] "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", Ovidiu Vermesan, Peter Friess, River Publishers.
- [2] Bernd ScholzReiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer.

5IT05 OPEN ELECTIVE - I (I) SOFT SKILLS & INTERPERSONAL COMMUNICATIONS

Course objectives:

1. Explain and elaborate fundamentals of communication
2. Apply knowledge of verbal and nonverbal communication in business cases
3. Elaborate the barriers of communication and apply it improve communication

Course outcomes:

Student will be able to

1. Use and apply interaction skills
2. Use and apply leadership skills
3. Use and apply negotiations skills.

Unit I: Introduction, Need for Communication, Process of Communication, Written and Verbal Communication, Visual communication, Signs, Signals and Symbols, Silence as a Mode of Communication, Inter-cultural, Intra-cultural, Cross-cultural and International communication, Communications skills, Communication through Questionnaires, Business Letter Writing, Electronic Communication.

Unit II: Business Cases and Presentations, Letters within the Organizations, Letters from Top Management, Circulars and Memos, Business Presentations to Customers and other stakeholders, Presenting a Positive Image through Verbal and Non-verbal Cues, Preparing and Delivering the Presentations, Use of Audio-visual Aids, Report Writing.

Unit III: Barriers to Communication, Improving Communication Skills, Preparation of Promotional Material, Non-verbal communication, Body language Postures and gestures, Value of time, Organizational body language, Importance of Listening, Emotional Intelligence.

Unit IV: Individual Interaction and skills, Basic Interaction Skills "Within family, Society, Personal and interpersonal intrapersonal skills, Types of skills; conceptual, supervisory, technical, managerial and decision making skills. Problem Solving, Lateral Thinking, Self Awareness and Self Esteem, Group Influence on Interaction Skills, Human relations examples through role "play and cases.

Unit V: Leadership Skills, Working individually and in a team, Leadership skills, Leadership Lessons through Literature, Team work & Team building, Interpersonal skills "Conversation, Feedback, Feed forward, Interpersonal skills "Delegation, Humor, Trust, Expectations, Values, Status, Compatibility and their role in building team "work Conflict Management "Types of conflicts, how to cope with them, Small cases including role "plays will be used as teaching methodology.

Unit VI : Negotiation Skills (To be Taught through Role Plays and Cases), Types of Negotiation, Negotiation Strategies, Selling skills "Selling to customers, Selling to Superiors, Selling to peer groups, team mates & subordinates, Conceptual selling, Strategic selling, Selling skills "Body language,

Books Recommended:

1. Peggy Klaus, The Hard Truth about Soft Skills.
2. Nitin Bhatnagar. Effective Communication and Soft Skills. Pearson Education India.
3. Eric Garner. Team Building. 4. Wendy Palmer and Janet Crawford. Leadership Embodiment.

5IT05 OPEN ELECTIVE - I (II) COMPUTATIONAL BIOLOGY

Unit I: Introduction: Molecular Biology Introduction, Cell, Nucleus, Genes, DNA, RNA, Proteins, And Chemical structure of DNA, RNA, Transcription and Translation Process. Protein Structure and Functions, Nature of Chemical Bonds Molecular Biology tools, Polymerase chain reaction

Unit II: Sequence Alignment: Simple alignments, Gaps, Scoring Matrices, Global and Local Alignments, Smith-Waterman Algorithm, Multiple sequence Alignments, Gene Prediction, Statistical Approaches to Gene Prediction

Unit III: Genome Algorithms: Genome Rearrangements, Sorting by Reversals, Block Alignment and the Four-Russians Speedup, Constructing Alignments in Sub-quadratic Time, Protein Sequencing and Identification, the Peptide Sequencing Problem, Introduction to Nature Inspired Algorithms.

