संत गाडगे बाबा अमरावती विद्यापीठ
SANT GADGE BABA AMRAVATI UNIVERSITY

अभ्यासक्रमिका

(FACULTY OF ENGINEERING & TECHNOLOGY)

PROSPECTUS

Prescribed for
Post Graduate Two Year Degree Course
Master of Engineering
(Full Time)
Credit Grade System

I & IInd Year Examinations 2012 - 2013 & Onwards

BRANCHES

1) M.E. (Electronics & Telecommunication)
2) M.E. Civil (Structural Engineering)
3) M.E. Civil (Transportation Engineering & Management)
4) M.E. Mechanical (Thermal Engineering)
5) M.E. Mechanical (Adv. Man. & Mech. Syst. Design)
6) M.E. (Electrical & Electronics Engineering)
7) M.E. (Computer Science & Information Technology)

2012

Visit us at www.sgbau.ac.in

Price Rs. ..../-

_____

SANT GADGE BABA AMRAVATI UNIVERSITY

SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

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

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

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

Ordinance No. 109	:	Recording of a change of name of a University student in the records of the University.
Ordinance No. 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.

SANT GADGE BABA AMRAVATI UNIVERSITY
DIRECTION

No. 32 /2012   Date : 18 /09/2012

Subject :- **Corrigendum to Direrction No.31 of 2010, 57 of 2010 & 30 of 2012 regarding Examinations leading to the Degree of अभियांत्रिजी पारंजत (Master of Engineering) (Full Time) तंत्रशास्त्र पारंजत (Master of Technology) (Semester Pattern... Credit Grade System)**

Whereas, the Direction No.31/2010 in respect of the examinations leading to the degree of अभियांत्रिजी पारंजत(Master of Engineering) (Full Time)/ तंत्रशास्त्र पारंजत (Master of Technology) (Full Time) (Semester Pattern.. Credit Grade System) is in existence**,**

AND

Whereas, the Schemes of teaching & examinations for various branches of Two Year Post Graduate Degree Course in Master of Engineering (Full Time) in the faculty of Engineering & Technology have been provided vide appendices A, B,C,D,E,F,G,H and I appended with Direction No. 31 of 2010,

AND

Whereas, the provisions for the admissions and other detailed provisions to the Degree of Master of Engineering (Full Time) are prescribed by the Direction No. 31 of 2010,

AND

Whereas, the Direction No. 30/2012 which was issued as Corrigendum to Direction No. 31 of 2010 for revised Schemes of teaching and Examinations of M.E. Civil (Structural Engg.) (Full Time) is in existence,

AND

Whereas, the proposals were received from the Principal, I.B.S.S. College of Engg., Ghatkheda, Amravati, Principal, P.R. Pote (Patil) College of Engg., Amravati, Principal, S.S.G.M. College of Engg., Shegaon, Principal, P.R.M.College of Engg. & Mngt., Badnera and H.O.D., P.G. Deptt. of Computer Science, Sant Gadge Baba Amravati University, Amravati regarding starting of new course i.e. M.E. Civil (Transportation Engg.) (Full-Time), M.E. Mechanical (Thermal Engg.) (Full-Time), M.E. Mechanical Engg. (Advanced Manufacturing & Mechanical Systems Designs) (Full Time), M.E. (Electrical & Electronics Engg.) (Full Time), M.E. (Computer Science & Information Technology)(Full Time) respectively from the current Academic Session 2012-2013,

AND

Whereas, the Board of Studies in Computer Science & Engineering in its meeting held on 29.08.2012 resolved to recommend the scheme of teaching & examination, Eligibility Criteria and draft syllabus of Master of Engineering in Computer Science & Information Technology course for its implementation from the current sessiion 2012-2013 and onwards,

AND

Whereas, Hon'ble Vice Chancellor has accepted the Scheme of teaching & examination, Eligibility Criteria with correction and draft syllabus of Master of Engineering in Computer Science & Information Technology course under section 14(7) of the Maharashtra Universities Act, 1994 on behalf of the Faculty of Engineering & Technology and Academic Council,

AND

Whereas, the Management Council in its meeting held on 16.5.2012, vide item No. 175 has considered and approved the recommendations of Academic Council to start M.E. in Computer Science & I.T. in the P.G. T. Deptt. of Computer Science of Sant Gadge Baba Amravati University,

AND

Whereas,the Management Council in its meeting held on 14.08.2012, vide item No. 251 has resolved to refer the proposal for starting M.E.(Computer Science & Information Technology) Course to the Board of Studies in Computer Engineering in the faculty of Engineering & Technology, for consideration and recommendation in this respect,

AND

Whereas, the Academic Council in its meeting held on 28-8-2012 vide Item No.96 has considered and approved the Schemes of Examinations and Syllabi alongwith Eligibility Criteria for admission to M.E. Civil (Transportation Engg.) (Full-Time), M.E. Mechanical (Thermal Engg.) (Full-Time), M.E. Mechanical Engg. (Advanced Manufacturing & Mechanical Systems Designs) (Full Time), and M.E. (Electrical & Electronics Engg.) (Full Time) alongwith the corrections received from the Chairman, Board of Studies in Civil Engineering (including Construction Technology) in the revised scheme of teaching & examinations of first & second Semester of M.E.Civil (Structural) Engineering which was already approved by theAcademic Council inits meeting held on 05.05.2012,

AND

Whereas, the Schemes of Examinations and Syllabi alongwith Eligibility Criteria for admission to the courses as mentioned in above paragraph are to be implemented from the current academic session 2012-2013 in phase wise manner,

AND

Whereas, admissions to the First Year of Master of Engineering (Full Time) course are to be made in the Academic Session 2012-2013,

AND

Whereas, the matter for admission of the students at the examination is required to be regulated by an Ordinance,

AND

Whereas, the Schemes of Examinations for the said courses in the faculty of Engineering & Technology are required to be regulated by the Regulation,

AND

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

AND

Whereas, the Syllabi along with the Schemes of Examinations of the above mentioned courses for Semester I & II of M.E. (Full Time) Courses 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 Direrction No.31 of 2010, 57 of 2010 & 31 of 2012 regarding Examinations leading to the Degree of अभियांत्रिजी पारंजत (Master of Engineering) (Full Time) तंत्रशास्त्र पारंजत (Master of Technology) (Semester Pattern... Credit Grade System) Direction, 2012."

2.   This Direction shall come into force with effect from the session:

i)   2012-2013 for Semester -I & II and,

ii)   2013-2014 for Semester - III & IV

3.   The Eligibility Criteria for admission to the degree of Master of Engineering (Full Time)/Master of Technology (Full Time) course shall have passed the Degree examination in Bachelor of Engineering/Bachelor of Technology in the branches mentioned under Column No.2 of the following table against the respective courses :-

TABLE

M.E./M.Tech.		B.E./B.Tech.of this University or any other statutory University/ Diploma
1.		2.
a)	M.E.Civil (Transportation Engg.)	Civil/Construction Engg. Similarly Diplma holders in Civil Engg. who have completed A.M.I.E. through the Institution of Engineerins (I),Kolkata
b)	M.E.Mechanical (Thermal Engg.)	Mechanical/Automobile Engg. Similarly Diploma holders in Mechanical Engg.who have completed A.M.I.E. through the Institution the Engineers(I),Kolkata.
c)	M.E.Mechanical (Adv.Manufac.& Mech. Systems Design)	Mechanical/Automobile/Production/ Industrial Engg. Similarly Diploma holders in Mechanical/Production Engg.who have completed A.M.I.E. through the Institution of Engineers, (I),Kolkata.
d)	M.E. (Electrical & Electronics Engg.)	Electrical Engg.,Electrical(Electronics & Power) Electrical & Electronics Engg.,Electronics Engg.,Industrial Electronics Engg., Electronics & Telecommunication Engg., Instrumentation, Electrical Power System, Biomedical Engg., Telecommunication Engg.,
e)	*M.E.(Computer Science & Information Technology)	Computer Technology, Computer Engineering, Computer Science & Engg.,Electronics & Tele. Engg., Information Tech.,Electronics Engg., Electrical & Electronics Engg.,

* The process of admission shall be as per G.R. issued from time to time by the Higher & Technical Education Department, Government of Mahrashtra, Mumbai.

4. The Schemes of Examinations for M.E. Civil (Transportation Engg.) (Full-Time), M.E. Mechanical (Thermal Engg.) (Full-Time), M.E. Mechanical Engg. (Advanced Manufacturing & Mechanical Systems Designs) (Full Time), M.E. (Electrical & Electronics Engg.) (Full Time), M.E. (Computer Science & Information Technology)(Full Time) shall be as per the appendices-A, B, C, D and E respectively, appended with this Direction.

5. Following corrections shall be carried out in Direction No. 30 of 2012:-

   a) In Appendix, Under the Schemes of Examination of First Semester of Master of Engineering Civil (Structural Engg.) (Full-Time) -
      (i) Under the column of "Minimum Pass Marks" the words "College assessment" shall be substituted by the word "Subject" and the figure "10" against subject Sr.No. 1 to 5 of the same column shall be substituted by the figures "50",
      (ii) Under the column "Name of the subject", against Sr. No. 6 and 7, the word "Studio" be substitued by the word "Lab" respectively.

   b) In Appendix, Under the Schemes of Examination of Second Semester of Master of Engineering Civil (Structural Engg.) (Full-Time) -
      (i) Under the column of "Minimum Pass Marks" the words "College assessment" shall be substituted by the word "Subject" and the figures "10" against subject Sr.No. 1 to 5 of the same column shall be substituted by the figures "50",
      (ii) Under the column "Name of the subject", against Sr. No. 6 and 7, the word "Studio" be substitued by the word "Lab" respectively.

6. Other related provisions of the Direction No. 31 of 2010 shall be applicable for the above mentioned courses.

Date : /09/2012   **(Mohan K. Khedkar)**
                                        Vice-Chancellor

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULL TIME)
CIVIL ENGINEERING (TRANSPORTATION ENGINEERING AND MANAGEMENT)
CREDIT GRADE SYSTEM

Appendix - A

First Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total HOURS	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	THEORY PAPER (Min Pass)	SUBJECT (Min Pass)	EXTERNAL	INTERNAL	TOTAL	MIN. PASSING MARKS
01	1SFTR1	Trafic Engineering and Field Studies	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
02	1SFTR2	Transport Planning and Management	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
03	1SFTR3	Design and Construction of Pavement	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
04	1SFTR4	Docks Harbour and Airport Engineering	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
05	1SFTR5	Elective – I	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
06	1SFTR6	Trafuc Engineering and Field Studies (Lab)	0	0	2	2	1	–	–	–	–	–	–	25	25	50	25
07	1SFTR7	Design & Construction of Pavement (Lab)	0	0	2	2	1	–	–	–	–	–	–	25	25	50	25
		TOTAL	20	0	4	24	22				500					100	
		TOTAL														600	

Elective – I 1) Applied soil mechanies 2) DESIGN OF BRIDGES

Second Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total HOURS	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	THEORY PAPER (Min Pass)	SUBJECT (Min Pass)	EXTERNAL	INTERNAL	TOTAL	MIN. PASSING MARKS
01	2SFTR1	Advanced Rail Road Engineering	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
02	2SFTR2	Road Safety and Management System	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
03	2SFTR3	Environmental Impact Assessment	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
04	2SFTR4	Elective – II	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
05	2SFTR5	Elective – III	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
06	2SFTR6	Road Safety and Management System (Lab)	0	0	2	2	1	–	–	–	–	–	–	25	25	50	25
07	2SFTR7	Environmental Impact Assessment (Lab)	0	0	2	2	1	–	–	–	–	–	–	25	25	50	25
		TOTAL	20	1	2	23	22				500					100	
		TOTAL														600	

Elective –II – 1) Geometric Design of Transportation Facilities   2)Theory and Application of GIS
Elective –III – 1) Transprtation Economics & Evaluation   2) Transportaion Systems.

Third Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS	INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	3 SFTR 1	SEMINAR AND DISSERTATION	–	–	6	6	15	100	100	50
		TOTAL	–	–	6	6	15		100	

				TOTAL	100

Fourth Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS	EXTERNAL MARKS	INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	4 SFTR 1	SEMINAR AND DISSERTATION	–	–	12	12	30	200	100	300	150
		TOTAL	–	–	12	12	30			300	

				TOTAL	300
				GRAND TOTAL	**1600**

Semester III

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

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

Semester IV

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

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

Notes : 1. Student should fill the examination form in the begining of III semester jointly for III & IV semester.

2. Single marksheet for III & IV semester together will be given to the student.

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULL TIME)
MECHANICAL ENGINEERING (THERMAL ENGINEERING)
CREDIT GRADE SYSTEM

Appendix - B

First Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total HOURS	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	THEORY PAPER	SUBJECT	EXTERNAL	INTERNAL	TOTAL	MIN. PASSING MARKS
			HOURS / WEEK					THEORY				MIN. PASSING MARKS		PRACTICAL MAX. MARKS			
01	1MTE1	Advanced Mathematics	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
02	1MTE2	Advanced Thermodynamics	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
03	1MTE3	Fluid Dynamics	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
04	1MTE4	Advanced Heat Transfer	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
05	1MTE5	Elective – I	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
06	1MTE6	Fluid dynamics Labs	0	0	2	2	1	–	–	–	–	–	–	25	25	50	25
07	1MTE7	Advanced Heat Transfer Lab	0	0	2	2	1	–	–	–	–	–	–	25	25	50	25
		TOTAL	20	0	4	24	22				500					100	
															TOTAL		600

Elective – I 1) Waste Management & Energy Generation Systems. 2) Energy Conservation & Power Plant Economics
3) Modern Energy Sources   4) Environmental Pollution Control

Second Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total HOURS	CREDITS	DURATION OF PAPER	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	THEORY PAPER	SUBJECT	EXTERNAL	INTERNAL	TOTAL	MIN. PASSING MARKS
01	2MTE1	Advanced Internal Combustion Engines.	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
02	2MTE2	Advance Refrigeration Engineerings	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
03	2MTE3	Research Methodology	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
04	2MTE4	Elective – II	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
05	2MTE5	Elective – III	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
06	2MTE6	Advance Internal Combustion Engine Lab	0	0	2	2	1	–	–	–	–	–	–	25	25	50	25
07	2MTE7	Advanced Refrigeration Engineering Lab	0	0	2	2	1	–	–	–	–	–	–	25	25	50	25
		TOTAL	20	1	2	23	22				500					100	
															TOTAL		600

Elective –II – 1) Heat Exchanger Design 2) Advanced Air Conditioning Systems 3) Finite Element Methods 4) Gas Turbine and Jet Propulsion
Elective –III – 1) Fuels and Combustion 2) Solar Energy 3) Mechatronics 4) Computational Fluid Dynamics.

Third Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS	INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	3 MTES	SEMINAR AND DISSERTATION	_	_	6	6	15	100	100	50
		TOTAL	_	_	6	6	15		100	

	TOTAL	100

Fourth Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS	EXTERNAL MARKS	INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	4 MTEP	SEMINAR AND DISSERTATION	_	_	12	12	30	200	100	300	150
		TOTAL	_	_	12	12	30			300	

	TOTAL	300
	GRAND TOTAL	1600

Semester III

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

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

Semester IV

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

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

Notes : 1. Student should fill the examination form in the begining of III semester jointly for III & IV semester.

2. Single marksheet for III & IV semester together will be given to the student.

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULL TIME)

MECHANICAL ENGINEERING (Advanced Manufacturing & Mechanical System Design)

CREDIT GRADE SYSTEM

Appendix - C

			First Semester																	
			TEACHING SCHEME						**EXAMINATION SCHEME**											
			HOURS / WEEK							**THEORY**						**PRACTICAL**				
													MIN. PASSING MARKS		**MAX. MARKS**					
Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total HOURS	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	THEORY PAPER	SUBJECT	EXTERNAL	INTERNAL	TOTAL	MIN. PASSING MARKS
01	1MMD1	Advanced Manufacturing Processes	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
02	1MMD2	Advanced Machine Design	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
03	1MMD3	Computer Aided Design and Engineering	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
04	1MMD4	Design of Material Handling Equipments	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
05	1MMD5	Elective – I	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
06	1MMD6	Advanced Manufacturing Processes- Lab	0	0	2	2	1	–	–	–	–	–	–	25	25	50	25
07	1MMD7	Computer Aided Design and Engineering Lab	0	0	2	2	1	–	–	–	–	–	–	25	25	50	25
		TOTAL	20	0	4	24	22				500					100	
													TOTAL				600

Elective – I   1) Reliability, Maintenance Management & Safety, 2) New Product design   3) Lean Manufacturing
4) Design for Manufacturing and Assembly   5) Ergonomics of Manufacturing

			Second Semester															
01	2MMD1	Advanced Material Technology	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
02	2MMD2	Required Prototyping and Tooling	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
03	2MMD3	Mechatronics in System Design	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
04	2MMD4	Experimental Stress Analysis	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
05	2MMD5	Elective – II	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
06	2MMD6	Mechatronics in System Design Lab	0	0	2	2	1	–	–	–	–	–	–	25	25	50	25
07	2MMD7	Experimental Stress Analysis Lab	0	0	2	2	1	–	–	–	–	–	–	25	25	50	25
		TOTAL	20	1	2	23	22				500					100	
													TOTAL				600

Elective –II – 1) Optimization Methods in Engineering Design, 2) Advanced Machine Tool Design 3) Total Quality Management
4) Computer Assisted Production Management,   5) Concurrent Engineering & Product Lifecycle Management

Third Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS	INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	3 MMDS	SEMINAR AND DISSERTATION	_	_	6	6	15	100	100	50
		TOTAL	_	_	6	6	15		100	

		TOTAL	100

Fourth Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS	EXTERNAL MARKS	INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	4 MMDP	SEMINAR AND DISSERTATION	_	_	12	12	30	200	100	300	150
		TOTAL	_	_	12	12	30			300	

		TOTAL	300
		GRAND TOTAL	1600

Semester III

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

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

Semester IV

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

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

Notes : 1. Student should fill the examination form in the begining of III semester jointly for III & IV semester.