Unit IV: Microarray Data Analysis: Microarray technology for genome expression study, Image analysis for data extraction, Data analysis for pattern discovery, gene regulatory network analysis

Unit V: Phylogenetic: Neighbor-joining method, Neighbor-joining method, Maximum likelihood Approaches, Multiple Sequence Methods Structural Biology, Sequence, organisms, 3D structures, complexes, Assemblies, Case Studies, examples

Unit VI: Drug Discovery & Next Gen Sequencing: Similarities/differences between drugs and receptors, protein-ligand docking, Massively Parallel Signature Sequencing (MPSS), SOLiD sequencing, Single molecule real time (SMRT) sequencing .

Text Books:

- 1) Dan E. Krane, Michael L. Raymer, "Fundamental Concepts of Bioinformatics", Pearson Education, Inc. Fourth Edition, 9780805346336.
- 2) Harshwardhan P. Bal, "Bioinformatics Principles and Applications", Tata McGraw-Hill, seventh reprint, 9780195692303.

Reference Books:

- 1) Teresa Attwood, David Parry-Smith, "Introduction to Bioinformatics", Pearson Education Series, 9788180301971
- 2) R. Durbin, S. Eddy, A. Krogh, G. Mitchison., "Biological Sequence Analysis: Probabilistic Models of proteins and nucleic acids", Cambridge University Press, 9780521629713.

SIT05 OPEN ELECTIVE - I (III) CYBER LAW & ETHICS

Course Objectives:

1. To identify and describe the major types of cyber crime.
2. To identify cyber crime vulnerabilities and exploitations of the Internet.
3. To understand the law with regards to the investigation and prosecution of cyber criminals.
4. To identify appropriate law enforcement strategies to both prevent and control cyber crime.
5. Explain jurisdictional challenges that nations face when responding to cybercrime

Course outcomes:

1. Understand Cyber laws
2. Describe Information Technology act and Related Legislation
3. Demonstrate Electronic business and legal issues.
4. Interpret Cyber Ethics.

Unit I: Introduction to Cyber law: Evolution of computer Technology, emergence of cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace Web space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.

Unit II Information Technology Act: Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.

Unit III : Cyber law and Related Legislation: Patent Law, Trademark Law, Copyright, Software ó Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution, Online Dispute Resolution (ODR).

Unit IV : Electronic Business and legal issues: Evolution and development in E-commerce, paper vs paper less contracts E-Commerce models- B2B, B2C, E security. Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.

Unit V: Cyber Ethics: The Importance of Cyber Law, Significance of cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics.

Unit VI : Case Study On Cyber Crimes: Harassment Via E-Mails, Email Spoofing (Online A Method Of Sending E-Mail Using A False Name Or E-Mail Address To Make It Appear That The E-Mail Comes From Somebody Other Than The True Sender, Cyber Pornography (Exm.MMS),Cyber-Stalking.

Reference Books:

1. Cyber Laws: Intellectual property & E Commerce, Security- Kumar K, dominant Publisher
2. Cyber Ethics 4.0, Christoph Stuckelberger, Pavan Duggal, by Globethic
3. Information Security policy & Implementation Issues, NIIT, PHI
4. Computers, Internet and New Technology Laws, Karnika Seth, Lexis Nexis Butterworths Wadhwa Nagpur.
5. Legal Dimensions of Cyber Space, Verma S, K, Mittal Raman, Indian Law Institute, New Delhi,
6. Cyber Law, Jonthan Rosenoer, Springer, New York, (1997).
7. The Information Technology Act, 2005: A Handbook, OUP Sudhir Naib,, New York, (2011) .