2. Single marksheet for III & IV semester together will be given to the student.

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULLTIME)
ELECTRICAL & ELECTRONICS ENGINEERING
CREDIT GRADE SYSTEM

Appendix - D

First Semester

Sr. No.	Subject Code	Subject	TEACHING SCHEME HOURS / WEEK					EXAMINATION SCHEME THEORY				MIN. PASSING MARKS		PRACTICAL MAX. MARKS			
			Lecture	Tutorial	Practical	Total HOURS	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	THEORY PAPER	SUBJECT	EXTERNAL	INTERNAL	TOTAL	MIN. PASSING MARKS
01	1EEEME1	Advanced Control Systems	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
02	1EEEME2	Advanced Power Electronics	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
03	1EEEME3	Advanced Digital Signal Processing	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
04	1EEEME4	VLSI Design	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
05	1EEEME5	Modelling & Analysis of Electrical Machines	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
06	1EEEME6	Seminar	0	1	0	1	1	–	–	–	–	–	–	–	50	50	25
07	1EEEME7	VLSI Design-Lab	0	0	2	2	1	–	–	–	–	–	–	25	25	50	25
		TOTAL	20	1	2	23	22				500					100	
															TOTAL		600

Second Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total HOURS	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	THEORY PAPER	SUBJECT	EXTERNAL	INTERNAL	TOTAL	MIN. PASSING MARKS
01	2EEEME1	Digital Instrumentation	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
02	2EEEME2	Embedded Systems Design	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
03	2EEEME3	Neuro Fuzzy Control	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
04	2EEEME4	Elective- I	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
05	2EEEME5	Elective- II	4	0	0	4	4	3	80	20	100	40	50	–	–	–	–
06	2EEEME6	Seminar	0	1	0	1	1	–	–	–	–	–	–	–	50	50	25
07	2EEEME7	Embedded Systems Design-Lab	0	0	2	2	1	–	–	–	–	–	–	25	25	50	25
		TOTAL	20	1	2	23	22				500					100	
															TOTAL		600

Elective- I : 1) Power Electronic Controlled Drives   2) Digital Communication
Elective- II : 1) Flexible AC Transmission Systems   2) Digital Image Processing

		Third Semester										
Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS		INTERNAL MARKS	TOTAL	MIM. PASSING MARKS	
01	3EEEME1	SEMINAR AND DISSERTATION	–	–	6	6	15		100	100	50	
		TOTAL	–	–	6	6	15			100		

| | | | | | | | | | | | | TOTAL | 100 |

		Fourth Semester											
Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS		EXTERNAL MARKS	INTERNAL MARKS	TOTAL	MIM. PASSING MARKS	
01	4EEEME1	SEMINAR AND DISSERTATION	–	–	12	12	30		200	100	300	150	
		TOTAL	–	–	12	12	30				300		

												TOTAL	300
												GRAND TOTAL	1600

Semester III

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

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

Semester IV

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

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

Notes : 1. Student should fill the examination form in the begining of III semester jointly for III & IV semester.

2. Single marksheet for III & IV semester together will be given to the student.

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULL TIME)

COMPUTER SCIENCE & INFORMATION TECHNOLOGY

CREDIT GRADE SYSTEM

Appendix - E

First Semester

S.No.	Subject Code	Subject	Lecture	Tutorial	Practical	TOTAL HOURS	CREDITS	DURATION OF PAPERS (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESSMENT	TOTAL	THEORY PAPER	SUBJECT	EXTERNAL	INTERNAL	TOTAL	MIN. PASSING MARKS
01	1RNME1	Advance Computer Architecture	3	0	0	3	3	3	80	20	100	40	50	--	--	--	--
02	1RNME2	Distributed Operating System Design	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
03	1RNME3	Distributed Database System	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
04	1RNME4	Wireless Communication & Network Computing	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
05	1RNME5	Elective-I	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
06	1RNME6	CSIT Lab-I	0	0	2	2	1	--	--	--	--	--	--	25	25	50	25
07	1RNME7	CSIT Lab-II	0	0	2	2	1	--	--	--	--	--	--	25	25	50	25
08	1RNME8	Seminar & Technical Paper Writing	0	1	0	1	1	--	--	--	--	--	--	--	50	50	25
		TOTAL	19	1	4	24	22				500					150	
															TOTAL	650	

Elective-I: 1) Expert System Design & Intelligent System 2) Algorithmics 3) Information Technology & Management

Second Semester

S.No.	Subject Code	Subject	Lecture	Tutorial	Practical	TOTAL HOURS	CREDITS	DURATION OF PAPERS (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESSMENT	TOTAL	THEORY PAPER	SUBJECT	EXTERNAL	INTERNAL	TOTAL	MIN. PASSING MARKS
01	2RNME1	Real Time Embedded Systems	3	0	0	3	3	3	80	20	100	40	50	--	--	--	--
02	2RNME2	Performance Analysis For Imaging Systems	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
03	2RNME3	Information Technology & Security	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
04	2RNME4	Software Engineering, Testing & Reliability	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
05	2RNME5	Elective-II	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
06	2RNME6	CSIT Lab-III	0	0	2	2	1	--	--	--	--	--	--	25	25	50	25
07	2RNME7	CSIT Lab-IV	0	0	2	2	1	--	--	--	--	--	--	25	25	50	25
08	2RNME8	Seminar	0	1	0	1	1	--	--	--	--	--	--	--	50	50	25
		TOTAL	19	1	4	24	22				500					150	
															TOTAL	650	

Elective-II : 1) Advanced Computing Techniques 2) Mobile Computing 3) Digital Media Development

			Two Year Post Graduate Degree Course in Master of Engineering (Full-Time) (CGS)									
			Computer Science & Information Technology									
			Third Semester									
S.No.	Subject Code	Subject	Lecture	Tutorial	Practical	TOTAL	CREDITS	INTERNAL MARKS	TOTAL	MM. PASSING MARKS		
01	3RNME1	SEMINAR AND DISSERTATION	--	--	6	6	15	100	100	50		
		TOTAL	--	--	6	6	15		100			
										TOTAL		100

			Fourth Semester									
S.No.	Subject Code	Subject	Lecture	Tutorial	Practical	TOTAL	CREDITS	EXTERNAL MARKS	INTERNAL MARKS	TOTAL	MM. PASSING MARKS	
01	4RNME1	SEMINAR AND DISSERTATION	--	--	12	12	30		100	300	150	
		TOTAL	--	--	12	12	30		100	300		
										TOTAL	300	
										GRAND TOTAL	1700	

Semester III

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

Semester IV

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

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

Notes: 1. Student should fill the examination form in the beginning of III semester jointly for III & IV semester.

2. Single mark sheet for III & IV semester together will be given to the student.

SYLLABUS PRESCRIBED FOR
TWO YEAR P. G. DEGREE COURSE IN M.E. (F.T.)
ELECTRONICS & TELECOMMUNICATION (C.G.S.)

SEMESTER I

1ENTC1 ADVANCED OPTICAL COMMUNICATION

SECTION - A

Unit I : Optical Fibre basics and Transmission Characteristics:-
Prorogation of light in planer and circular optical waveguides, Numerical Aperture, Modes in optical fibres, Attenuation in single and multimode fibres, Inter-modal and chromatic dispersion of single mode and multi-mode fibres, Waveguide dispersion, Bandwidth of single mode and multimode fibres, Polarization mode dispersion, Dispersion Compensation fibres, Techniques for reducing fiber losses.

Unit II : Optical Sources, Detectors and Optical fibre measurements
Optical Sources: Absorption & emission of radiation, Einstein Relations, Population inversion, Optical feedback and LASER oscillations, Threshold Conditions, Principles of LASER diode, characteristic and efficiency, Semiconductor injection LASER, Injection LASER characteristics.

Optical Detectors: Optical Detection principles, PIN photodiode, Avalanche photodiodes, Metal semiconductor photo detectors, Noise in P-N photo diode.

Measurements: Fibre attenuation measurement, Fibre dispersion measurement, Fibre reflective index profile measurement, Fibre cut-off wavelength measurement, Fibre NA and diameter measurement, Reflectance and optical return losses , field measurement.

SECTION- B

Unit III : **Optical fibre links and components of fibre optic network:-**
Link power budget, rise time budget, transmission distance for single mode links, Power penalties in design, Semiconductor optical amplifiers, Erbium Doped Fibre amplifier (EDFA), Stimulated Raman's Scattering, Raman Amplifiers, Optical parametric amplifiers.
<u>**Passive Components, switches and functional modules:-**</u>
Directional couplers, fixed and tuneable optical filters, isolators, circulators and attenuators, Concept of optical switching,

optical switches, wavelength converters, Optical add/drop multiplexers, optical cross connectors.

Unit IV : WDM Devices and it's Application
Hybrid & planer wave guide devices, Active WDM devices, Wavelength non selective devices, System application. Long Haul Broad Bandwidth Transmission System : Designing systems for long haul broad bandwidth consideration-Outage, Bit error rate, Cross connect, Low & high speed inter-phases, Multiplex / De-multiplex consideration, Regenerator spacing, Degeneration & Allowances

REFERENCE BOOKS:

1) Fiber Optic Communication Technology by Djafar Mynbaev, Lowell Scheiner, Pearson Education 2011.

2) Optical Fiber communication Principles and Practice by John M Senior, 3rd Ed, Pearson Education.

3) Optical Fiber Communication by Gerd Keiser, 4th Ed, McGraw Hill

4) Optical Network by Raju Ramswami (2nd Edition)

1ENTC2 RANDOM PROCESSES

SECTION-A

Unit - I : Scalar Random Variables: -
Concept of random variable, Discrete random variable, Continuous random variable, Expectations & Moments, Characteristics functions, Functions of random variables, Moment generation function, Central Limit theorem (CLT), Generation of random numbers.

Unit - II: Multi-dimensional Random Variables: -
Joint distribution function, Joint density function, Marginal distribution function, Conditional distribution, Covariance & Covariance matrix, Expectations & Moments, Mean and Variance of weighted sum of Random Variables, Joint Gaussian Random Variables

SECTION -B

Unit - III: Random Processes and Statistical Models for Random Signals:-
Concept of random process, Characterization and Classification, Correlation function, Properties of Auto Correlation function, Relationship between two Random Processes, Properties of

Cross Correlation function, Gaussian Random Processes. Introduction to White noise, Random Walks, Brownian motion

UNIT- IV: Power Spectral Density (PSD): -

Concept of Power Spectral Density, Properties of PSD, Power Spectral Estimation, Cross Spectral Density, Power Spectrum in Laplace Domain

REFERENCE BOOKS:

1) Probabilistic Random Signals and Statistics by X Rong Li, CRC Press
2) Random Signals and Systems by Bernard Picnicbono, PHI.
3) A First Course in Probability by Shelabo Ross, Pearson Education

1ENTC3   DIGITAL COMMUNICATION TECHNIQUES

SECTION -A

Unit -I : Characterization of Communication Signal and Optimum Receiver for AWGN Channel:-
Signal Space representation, Memory less Modulation methods, Linear Modulation with memory, Non- linear Modulation methods with memory, CPFSK & CPM, Power Spectra of Linear Modulated signal, Power Spectra of CPFSK & CPM Signals, Correlation Demodulator, Match Filter Demodulator, Optimum Detector, Probability of Error for Binary & M-array signals

Unit - II : Source and Channel Coding:-
Average mutual information & Entropy, Coding of discrete memory-less sources, Discrete Stationary Sources, Lempel-Ziv algorithm; Coding of analog sources, Rate distortion function, Scalar Quantization & Vector Quantization, Temporal and Spectral Waveform Coding, BCH codes, Reed Soloman codes, Reed Muller Codes, Convolution Codes, Transfer function of convolution codes, Viterbi decoding algorithm, stack algorithm(No problems expected)., trellis coded modulation.

SECTION: B

Unit -III : Signal Design for Band Limited Channel & Equalization:-
Design of band limited signal for zero ISI, Nyquist Criterion, Design of band limited signal for controlled ISI, partial response signaling, Data detection for controlled ISI

Linear Equalization: Peak Distortion Criterion, Mean Square Error (MSE) criterion, Decision Feedback Equalization, Coefficient Optimization, Adaptive Linear Equalizer, Zero Forcing Algorithm, LMS Algorithm.

Unit -IV : Spread Spectrum Techniques:-
Generation of PN sequence, direct sequence spread spectrum system, processing gain, jamming margin, application of direct sequence spread spectrum signal, frequency hopped spread spectrum signal, time hopping spread spectrum signal, synchronization of spread spectrum signal – acquisition & tracking.

REFERENCE BOOKS :

1) Digital Communication by J.G. Proakis, Fourth Ed, Mc Graw Hill
2) Digital Communication Techniques by Simon Haykin, John Wiley & Sons
3) Digital Communication Fundamentals and applications by Bernard Sklar, 2nd Ed, Pearson Education Asia
4) Advanced Digital Communication System and Signal Processing techniques by Dr. Kemilo Feher Prentice Hall International

1ENTC 4   DIGITAL SIGNAL PROCESSING AND APPLICATIONS

SECTION –A

Unit -I: Design of Digital FIR filters:-
Filter specifications, Magnitude & Phase response of digital filter.
Linear Phase filters: Type I, Type II, Type III, & Type IV.
FIR filter design using Impulse Response Truncation: Low pass, High pass filter & Band pass filter, FIR design using Hamming, Hanning, Blackman & Kaiser window, Differentiators, Hilbert transforms, Equi-ripple FIR filter design.

Unit -II: Design of Digital IIR filter:-
Analog filter basics: Butterworth, Chebyshev, Inverse Chebyshev filters, Elliptic filters, IIR filter design using impulse invariance, Bilinear Transform, Matched Transformation, Differentiation method (Backward difference method), Frequency transformations in Analog and Digital domain, frequency normalization, Finite word length problem, Quantization Effects on poles & zeros and frequency response

SECTION - B

Unit III: Multi-rate Digital Signal Processing:-
Decimation & Interpolation, Linear filtering with decimation and interpolation, Poly-phase filters, Filter banks, sub-band processing, Decimated filter banks, Uniform DFT filter banks, Quadrature mirror filters

Unit IV: DSP Processors and its Application:-
Architecture of TMS 320C67XX, Assembly language instructions, pipeline operations, Speech signal processing, Radar signal processing

REFERENCE BOOKS:

1) A Course in Digital Signal Processing by Boaz Porat John Wiley & Sons

2) Digital Signal Processing by J. P. Proakis, PHI

3) Real Time Digital Signal Processing- Implementation and Applications by Sen M. Kuo, Bob H.

   Lee and Wenshun Tian, 2nd Ed, John Wiley & Sons, 2006

4) Digital Signal Processing- A Computer based Approach by Sanjit K. Mitra, 4th Ed, Mc- Graw Hill

5) Digital Signal Processing: A Modern Introduction, Ashok Ambardar, Thomson, 2007

6) Digital Signal Processing, Thomas J. Cavicchi, John Wiley

ELECTIVE-I

1ENTC5 (A) REAL TIME EMBEDDED SYSTEM

SECTION – A

Unit I : Embedded System Hardware: -
Embedded systems overview, Hardware components like microcontroller, GPP, ASSP, AISP, SOC, Details of 32 bit ARM SOC architecture, Organization, Analog, Digital & High speed I/O for embedded systems, Interfacing SRAM, DRAM and flash memories with microcontroller, memory management, allocation of memory to program segments and blocks, memory maps.

Unit II : Embedded System Software: -
Techniques of writing efficient C code for microcontroller, C data types for ARM, Signed & unsigned data types, limitation of char & data types, storage class – static & extern, volatile keyword, operation on bits, functions, ARM Thumb procedural

call standard, pointers & arrays, conditional statements – if-else, switch, structure, conditional loops – for & while, preprocessing, compiling, cross compiling, compiler driver, startup code and board support packages, program segments calling assembly routines in C, interrupt handling in C, interrupt latency.

SECTION - B

Unit III: Uniprocessor Real Time Scheduling: -
Real time systems, tasks and its states, task assignment & scheduling, scheduling algorithms – rate monotonic and earliest deadline first, inter-task communication, semaphore, priority inheritance protocol, priority ceiling protocol, real time operating system features, features of micro COS – II, RTOS.

Unit IV: Embedded System Architecture & Design: -
Embedded system implementation aspects & estimation modeling, embedded system architecture, validation and debugging of embedded systems, hardware – software co-design in an embedded system, ARM Philips NXP LPC 2148 programming of on – chip components like ADC and interfacing external peripherals like keyboard, LCD, Stepper Motor.

REFERENCE BOOKS:

01) Embedded Systems by Rajkamal, 2nd Ed, Tata McGraw Hill

02) Embedded Real-time Systems Programming by Iyer & Gupta, Tata McGraw Hill

03) ARM System on Chip Architecture by Furber, 2nd Ed, Pearson India

04) Intro. To Embedded Systems by K.V. Shibu, McGraw Hill

05) Philips NXP LPC 2148 user manual

06) Scheduling in Real Time systems by Cottet, Delacroix & Mammeri, John Wiley & Sons

07) Embedded system design A Unified Hardware/software approach by Frank Valid & Tony Givangis, Publishing 1999

08) Embedded systems: World Class Designs- Jack Ganssle, Newness Publication, Australia.

09) Embedded Microprocessor Systems: Real world design – Stuart R & Ball P.E., 3rd Ed.,   Newness, Imprint Elsevier Science.

1ENTC5 (B) DATA COMPRESSION
SECTION- A

UNIT- I : Introduction and Mathematical background: -
Lossless compression, Lossy compression, Measure of performance, Modeling and Coding, Physical model, Probability model, Markov model, Composite Source model, Uniquely decodable codes, Prefix codes, Kraft-McMillan inequality

Huffman coding: Minimum variance, optimal, length, Extended Huffman codes, Non-binary Huffman codes, Adaptive Huffman coding, Application of Huffman codes.

Arithmetic coding: Coding a sequence, generating binary codes, Adaptive arithmetic coding, Application of arithmetic coding

Unit - II : Dictionary based compression, Context based compression and Lossless image compression: -
Static and adaptive dictionary coding techniques, Application related to file compression and Image Compression, V.42 bis Standard.

Context based Compression: Prediction with Partial Match (PPM), Burrows Wheeler Transform, Associative coder,

Lossless Image Compression: JPEG, Run-length coding, facsimile coding standards, progressive Image transmission

SECTION- B

Unit –III: Quantization Transform Coding and Sub-band Coding: -
Scalar Quantization, Quantization problem, Uniform quantization, Adaptive quantization, Non-uniform Quantization, Entropy Coded Quantization.

Vector Quantization (VQ): Advantages over Scalar Quantization, The Linde-Buzo-Gray algorithm, Tree Structured, Vector Quantization, Structured VQ.