5IT06 DATABASE MANGEMENT SYSTEMS - LAB

1. **Practical 1:** To Study a Database Modeling Tool. Study of Data Modeling Tools
 - Take a description of the enterprise, create its corresponding ER Diagram and build a database model using any modeling tool. The following basic features of the modeling should be covered while building the model:
 - Logical / Physical Modeling
 - Adding an entity / its attributes , relationships (all kinds of relationships viz., parent-child, foreign key references, one to many, many to many etc)
 - Forward / reverse engineering
 - Details of forward engineering / schema generation
 - Steps to generate the schema
2. **Practical 2:** To Study and implement DDL Commands
Implement the model created in Practical 1, in any of the DBMS like Oracle, MySQL, or Microsoft SQL Server database software.
 - Creating the proper tables
 - Insert the data into it.
 - Study Dropping and Altering the Tables. Study the cascaded deletes.
3. **Practical 3:** To Study and implement DML Commands-I
 - SQL queries : Write and execute different SQL queries
 - Execute Simple queries using SELECT, FROM, WHERE clauses,
 - In Where clause use different predicates involving OR,AND, NOT
 - Rename operation
 - Tuple Variables
 - Write SQL for various String operations (% ,_ ,*)
 - Match beginning with
 - Match ending with
 - Substring
 - Match exactly n characters
 - Match at least n characters
 - Sort the output of the query using **Order by**
 - Write SQL using **Having**
4. **Practical 4 :** To Study and implement DML Commands-II
Write SQL queries and perform
 - Set membership operations
 - In, not in
 - Some
 - All
 - Exists and not exists, Test for emptyness using exists, not exists
 - Test for absence of duplicates.
 - Nested queries
5. **Practical 5.** Study and implement aggregation functions.
Write different queries using following Aggregate functions
 - a. Min (minimum 3 SQL queries)
 - b. Max (minimum 3 SQL queries)
 - c. Avg (minimum 3 SQL queries)
 - d. Sum (minimum 3 SQL queries)
 - e. Count (minimum 3 SQL queries)

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 "Fundamentals of Multimedia" (Pearson Education)

REFERENCE BOOKS:

1. Rajan Parekh "Principles of Multimedia" (Tata McGraw-Hill)
2. S.J.Gibbs & D.C.Tsichritzis "Multimedia Programming", Addison Wesley 1995
3. P.W.Agnew & A.S.Kellerman "Distributed Multimedia", Addison-Wesley 1996
4. C.A.Poynton, "A Technical Introduction to Digital Video" Wiley 1996
5. F.Fluckiger, "Understanding Networked Multimedia", 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 and Structure of web site, Designing web pages, Multimedia content. Cascading Style Sheet (CSS): Introduction, advantages, Adding CSS, Browser compatibility, CSS and page layout, Selectors, Grouping, Type Selectors. (08Hrs)

Unit III: Extensible Markup Language (XML): Common Usage, Role of XML, Prolog, Body, Elements, Attributes, Validation, Displaying 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): Internet programming paradigm, Server side programming, Language for CGI, Applications, Server environment, Environment variables, CGI building blocks, CGI scripting using C, shell script, writing CGI program, 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.: Designing 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: Interaction devices: Keyboards and function keys, Pointing devices, Speech recognition , digitization and generation, Image and Video Displays, Printers. Response time and Display rate: Theoretical foundations, Expectations and attitudes, User Productivity, Variability.

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

(08 Hrs)

TEXT BOOK:

Ben Shneiderman:öDesigning the User Interfaceö, Pearson Education.

REFERENCE BOOKS:

1. R. Beale, A.J. Dix, J. E. Finlay, G. D. Abowd öHuman-Computer Interactionö,Prentice-Hall.
2. Joann Hackos, Janice Redish, öUser and Task Analysis for Interface Designö,Wiley.
3. Jeff Raskin, öThe Humane Interfaceö, Pearson Education.
4. Jesse James Garrett, -The Elements of User Experienceö, 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) DISTRIBUTED 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 approach, Process management in a distributed environment, Process migration, Threads, Fault tolerance. (08 Hrs)

UNITV: 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)

UNITVI: 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: Wireless 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) Architecture, i-mode, SyncML, WAP2.0. (08 Hrs)

TEXT BOOK :

ochen Schiller: "Mobile Communication" Pearson Education, Second Edition.