Transform Coding: K L Transform, DCT, DST, Discrete Walsh-Hadamard transform, Applications of Transform coding to Image and audio compression

Sub band Coding: Filters, Basic Sub-band coding, algorithm, design of Filter Banks, Application to speech coding audio coding and Image compression

Unit - IV : Audio, Image and Video Compression: -
Spectral masking, Temporal masking, Psychoacoustic model, MPEG Audio coding, MPEG Advanced Audio coding, Dolby digital.

Image Compression : Predictive techniques like PCM, DPCM and DM, JPEG,JPEG-2000.

Video compression: Video signal representation, H.261 Standard by ITU-T, model based coding MPEG-1 and MPEG-2 Video Standards, ITU-T H.263 and H.264 Standards, Packet Video

REFERENCE BOOKS:
1) Introduction to Data Compression by Khalid Sayood, 2nd Ed, Academic Press.
2) Data Compression Complete Reference by David Salomon, 3rd Edition, Springer 2004.
3) Digital Image Processing by S Jayaraman, S Esakkirajan, T Veerakumar, Tata Mc-Graw Hill.
4) Digital Image Processing by R.C.Gonzalez and Woods 3rd Edition, Pearson Education.

1ENTC5 (C) ARTIFICIAL INTELLIGENCE
SECTION-A

Unit I : Fuzzy Set theory: -
Introduction to Fuzzy sets, Fuzzy relation, Membership functions, Fuzzification, De-fuzzification, Fuzzy logic, Fuzzy rule based system, Fuzzy inference system

Unit II : Fuzzy Decision Making: -
Fuzzy modeling, Adaptive Neuro-Fuzzy Inference system, Cognitive Neuro-Fuzzy modeling, Neuro-fuzzy control, Application of Neuro Fuzzy control

SECTION-B
Unit III: Artificial Neuron model: -
Single and multilayer perceptron neural network (MLP)

Learning process: Training by back-propagation, Swarm particle optimization, Genetic algorithm, simulated annealing, basic concept of bidirectional associative memory (BAM), Self organization feature map, Optical neural network.

Unit IV : Neural Networks and Applications: -
Recurrent Networks, Hamming Network, Support Vector Machine, Counter Propagation Networks, Cluster Discovery Network (ART), Applications of Neural Network in Character Recognition, Forecasting, Robot Kinematics and Biomedical signals .

REFERENCE BOOKS:
1) Fuzzy sets and Fuzzy Logic -Theory and Applications by George J. Klir, Bo Yuan, PHI
2) Neural Networks by Simon Haykin, Pearson Education

3) Neural networks, Fuzzy logic and genetic algorithms synthesis and applications by S. Rajasekaran, G.A. Vijayalakshmi Pai, Prentice Hall Inc (PHI)

4) Artificial Neural Networks by Zurada

5) Neuro Fuzzy and Soft Computing by Jang-Sun, Mezutani, Pearson Education

6) Introduction to Neural Networks using MATLAB 6.0 by S.N.Sivanandan, S. Sumathi, S.N. Deepa, McGraw Hill

7) Intelligent Systems & Controls by Laxmidhar Behera, Indrani Kar, Oxford University Press

1ENTC5 (D) CRYPTOGRAPHY AND NETWORK SECURITY

SECTION-A

Unit I : **Overview: Services, Mechanisms and Attacks:-**
The OSI Security Architecture, A model for network security.
Classical Encryption Techniques: Symmetric Cipher model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography .
Block Ciphers and Data Encryption Standards: Simplified DES, Block cipher principles, Data encryption, The Strength of DES, Differential linear cryptanalysis, Block cipher design principles, Block cipher modes of operations, Contemporary symmetric ciphers- Triple DES, Blowfish, RC5, Characteristics of Advanced symmetric block ciphers
Confidentiality using symmetric encryption: Placement of Encryption function, Traffic Confidentiality, Key distribution

Unit II: **Public Key Cryptography and RSA:-**
Principles of Public key crypto-systems, The RSA Algorithm, Key management, other public key crypto-systems, Key management, Diffle-Hellaman key exchange
Message Authentication and flash function: Authentication requirements, Authentication function, Message Authentication codes, Hash function, Security of Hash function & MACs

SECTION- B

Unit - III: **Hash Algorithms:-** MD5 Message Digest Algorithm, Secure Hash Algorithm Authentification Applications: Kerberos X-509, Authentication Service.

Unit - IV: **Electronic Mail, IP & Web Security:-**
Electronic Mail Security: Pretty good privacy, S/MIME IP

Security: Overview, IP Security Architecture, Authentifications, Header, Encapsulating Security Payload, Combining security Associations, key Management
Web Security: Web security considerations, System Security: Intruders, Malicious software, Viruses, Viruses and related threats Firewalls: Firewall design principles.

REFERENCE BOOKS:

1) Cryptography and Network Security by William Stallings, Third Edition, Pearson Education.

2) Network Security, Private Communication in Public World by Charlie Kaufman, Rudia Perlman, Mike Spenciner, Second Ed., Pearson Education Asia 2002.

3) Contemporary Cryptography by Rolf Oppliger, Artech Home Publication, 2005

4) Cryptography and Network Security by Atul Kahate, Tata McGraw Hill,2003

LABORATORIES

1ENTC6 Lab-I: The laboratory work shall consist of at least 8 experiments. The experiments shall be equally distributed and based on 1ENTC1 and 1ENTC3.

1ENTC7 Lab-II: The laboratory work shall consist of at least 8 experiments. The experiments shall be equally distributed and based on 1ENTC2 and 1ENTC4.

SEMESTER-II
2ENTC1   ADAPTIVE SIGNAL PROCESSING

SECTION -A

Unit I: **Introduction to Random Signals: -**
Random variables, Sequences and Stochastic Process, Random Signals and Distributions, Averages, Stationary Processes, Special Random signals & its Probability Density Functions (PDF), Weiner-Khintchin relations, Filtering Random processes, Non-parametric spectral estimation, Parametric methods of power spectral estimations

Unit II: **Wiener Filter and Adaptive Filtering Algorithms: -**
Mean Square Error (MSE), FIR Wiener filter, Wiener solution with Wiener filtering examples.
Algorithms: Eigen values of the correlation matrix, one dimensional gradient search method, Steepest Descent algorithm, LMS algorithm, Modified LMS algorithm, Examples of LMS algorithm.

Performance analysis: stability Constraints, Conversion Speed, excess MSE

SECTION - B

UNIT III: Kalman Filters and Square Root Adaptive Filters:

Introduction to Recursive Least-Squares Adaptive filters, Recursive minimum MSE for Scalar random variables, Kalman filtering problem, Innovation process and estimation of state, Kalman filtering, Square root Kalman filters, QR-RLS algorithm

UNIT IV : Applications of Adaptive filtering:

Adaptive Equalization, Adaptive noise cancellation, Adaptive Linear prediction, Adaptive Echo Cancellation, Adaptive Lattice Filters

REFERENCE BOOKS:

1) Adaptive filter Theory by Simon Haykin, 3rd Ed, Prentice Hall Inc, 2002
2) Real Time Digital Signal Processing- Implementation and Applications by Sen M. Kuo, Bob H. Lee and Wenshun Tian, 2nd Ed, John Wiley & Sons, 2006
3) Adaptive Filtering Primer with MATLAS by Alexander D. Poulanikas & Zayed M Ramadan, Taylor & Francis Series, CRS press.
4) Adaptive Digital Filters by Maurice G Bellanger, 2nd Edition, MARCEL DEKKAR INC Adaptive Nonlinear System Identification by T Ogunfummi, Springer

2ENTC2   WIRELESS COMMUNICATION

SECTION-A

Unit -I :   Fundamentals of Wireless Communication : Evolution of wireless networks and challenges

Long term fading models: two ray model, diffraction model, scattering model, Shadow fading

Short term fading: Impulse response of time varying channels, Narrow band fading model, wide band fading models, discrete time model. Capacity of wireless channel, Capacity of AWGN channel, Capacity of flat fading channel, Capacity of frequency selective fading channel, Basic diversity combining techniques.

Unit II :   Analog and Digital Cellular Mobile System:- Analog Cellular System: AMPS, NMT Digital Cellular System: GSM, GSM Architecture, TDMA frame structure, Traffic and Control channels, Voice Processing in GSM. IS -95 (CDMA one): Forward Modulation channel, Reverse Modulation channel.

SECTION-B

Unit III : Low power wireless communication systems, Data Networks and protocols:-

Cordless Telephony 2 (CT2), Digital Enhanced Cordless Telephony (DECT), PHS, PDC, WAP, PCS (Functional Architecture, Radio Specifications, Frame Structure).
Protocols: IEEE 802.11, IEEE 802.15.

Unit IV: Private Mobile Radio network and Introduction to 3G Systems:-

Private Mobile Radio (PMR): Introduction, user community, requirement of PMR services, PMR configurations, PMR standards, TETRA Network Architecture. IMT 2000: Radio aspects, Network Aspects and Regional initiatives
Universal Personal Communication: UPT, Concepts and Service aspects, Functional architecture, Routing, Scenarios for partitioning and location of service information, Access security, Basic concepts of UMTS.