REFERENCE BOOKS:

1. Mazliza Othman: "Principles of Mobile Computing and Communications", Auerbach.
2. Agrawal and Zeng: "Introduction to Wireless and Mobile Systems", Cengage Learning.
3. Upena Dalal: "Wireless Communication", Oxford University Press.
4. Raj Kamal: "Mobile Computing", 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 Multi-layer Perceptron, Back propagation learning, Input Layer, Hidden Layer and Output Layer Computation, Calculation of error, Training of Neural Network, Method of Steepest Descent, Effect of Learning rate, Adding a momentum Term, Backpropagation Algorithm. (08Hrs)

UNIT-III: Fuzzy Set Theory: Fuzzy versus 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)

UNITIV: 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)

UNITV: 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)

UNITVI: 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: "Neural Network, Fuzzy logic, and Genetic algorithms Synthesis and Applications", PHI.

REFERENCE BOOKS:

1. S. Haykin: "Neural Networks", Pearson Education.
2. Jang, Sun and Mezutani: "Neuro Fuzzy and Soft Computing", McGraw-Hill
3. J. Yen, R. Langari: "Fuzzy Logic: Intelligence, Control & Information", Pearson Education.
4. N.P. Pahey: "Artificial Intelligence and Intelligent Systems", 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: Network Security Essentials Applications and Standards Pearson Education, Third Edition.

REFERENCE BOOKS:

1. Atul Kahate: Cryptography and Network Security Mc Graw Hill.
2. Forouzan and Mukhopahyay: Cryptography and Network Security Mc Graw Hill.
3. Matt Bishop: Computer Security: Art & Science Pearson Education.
4. Brijendra Singh: Network Security & Management 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

**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 time periodic signals, properties of discrete time Fourier series, Fourier series and LTI systems, filtering. (08 Hrs)

Unit IV: Continuous 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 transform. (08 Hrs)

TEXT-BOOK:

Oppenheim, Willsky, Nawab -Signals and Systems Pearson Education.

FREE ELECTIVE-I
5FEKS05 (i) DATA STRUCTURES & ALGORITHMS

Unit I: Data structures basics, Mathematical /algorithmic notations & functions, Complexity of algorithms, Sub-algorithms. String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms. **08Hrs.**

Unit-II : Linear arrays and their representation in memory, traversing linear arrays, inserting & deleting operations, Bubble sort, Linear search and Binary search algorithms. Multi-dimensional arrays, Pointer arrays. Record structures and their memory representation. Matrices and sparse matrices. **08Hrs.**

Unit-III: Linked lists and their representation in memory, traversing a linked list, searching a linked list. Memory allocation & garbage collection. Insertion deletion operations on linked lists. Header linked lists, Two- way linked lists. **08Hrs.**

Unit-IV: Stacks and their array representation. Arithmetic expressions: Polish notation. Quick sort, application of stacks. Implementation of recursive procedures by stacks, Queues. Deques. Priority queues. **08Hrs.**

Unit-V : Trees, Binary trees & and their representation in memory, Traversing binary trees. Traversal algorithms using stacks, Header nodes : threads. Heap and heapsort. Path length & Huffman's algorithm. General trees. **08Hrs.**

Unit-VI: Graph theory, sequential representations of graphs, Warshalls' algorithm, Linked representation, operations & traversing the graphs. Posets & Topological sorting. Insertion Sort, Selection Sort. Radix sort. **8Hrs.**

Text Book:

Seymour Lipschutz: "Data Structures with C", Schaum's Outline Series.

Reference Books:

1. Forouzan, Gilberg: Data Structures and Algorithms, CENGAGE Learning.
2. Reema Thareja: Data Structures using C, Oxford University Press, 2011.
3. Arpita Gopal: Magnifying Data structures, PHI (EEE), 2010.
4. Ellis Horowitz, Sartaj Sahni: Fundamentals of Data Structures, CBS Publications.

FREE ELECTIVE-I
5FEKS05 (ii) DATA COMMUNICATION AND NETWORKING

Unit I : Introduction: Components, Networks, Protocols and standards, Basic Concepts: Line Configuration, Topology, Transmission mode, analog and digital signals, periodic and aperiodic signals, analog signals, time and frequency domains, composite signals, digital signals.

Unit II : Encoding and modulating: digital –to- digital conversion, analog-to-digital conversion, digital to analog conversion, analog to analog conversion, digital data transmission, DTE-DCE interface, modems, cable modems, transmission media: guided media, unguided media, transmission impairment.

Unit III : Multiplexing: Many to one/ one to many, frequency division multiplexing, wave division multiplexing, TDM, multiplexing applications: the telephone system , Error detection and correction : types of errors, detection , cyclic redundancy check, checksum, error correction.

Unit IV: Data link Control: Line Discipline, flow control, error control, Data link Protocols: Asynchronous Protocols, synchronous protocols, character oriented protocols, bit - oriented protocols.

Unit V : Local Area Networks: Ethernet, other Ethernet networks, token bus, token ring, FDDI, Comparison, MAN: IEEE802.6 (DQDB) SMDS, Switching: circuit switching, packet switching, message switching.

UNIT VI: Networking and Internetworking Devices: Repeaters, Bridges, Routers, Gateways. Transport Layer: Functions of transport layer, connection, the OSI transport protocol, upper OSI Layer: Session layer, presentation layer, Application Layer.

Text Book:

Behrouz A. Forouzan: Data Communication and Networking, (2/e), TMH.

Reference Books:

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

5KS06 / 5KE06 COMMUNICATION SKILLS

Unit I: Introduction to Communication: Introduction- Importance of Communication, Basics of Communication, Purpose and Audience, Cross-cultural Communication, Language As a tool of communication, Communicative Skills-LSRW, Effective Communication, Modes of Communication, Importance of Technical Communication, Barriers to Communication: Introduction, Classification of Barriers, Information Gap Principle-Given and New Information, Filters, Basics of Technical Communication: Introduction, Objective and Characteristics of Technical Communication, Process of Communication, Levels of Communication, Flow of Communication, Communication Networks, Visual Aids in Technical Communication

Unit II : Active Listening: Introduction, Reason for poor Listening, Traits of a Good Listener, Listening Modes, Types of Listening, Barriers to Effective Listening, Listening for General Content and Specific Information, Effective Speaking: Introduction, Achieving Confidence, Clarity, and Fluency, Paralinguistic Features, Barriers to Speaking, Types of Speaking, Persuasive Speaking, Public Speaking, Listening and Speaking: Introduction, Conversations, Telephonic Conversations and Etiquette, Dialogue Writing, Effective Presentation Strategies: Introduction, Planning, Outlining and Structuring, Nuances of Delivery, Controlling Nervousness and Stage Fright, Visual Aids in Presentations, Application of Ms PowerPoint, Interviews: Introduction, Objectives of Interviews, Types of Interviews, Job Interviews, Media Interviews, Press Conferences, Group Communication: Introduction, Forms of Group Communication, Use of Body Language in Group Communication, Discussions.

Unit III : Reading: Introduction, Reading Rates, Reading and Interpretation, Intensive and Extensive Reading, Critical Reading, Reading for different Purposes, Reading Comprehension, Reading Techniques: Introduction, Improving Comprehension Skills, Techniques for Good Comprehension, General Kitchen Layout, Predicting the Content, Understanding the Gist, SQ3R Reading technique, Study Skills, Technical Writing: Introduction, Audience Recognition/Analysis, Language, Elements of Style, Techniques for Good Technical Writing, Reports: Introduction, Characteristics of a Report, Categories of Reports, Formats, Prewriting, Structure of Reports (Manuscripts format), Types of Report, Technical Proposals:

Introduction, Definition and Purpose, Types, Characteristics, Structure of Proposals, Style and Appearance, Evaluation of Proposals, Research Paper, Dissertation, Thesis.