REFERENCE BOOKS:

1) Wireless Networks by G. S. Papadimitriou, A. S Pomportisis, P Nicopolitidis, John Wiley & Sons.
2) Wireless Communication by Andrea Goldsmith, Cambridge University Press.
3) Mobile and personal Communication: Systems & Service by Raj Pandya, Prentice Hall India.
4) Digital Mobile Communication and TETRA Systems by John Dunlop, Demessie Girma, James Irvine, John Wiley & Sons.
5) Wireless communications: Principles and Practice by Theodore S. Rappaport, P.E.
6) Principles of Mobile Communication by Gordon L Stuber, 2nd Ed, Kluwer Academic Publishers
7) Mobile Cellular Telecommunication, William C Y Lee , Mc Graw Hill

2ENTC3   ADVANCED COMPUTER NETWORKS AND PROGRAMMING

SECTION- A

Unit - I: Basics of Communication Networks:-

Communication networks and services, Approach to network design, Key factors in Communication network, Evolution, Concept of Layering, OSI Reference model, TCP/IP

architecture, Barkley API, TCP/IP utilities, Concept of Space-Division Switching and Time- Division Switching, Time Space Time (TST) Switching

Unit - II: Queuing models: -
Delay analysis, Arrival rate, Traffic load, Erlang 'B' and Erlang 'C' concepts, Arrival process, Service time classification of queuing systems, M/M/1 queue and Basic multiplexer model, M/M/1 steady state probabilities, Effect of scale on performance, Average packet delay, M/M/C/C Systems, M/G/1 model, Service time, Variability and Delay in M/M/1 systems.

SECTION- B

Unit III: TCP/IP and Routing: -
Architecture IPV6 IP addressing ICMP, IGMP, ARP, RARP, DHCP, Transmission Control (TCP), TCP Segment, TCP flow control, TCP Congestion control, UDP, Mobile IP, Unicast Routing protocols, Multicast Routing Protocols

Unit IV: ATM Network and Advanced Network Architectures:-
Need for ATM, B-ISDN Reference model, ATM layers, ATM Adaptation layers, ATM signaling, PNNI Routing, QoS in ATM, Overlay model, MPLS, Integrated services, RSVP, Differentiated Services.

REFERENCE BOOKS :
1) Communication Networks by Leon Garcia, Wadeja, Tata Mc Graw Hill
2) Data and Computer Communication by William Stallings, 8th Edition, Pearson Education.
3) Data Communication and networking by Behrouz Furozan, Fourth edition, McGraw Hill.
4) TCP /IP Protocol Suite by Behrouz Furozan, McGraw Hill.
5) Internetworking with TCP/IP- Vol I, II, & III by D.E. Comer, PHI

2ENTC4   RF AND MICROWAVE CIRCUIT DESIGN

Unit I :   Two Port RF Networks-Circuit Refrigeration
Low frequency parameters-impedance, admittance, hybrid and ABCD. High frequency parameters-Formulation of S parameters, properties of S parameters-Reciprocal and lossless networks, transmission matrix, Signal Flow Graph:

Unit II :   RF Transistor Amplifier Design And Matching Networks
Amplifier power relation, stability considerations, gain considerations noise figure, impedance matching networks,

frequency response, T and Ð matching networks, microstripline matching networks   (unilateral/bilateral)

Unit III : **Microstrips Lines, Design, Analysis**
Introduction, types of MICs and their technology, Propagating models, Analysis of MIC by conformal transformation, Numerical analysis, Hybrid mode analysis. losses in Microstrip, Introduction to coupled Microstrip, Even and odd mode analysis, Directional couplers, branch line couplers, Design and Fabrication of Lumped elements for MICs,

Unit IV :   Microstrip Circuit Design And MMIC Technology
Introduction, Impedance transformers, Filters, High power circuits, Low power circuits, MICs in satelite and Radar. Fabrication process of MMIC, Hybrid MICs, Configuration, Dielectric substances, thick and thin film technology, Testing methods, Encapsulation and mounting of Devices.

TEXT BOOKS :

1) Samuel Y Liao, "Microwave Devices & Circuits" , Prentice Hall of India, 2006.
2) Reinhold.Ludwig and Pavel Bretshko 'RF Circuit Design", Pearson Education, Inc., 2006
4) M.M.Radmanesh , RF & Microwave Electronics Illustrated, Pearson Education, 2007.
5) Hoffman R.K."HandBook of Microwave intergrated circuits",Artech House,Boston,1987.
6) Gupta .K.C and Amarjit Singh,"Microwave Intergrated circuits"John Wiley,New York,1975.

2 ENTC5   Elective-II
(A) MOBILE COMPUTING

Unit – I: Wireless network technology: Introduction to 3G and 4G mobile systems. Global System for Mobile Communication (GSM) , Wireless media access control protocols; Wireless LAN, TDMA, PRMA, CDMA, WCDMA.

Unit – II: Location management: Location management in internet, Location management in cellular phone network and PCN, performance issues, future research directions. Transport protocols in mobile environments: I-TCP, snooping protocols, Multicast transport services.

Unit – III: Services in wireless networks: Quality of service, Delays, error and packet loss, Error control schemes, Mobile distributed application support: Operating system support, Mobile

middleware and object architecture, Mobile transaction, Remote execution and mobile RPC, Cache strategies for wireless networks.

Unit – IV: Security issues in mobile and wireless: Traditional Security Issues, Mobile and Wireless Security Issues, Additional Issues(Liability, Fear, uncertainty and doubt, Fraud, Big bucks at stake), Additional Types of Attacks(man in the middle attacks, traffic analysis, Replay attacks, Buffer overflow attacks)
Approaches to security: Limit the signal, Encryption, Integrity codes, Ip security, Other Security related Mechanism (Authentication protocols, AAA, Special Hardware)

REFERENCE BOOKS:
1. Mobile Computing, edited by T. Imielinski and H.F. Korth, KluwerAcademic
2. Mobile computing by Asok Talukdar, Roopa Yawagal, TMH
3. Fundamentals of Mobile and Pervasive Computing by Frank Adelstein, Sandeep K.S. Gupta—TMT

2 ENTC5 ELECTIVE-II
(B) COMMUNICATION SYSTEM DESIGN

Unit – I: Designers perspective of communication system: Wireless channel description, path loss, multi path fading Communication concepts, Receiver Architectures: Introduction, Overview of Modulation Schemes, Classical Channel, Wireless Channel Description, Path Losses: Detailed Discussion.

Unit – II: Multipath Fading: Channel model and Envelope Fading, Multipath Fading: Frequency Selective and Fast Fading, Summary of Standard Translation, Introduction Receiver Architectures, Receiver front End: general discussion, Filter Design, rest of Receiver Front Eng: Nonideatlites and Design Parameters, Derivation of NF, IIP3 of Receiver Front End, Partitioning of required NFrec_front and IIP3,rec_front into individual.

Unit – III: Low Noise Amplifier: Introduction, Wideband LNA, Design, Narrow band LNA:Impedance Matching, Narrowband LNA: Core Amplifier, Active Mixer: Introduction, Balancing, Qualitative Description of The Gilbert Mixer, Conversion Gain, Distortion, Low-Frequency Case: Analysis of Gilbert Mixer, Distortion, High- Frequency Case, Noise, A Complete Active Mixer, References, Problems.

Unit – IV: Analog to Digital Converters: Demodulators, A to D Converters used in receivers, Low cost Sigma delta modulators and it's implementation, Design Technology for Wireless Systems: Design entry / simulation, Validation and analysis tools

REFERENCE BOOKS:
1. VLSI for Wireless Communication- Bosco Leuing, (PE).
2. The design of CMOS Radio frequency integrated circuits – T Lee (Cambridge University press)
3. Analysis and design of analog integrated circuits – P Gray and R Meyer (John Wiley & Sons)
4. Microelectronics Transistor Amplifier, Analysis and design G Gonzalez (Prentice Hall)

2ENTC5 ELECTIVE-II
(C) OPTICAL NETWORKS

Unit I : SDH/SONET/WDM & DWDM
SONET/SDH architecture and protocols,Multiplexing structures, Functional components, virtual tributaries and containers, SONET/ SDH network elements, SONET/ SDH migration, Single wavelength limitations, WDM concepts and components, Introduction of DWDM,WDM network designs.

Unit II: Optical Networks ATM, IP
Basic of ATM, ATM virtual channels and path, ATM signalling Principal LANE, MOPA ATM in optical world. IP suit, Router and Switches. MPL's switching in IP, MPLS as an optical control channel, getting IP packets onto DWDM. Optical routers

Unit III: Photonic Packet switching and network survivability
Optical TDM, Synchronization, Header processing, Buffering, Burst switching Testbeds, Basic concept, Protection in SONET / SDM, Protection in client lager, Service class base on protection, Optical layer protection scheme, Network between layers.

Unit IV : Control Management
N/W management functions of SDH/SONET Frames, optical layers services and interfacing, layers within optical layers, Multivendor Interoperability performance and fault Management, Optical safety.

REFERENCE BOOKS:
1. Optical Network by Raju Ramswami (2nd Edition) Morban Kaufmann Elfpvier
2. Optical Networks– Third generation transport system -Uyless Black (Prentice Hall)
3. Opto Electronic computing system – Jordan
4. Optical networking and WDM- W. Goralski

2ENTC5   (D) SPEECH & AUDIO PROCESSING
SECTION - A

Unit I: Introduction – Speech production and acoustic phonetics, speech perception. Speech analysis: time and frequency domain techniques for pitch and formant estimation, cepstral and LPC analysis.