Text Book:

Raman & Sharma: “Technical Communication Principles & Practice” (2/e) Oxford University Press.

Reference Books:

1. M Ashraf Rizvi: “ Effective Technical Communication” Mc Graw Hill.
2. Mohan, Banerjee: “Developing Communication Skills”, MacMillan India Limited.
3. Chrissie Wright(Editor): “Handbook of Practical Communication Skills”, Jaico Publishing House.
4. CDC, TTTI WR, Bhopal: “A Course in Technical English, Somaiya Publication Pvt. Ltd.”
5. F.Frank Candlin: “General English for Technical Students”, University of London Press Ltd.

5KS07 System Software Lab.: Minimum Eight experiments/ programming assignments must be completed based on the respective syllabus uniformly covering each of the units.

5KS08 Switching Theory & Logic Design Lab.: Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units. Design Practical examples should be based on Unit III to Unit VI using VHDL.

5KS09 Communication Skills Lab.: Minimum Eight experiments/ programming assignments must be completed based on the respective syllabus as follows.

On completion of this laboratory the candidate should be able to demonstrate adequate skills in oral and written communication for technical English language actively participate in group discussions and interviews and exhibit the evidence of vocabulary building. Candidates should be assessed through continuous monitoring and evaluation. The sample list of experiments is given below. This list can be used as guideline for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. Assignments and tests for vocabulary building, Phonetics.
2. Technical report writing
3. Group discussions
4. Interview techniques
5. Projects and tasks such as class news letter
6. Writing daily diaries and letters
7. Interactive language laboratory experiments.

2. J.P. Hayes: “Computer Architecture and Organization” ,McGraw Hill.
3. D.A. Patterson, J.L. Hennessy: “Computer Architecture” Morgan Kauffmann, 2002.
4. Hwang and Briggs: “Computer Architecture and Parallel Processing” McGraw-Hill.

6FEKS05 FREE ELECTIVE-II

(i) DATABASE MANAGEMENT SYSTEMS

Unit-I: Introduction: Database System Applications, Purpose of Database Systems, and View of Data, Database Languages, Database Architecture, Database Users and Administrators. Relational Model: Structure of Relational Databases, Fundamentals of Relational-Algebra.

Unit-II: SQL: Background, Data Definition, Basic Structure of SQL queries, Set Operations, Aggregate Functions, Null Values, Nested Sub queries, Complex Queries, Views, Modification of Database, Joined relations. SQL Data Types and Schemas, Integrity Constraints, Authorization.

Unit-III: Database Design: Overview of the Design Process, Entity-Relationship Model, Constraints, Entity-Relationship Diagrams, Reduction to Relational Schemas. Relational Database Design: Atomic Domains, Normalization and Normal Forms, Functional Dependencies, Decomposition using Functional Dependencies.

Unit-IV: Query Processing: Overview, Measures of Query Cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions. Query Optimization: Overview, Transformation of Relational Expressions, Materialized Views.

Unit-V: Transaction Management: Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Execution, Serializability, Recoverability, Testing for Serializability.

Unit-VI: Concurrency Control: Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiple Granularity, Weak Levels of Consistency, Recovery System: Failure Classification, Recovery and Atomicity, Log-Based Recovery.

Text Book :

Silberschatz, Korth, Sudarshan: “Database System Concepts”, (5/e) McGraw Hill.

Reference Books:

1. Raghu Ramkrishnan, Johannes Gherke: Database Management Systems, TMH.
2. C.J.Date: Introduction to Database Systems, Pearson Education.
3. Connolly & Begg: Database System, Low Price Ed.
4. El-Maseri, Navathe: Fundamentals of Database Systems, Pearson Education.

6FEKS05 FREE ELECTIVE-II

(ii) SOFTWARE PROJECT MANAGEMENT

Unit I: Evolving role of Software. Software crises & myths. Software engineering. Software process & process models: Linear sequential, prototyping, RAD, Evolutionary Product & Process. Project management concepts: People, Product, Process, Project. WSHH principle, critical practice.