Unit II : Speech Enhancement: Microform Codes, Source coders, and Hybrid coders. Microphone Array processing, Noice Suppression, and Echo Canceller.
SECTION - B

Unit III : Speech Recognition: Basic pattern recognition, preprocessing, Parametic representation, evaluating the similarity of speech pattern (Accommodating both spectral and temporal variability), Network for speech recognition, Language model, artificial neural networks. Summary of current speech recognition design.

Unit IV: Speech synthesis & Applications: Articulatory, formant, and LPC synthesis, voice response and text-to-speech systems. Applications: data compression, vocoders, speech enhancement, speech recognition speaker recognition, aids for the speech and hearing impairments.

Reference Books :
1. D O'shaughnessy, Speech Communication: Human and Machine, Addison Wesley.
2. L R Rabiner and R W Schafer, Digital Processing of Speech Signals, Prentice Hall
3. J Flanagan, Speech Analysis, Synthesis, and Perception, Springer Verlag.
4. L.R. Rabiner and B. Juang " Fundamentals of Speech Recognition" Pearson Education (Asia)Pte. Ltd., 2004.

2ENTC6 Lab- I (Based on 2ENTC2 & 2ENTC3)

2ENTC7 lAB-I (Based on 2ENTC1 & 2ENTC4)

THIRD SEMESTER

3ENTC1 SEMINAR & DISSERTATION
(As per Given Scheme)

FOURTH SEMESTER

4ENTC1 SEMINAR & DISSERTATION

(As per Given Scheme)

*****

SYLLABUS PRESCRIBED FOR
TWO YEAR P. G. DEGREE COURSE IN M.E. (F.T.)
CIVIL ENGINEERING (TRANSPORTATION ENGINEERING & MANAGEMENT) (C.G.S.)
SEMESTER-I

1SFTR1   TRAFFIC ENGINEERING AND FIELD STUDIES

Introduction: Components of road traffic - the vehicle, driver and road. Objectives and scope of traffic engineering.

Traffic Engineering: Road user characteristics; human and vehicle characteristics, factors affecting road traffic; methods of measurement. Concepts of passenger car units for mixed traffic flow.

Traffic Engineering Studies and Analysis: Sampling in traffic studies; adequacy of sample size; application of sampling methods for traffic studies, objectives, methods of traffic study, equipment, data collection, analysis and interpretation (including case studies) of (i) Spot speed (ii) Speed and delay (iii) Volume (iv) Origin - destination (v) Parking . Traffic manoeuvres and Stream Characteristics; application in intersection design.

Probability and statistics for traffic engineering .

Traffic Regulations and Control: General regulations; Regulations on Vehicles, drivers and flow; Other regulations and control. Traffic management; noise and air pollution due to road traffic and method of control.

Traffic Control Devices: Traffic signs, markings, islands and signals. Different methods of signal design; redesign of existing signal including case studies. Signal system and co-ordination. Evaluation and design of road lighting.

ITS: Introduction to Intelligent Transport System- Application of ITS to Traffic Management System- Public Transportation Management System **Traffic Forecast:** General travel forecasting principles, different methods of traffic forecast - Mechanical and analytical methods, Demand relationships, methods for future projection.

Design Hourly Volume for Varying Demand Conditions: Concept of Design vehicle units and determination of PCU under mixed traffic conditions, Price-volume relationships, demand functions. Determination of design hourly volume; critical hour concept.

Highway Capacity: Factors affecting capacity, level of service; Capacity studies Capacity of different highway facilities including unsignalised and signalised intersections.

REFERENCE BOOKS:
1. Kadiyali, L.R. 'Traffic Engineering and Transport Planning', Khanna Publishers.
2. Drew, D.R. 'Traffic Flow Theory and Control', McGraw Hill Book Co.
3. IRC and IS Publications.
4. Institute of Transportation Engineers, 'Manual of Transportation Engineering Studies', Prentice Hall
5. Khanna and Justo,Text book of Highway Engineering , Nemchand Brothers, Roorkee,2000.
6. Papacostas, C.A.,, Fundamentals of Transportation Engineering', Prentice-Hall of India Private Limited, New Delhi.2000.
7. William R. McShane and Roger P. Roess,, Traffic Engineering', Prentice hall, New Jersey,2000.
8. Drew, D.R., **'Traffic Flow Theory and Contro**l', McGraw Hill Book Co.
9. Pignataro, Louis; **'Traffic Engineering** - Theory and Practice', John Wiley.
10. IRC Third **Highway Safety Workshop**, Lecture Notes 1978 and other IRC publications.
11. Highway Capacity Manual. Transportation Research board .
12. Fundamentals of Transportation and traffic Operations. Pergamon, Elsevier science Inc

1SFTR2   TRANSPORT PLANNING AND MANAGEMENT

Urban Transportation Planning - Goals and objectives - Hierarchical levels of transportation planning - Forecast - Implementation - Constraints. UTP survey – Inventory of land use Trip generation - Trip classification - productions and attractions - Multiple regression models - Category analysis - Trip production models - Trip distribution models – Linear programming approach.

Modal split models - Behavioural models - Probabilistic models - Utility functions – logit models - Two stage model. Traffic assignment - Assignment methods - Route-choice behavior - Network analysis. Landuse and its interaction - Lowry derivative models - Quick response techniques - Non-Transport solutions for transport problems. Characteristics of urban structure. Town planning concepts.

Preparation of alternative plans - Evaluation techniques - Plan implementation - Monitoring- Financing of Project – Case studies.

Motor Vehicles Act - statutory provision for road transport and connected organizations.

Route scheduling, Freight transport, Vehicle scheduling, Optimum fleet size, Headway control strategies, Crew scheduling.

Depots and Terminals - Principles and types of layout, Depot location, Twin depot concept, Crew facilities. Design of parking facilities – Bus terminal, bus stops and bus bays.

REFERENCE BOOKS:
1. Hutchinson, B.G., '**Principles of Urban Transport System Planning'** - McGraw Hill Book Co.
2. Kadiyali, L.R., '**Traffic Engineering and Transportation Planning'** - Khanna Publication.
3. Institute of Traffic Engineers - **An Introduction to Highway Transportation Engineering**'.
4. Khisty C.J., *Transportation Engineering - An Introduction*, Prentice Hall, India, 2002.

1SFTR3   DESIGN AND CONSTRUCTION OF PAVEMENT

Components of pavement structure, importance of Sub-Grade soil properties on pavement performance. Functions of Sub-Grade, sub-base, base course and wearing course.

Stresses in flexible pavements: Stresses in homogeneous masses and layered system, deflections, shear failures, equivalent wheel and axle loads.

Elements in design of flexible pavement: Loading characteristics-Static, impact and repeated loads, affects of dual wheels and tandem axles, area of contact and tyre pressure, modulus, CBR value of different layers, equivalent single wheel load, equivalent stress equivalent deflection criterion, equivalent wheel load factors, climatic and environmental factors.

Types of distress: Structural and functional, serviceability, fatigue cracking, pavement deformation and low temperature shrinkage cracking. Factors affecting performance. Relation between performance & distress.

Design methods for flexible pavement: Group Index method, California bearing ratio (CBR), Triaxial method, Mcleod Method, Benkelman Beam method. Boussiusq's and Burmister's analysis and design method. Design of flexible airport pavements.

Elements in design of Rigid pavements: Wheel load, stresses, Westergaard's analysis. Basic properties of concrete elasticity, shrinkage & creep, durability of concrete, rigid pavement design, concrete mix design.

Temperature stresses: Thermal properties of aggregates and concrete. Effect of temperature variations on concrete pavements, Westergaard's and Tomlinson's analysis of warping stresses. Combination of stresses due to different causes.

Pavement overlays: Flexible overlays and Rigid overlays.

Pavement Construction :

Equipment in Highway Construction: Various types of equipment for excavation, grading and compaction - their working principle, advantages and limitations. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction

Subgrade: Earthwork grading and construction of embankments and cuts for roads. Preparation of subgrade, quality control tests

Flexible Pavements: Specifications of materials, construction method and field control checks for various types of flexible pavement layers

Cement Concrete Pavements: Specifications and method of cement concrete pavement construction; Quality control tests; Construction of various types of joints.

REFERENCE BOOKS:
1. Kadiyali L.R., " Principles & Practice of Highway Engineering" Khanna Publisher
2. Chakroborty P Das "Principles & Practice of Highway Engineering" (Khanna Publisher 2000)
3. "Highway Engineering", Khanna & Justo, (Nem Chand & Poros, Roorkee.1997)
4. E.J. Yoder, "Principles of Pavement Design," John Wiley & Sons lnc., New York.
5. Relevant IRC, ASTM, AASHTO and other Codes, Manuals and Specifications.
6. Teng – "Functional Designing of Pavements".
7. Huang - "Pavement Analysis & Design (Prentice Hall – 2003)
8. Yoder E,J, and Witezak – "Principles of Pavement Design". (Wiley & Sons, 1975)
9. Ralph Haos, Ronald Hudson & Zaniesuki " Modern Pavement Management (Kneiger Pubication,1994)

10. Sharma, S.C., '**Construction Equipment and its Management'**, Khanna Publishers

1SFTR4   DOCKS HARBOUR AND AIRPORT ENGINEERING

Water Transportation: Scope, Merits, Developments of Water Transportation in India, Inland waterways, River, Canal, Inland water transportation, Development of ports & Harbours, Harbour classification, Site selection, Harbour dimensioning.