Unit II: Measures, Metrics & Indicators. Metrics in process & project domains-software 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: Concepts. Peoples Efforts. Task set, Task network. Scheduling. EV analysis, Project Plan. Software quality concepts. SQ Assurance, Software reviews, technical reviews, software reliability, ISO 900 L, SQA Plan. SCM process. Version control. SCM standard.

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

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

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

Textbook:

Pressman Roger. S: “Software Engineering, A Practitioner’s Approach”, TMH.

Reference Books :

1. Somerville: Software Engineering (Addison-Wesley) (5/e)
2. Davis A: Principles of Software Development (McGraw Hill)
3. Jawadekar W.S.: Software Engineering Principles and Practice, Mc Graw Hill.
4. Jalote Pankaj: An Integrated Approach to Software Engineering, Narosa Publications.

6KS06 / 6KE06 PROFESSIONAL ETHICS

Unit I : Introduction: Computers in a Social Context. Moral and Legal Issues. Computer Ethical Issues. Philosophical Ethics: Descriptive and Normative Claims, Ethical Relativism, Utilitarianism, Deontological Theories, Rights, Virtue Ethics, Individual and Social Policy Ethics. Professional Ethics: Characteristics and system of Professions, Computing as Profession, Professional Relationships, Conflicting Responsibilities, Code of Ethics and Professional Conduct, Collective Responsibility. **08 Hrs**

Unit II : Ethics and The Internet: Three Morally Significant Characteristics, Hacking and Hacker Ethics, New Species of Old Crime, Netiquette, And Policy Approaches. Computers and Privacy issues, Legislative Background, Global Perspective, Proposals for Better Privacy Protection. Property Rights in Computer Software: Definitions, Current Legal Protection, Philosophical basis and analysis of Property, Proprietary Software, and Software Copying. **08 Hrs**

Unit III : Accountability, Computer and Information Technology: Different Senses of Responsibility, Buying and Selling Software, Y2K Problem, Diffusion of Accountability, Internet Issues, ISP Liability, and Virtual Action. Technology and Social change, Embedded Values, Enhanced and Impeded Values, Democratic Values in the Internet, Internet as Democratic Technology, Access and the Digital Divide, Free Expression, Overarching and Future Issues. **08Hrs**

Text Book:

Deborah G. Johnson: “Computer Ethics” Pearson Education (Third Edition).

Reference Books:

1. George Reynolds: “Ethics in Information Technology” Cengage Learning.
2. Hester and Ford: “Computers and Ethics in the Cyberage.
3. Duncan Langford: “Internet Ethics”
4. Richard A. Spinello: “Case Studies in Information Technology Ethics” PHI.

6KS07 Operating Systems Lab.: Minimum Eight experiments/programming assignments must be completed based on the respective syllabus uniformly covering each of the units.

6KS08 Database Systems 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.

6KS09 Computer Lab-II (Hardware Lab): This lab is based on PC organization, troubleshooting & maintenance.

Student should perform practical on the following areas of PC:

1. PC models.
2. Inside the PC.
3. Preventive maintenance.
4. PC troubleshooting.
5. Semiconductor memories
6. Power supplies & power protection
7. Hard Disks: installing, configuring & maintenance
8. SCSI drives
9. Printers & their troubleshooting
10. Modems & serial interfaces, USB’s and Devices.
11. Keyboard, Mice, Video adapters & displays
12. Sound boards, Video capture & CD ROMs.
13. Study of PC Ports & Interfacing Cards.

Books :

1. Mark Minasi : Complete PC upgrade & Maintenance Guide (BPB)
2. Scott Muller: Upgrading and Repairing PCs 12/e (Que)

Shri Sant Gajanan Maharaj College of Engineering, Shegaon

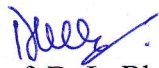
Session 2020-21 (Autumn Semester)

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

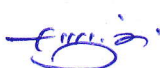
S. N.	Code	Name of Subject	Department
1.	5ET05	Fiber Optic and Satellite Communication	Electronics & Telecommunication Engineering
2.	5IT05	Introduction to Computer Networks	Information Technology
3.	5KS05	Data Communication and Networking	Computer Sciences & Engineering
4.	5EP05	Energy Audit and Management	Electrical Engineering (Electronics & Power)
5.	5ME05	Manufacturing Techniques	Mechanical Engineering

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 Engg.	Mechanical Engineering
8		Mechatronics	


Prof. D. L. Bhombe
Dean (Academics)




Dr. S. B. Somani
Principal


Shri Sant Gajanan Maharaj College of Engineering, Shegaon
Session: 2020-21 (Spring Semester)

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


S. N.	Code	Name of Subject	Department
1.	6FEET05	Introduction to Wireless Technology	Electronics & Telecommunication Engineering
2.	6FEIT05	E. Commerce	Information Technology
3.	6FEKS05	Software Project Management	Computer Sciences & Engineering
4.	6FEFP05	Power Supply System	Electrical Engineering (Electronics & Power)
5.	6FEME05	Non-convention Energy Sources	Mechanical Engineering

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

S. N.	Code	Name of Subject	Department
1	8ET04	Bio Medical Engineering	Electronics & Telecommunication Engineering
2	8IT04	Web Commerce	Information Technology
3	8KS04	Network Security	Computer Sciences & Engineering
4	8EP04	Electric Drives & Control	Electrical Engineering (Electronics & Power)
5		Power Quality	
6	8 ME01	Auto Engineering	Mechanical Engineering
7	8 ME02	Refrigeration & Air Conditioning	


 Prof. D. L. Bhombe
 Dean (Academics)




 Dr. S. B. Somani
 Principal


SHRI SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING, SHEGAON
NOTICE

Session: 2020-21 (Autumn Semester)


Date: 10/07/2020

All the Third Year students are informed that details regarding the free elective subject for the academic year 2020-21 (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	Fiber Optic and Satellite Communication	FE5ET5(2)	Prof. K.M. Thanvi	Online Class	3R, 3N, 3S, 3M,
2.	IT	Introduction to Computer Networks	5FEIT05	Prof. P. H. Gohatre		3S
				Prof. Ms. P. P. Bute		3R, 3M, 3U1, 3U2
3.	CSE	Data Communication and Networking	5FEKS05(ii)	Prof. Ms. K. P. Sable		3U1, 3U2
				Prof. Ms. T. M. Untawale		3N, 3S,
4.	ELPO	Energy Audit and Management	5FEEP05	Prof. R. K. Mankar		3N, 3M,
				Prof. M. R. Chavan		3R, 3U1, 3U2


Prof. D. L. Bhombe
Dean (Academics)




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)

SHRI SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING, SHEGAON
Free Elective VI Semester (Spring-2020-21)


Date: 08/04/2021

All the Third Year students are informed that details regarding the free elective subject for the academic year 2020-21 (Spring Semester) are as mentioned in the following table.

Sr. No.	Course	Free Elective Code	Free Elective Subject Open	Class	Name of Faculty
01	Electrical Engineering	6FEEP05	Power Supply System (10567)	3N, 3M, 3U1, 3U2	Prof. R. K. Mankar
02	Electronics & Telecommunication	6FEXT05	Introduction to Wireless Technology (10618)	3S, 3R, 3N, 3M	Mrs. A. A .Deshmukh
03	Information Technology	6FEIT05	E. Commerce (10738)	3R, 3U2	Prof. A. G. Sharma
				3U1, 3M	Prof. P. H. Gohatre
				3S	Prof. T. M. Untawale


Prof. D. L. Bhombe
Dean (Academics)




Dr. S. B. Somani
Principal

Copy To:

1. Hon. Principal sir for kind information
2. All HOD for circulation among faculty & display on student notice board (3rd year)
3. Time Table Coordinators (Departmental)