Natural Phenomena: Tides, Water waves, Wave decay & port, wave diffraction, breaking, reflection, Littoral drift, sediment transport.

Harbour Infrastructures: Types of breakwaters, jetty, dock fenders, piers, wharves, dolphin, mooring accessories, Repair facilities, wet docks, lift docks, dry docks, gates for graving docks, floating docks, slipways, locks and gates.

Port facility: transit shed, warehouses, cargo handling, container handling, Inland port facility, Navigational aids, types, requirements of signals, lighthouses, beacon light, buoys. Dredging & coastal protection: Types of dredgers, choices, usage of dredged material, sea wall protection-sea wall revetment, bulkhead.

Planning of ports: Planning of ports for regional and intercontinental transportation development, forecasting cargo & passenger demand, regional connectivity, cargo handling capacity of port, economic evaluation of port project, impacts of port activities.

Air Transportation: Characteristics of Air Transportation structure and organization, challenges and the issues, Airport Master Plan, Characteristics of the aircraft, Airport Requirements, site selection, layout plan and financial plan, Forecasting air travel demand, Air freight demand.

Air traffic control, lighting and signing, Airport capacity and configuration, parking configurations and apron facilities ,visual aids.

Geometric Design: of runway, taxiway, aprons, Design of Passenger Terminal, analysis of flow through terminals, Design of air cargo facilities, Airfield pavement and drainage design.

Field Visit:
1. Visit to the Airport terminal building, structures of terminal area and management office.
2. Visit to the major Port: Port area and Harbour area infrastructures.

REFERENCES:
1. Khanna S.K., Arora M.G., Jain S.S., *Airport Planning & Design*, Nemchand Bros.,Roorkee
2. Horenjeff Robert, *The planning & Design of Airports*, McGraw Hill Book Co.

3. Bindra S.P., *Docks & Harbour Engineering*, Dhanpat Rai Publications,
4. Srinivasan R., Harbours, *Docks & Tunnel Engineering*, Charotar Publishing House, Anand,1999.

ELECTIVE-I
1SFTR5 (1) APPLIED SOIL MECHANICS

Introduction: Soil Mechanics applications to Highway Engg. Soil formations, Types, Regional Soil deposits of India, Index properties, their determination, importance, various soil classification systems, HRB classification, problems on these.

Soil Compaction: Introduction, Lab Tests, Factors affecting, Structure & Engg behavior of compacted cohesive soil, Field compaction specifications Field compaction control, Different types of Equipments used for compaction, their choice.

Stability of slopes: Introduction, Types, Different methods of analysis of slopes for Øu=0 & C-Ø soil, Location of most critical circle, Earth dam slopes stability, Taylor s stability number. Effect of Earthquake Force, problems on above.

Shear strength of soil: Introduction, Importance, Measurements, shear strength of clay, Sand, Elastic properties of soil – Tangent, Secant modulus, Stress – Strain curves, Poisson s ratio, Shear Modulus.

Permeability of soil: Darcy s Law, Validity, Soil-water system, Types, Determination of permeability, problems.

Site Investigation: Introduction, Planning exploration programmes, Methods, Samplers, SPT, Subsoil investigation Report, Geophysical methods.

Reinforced Earth structures: Introduction , Components, Advantages, Types of stability – external, Internal,Geo textiles – types, Functions, their uses in road embankments and railway works, other uses.

Highway Drainage: Introduction, Importance, Surface drainage, Sub-surface drainage, methods, Design of subsurface drainage system, Road construction in water logged areas, Land slides – definition, classifies, factors producing.

REFERENCE BOOKS :
1. "Basic and Applied soil Mechanics", Gopal Ranjan, ASR Rao, New Age International Publishers.
2. "Soil Mechanics & Foundation Engg", Dr.B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications (P) Ltd, 16th edition.
3. "Highway Engg", S.K. Khanna, C.E.G. Justo, 5th edition.

4. "Soil Mechanics & Foundation Engg" – K.R. Arora Standard Publishers Distributors.
5. "Soil Mechanics for road Engineers" – HMSO, London.
6. IRC – Relevant Codes.

ELECTIVE-I
1SFTR5   (2)   DESIGN OF BRIDGES

Introduction: Principles of Planning of Elevated Rail Transit System, grade separation structures, pedestrian crossing and sub- ways.

Loads on Bridges: Dead loads, live loads, dynamic effects of vehicles, longitudinal forces, centrifugal forces, wind loads, earth quake forces, stream flow pressure, load combinations, design examples

Design of Bridge Slabs: Longitudinally reinforced deck slabs, transversely reinforced bridge slabs

Design of Reinforced Concrete Bridges: Design procedures for T- beam, box girder bridges design examples

Design of Prestressed Concrete Bridges: Design code, design examples

Segmental Box bridges - precast sections, criteria, design examples

Sub-Structure Design: Foundation investigation, bearings, bridge pier design, and abutment design. Examples.

REFERENCE BOOKS:
1. Conrad P. Heins and Richard A. Lawrie, '**Design of Modern Concrete Highway Bridges**, John Wiley and Sons,1999.
2. Baider Bakht and Leslie, G. Jaeger,'**Bridge Analysis Simplied**, Mcgraw Hill Book Co,1998.
3. Johnson Victor, '**Bridge Engineering'**, Oxford IBH, New Delhi,2000.
4. Raina, R.K, '**Principles of Design of RCC Bridges**, Tata McGraw Hill,1999.
5. Krishnaraju „**Bridge Engineering**‚‚ UPD Publishers, New Delhi,2000.

1SFTR6   TRAFFIC ENGINEERING AND FIELD STUDIES - LABORATORY

To achieve the objective the following practical will be conducted;
1. Traffic volume studies.
2. Spot -speed studies.
3. Speed and delay study.
4. Moving observer survey.
5. Parking studies
6. Origin -Destination studies, Desire line diagrams.
7. LOS study using VRT.
8. Problems related to traffic engineering.

1SFTR7   DESIGN & CONSTRUCTION OF PAVEMENT - LABORATORY

1. Plate Bearing Test.
2. Field CBR Test.
3. Pavement Evaluation by Benkelman Beam Method.
4. Road Unevenness Measurement by Bump-Integrator.
5. Valuation of Pavement Roughness by Roughometer / Profilometer.
6. Design of Flexible Pavements for Highway and Runway.
7. Design of Rigid Pavements For Highway and Runway.
8. Design of Overlays
9. Marshal Stability Test
10. Cement Concrete Mix Design

Field Visit:

1. Hot – mix plant visit,
2. Road construction site visit: Earth work construction procedure and bituminous mix laying, spreading and rolling procedure.

REFERENCE BOOKS:

1. Highway Material Testing – S K Khanna- C.E.G. Justo, Nemchand Bros- Rookee, 2000
2. S.K.Khanna & Justo C.E.G, Highway Material Testing Manual
3. A.K. Duggal and Vijay P.Puri, "Laboratory Manual in Highway Engineering,"

SEMESTER-II
2SFTR1   ADVANCED RAIL ROAD ENGINEERING

Introduction: Important development of Indian Railways, organization of Indian Railway, Track, Loco, Traction revolution for traffic growth on Indian Railways.

Track & Track Stresses: Permanent way, Track standards & structure, Track Modulus, Forces on the Track, loads, Hammer blow effect Bending Stresses in rail, stresses in Sleeper, Ballast, coning & Tilting of rails, Type of rails, Defect in rails, Rail failure, welding, methods, ultrasonic testing of thermit welding joints, Fastening of rails, fish plates, spikes, bearing plates, pandrol clips, new type of elastic fastening with S.T.sleeper, Rubber pads.

Formation, Sleeper & Ballast: Functions of formation, profile of Banks & cuttings, Track drainage, failure of bank & remedial measures, soil stabilization & Geotextiles methods, sleeper types, sleeper density, functions & requirement and Ballast types.

Point & Crossing & Turnouts: Turnout, type of switches, tongue rail, details of crossing, reconditioning of points & crossings calculation of elements of turnout coles method and IRS method. Symmetrical split, Diamond crossing, modern trend in design, problems.

Geometric Design of Track: Radius, degree of curve, super elevation, gradients, speed calculation, safe speed, equilibrium speed, permissible speed, cant, cant deficiency, negative cant, Transition curve & its design, Types, shift, laying of T.C., vertical curve & its design, problems.

Tractive power & Train resistance: various power requirements for steam, electric loco, diesel loco, Hauling power, resistances developed for Train & problems.

Signal & interlocking: Types of Signal, details of electrical signaling system, track circuits, Absolute block system, Automatic block system, interlocking & methods, Modern signaling techniques, Route relay interlocking, CTC systems.

Metropolitan Railways: Travel pattern, problems, Different forms of urban Transport, Trolley buses, surface railways, underground railways, elevated railways, mono rail, tube railways.

REFERENCE BOOKS:

1. Saxena & Arora. Railway Engineering Dhanpat Rai. Delhi.2000.
2. Ronald.A.Inglis, „An Introduction to Railway Engineering Chapman & Hall Ltd. London.1995.
3. W.W.Hay. Railway Engineering Chapman & Hall Ltd.London.1995.
4. Mundrey. J.S. Track Modernization.2000.
5. Manual on Signaling & Interlocking by Indian Railway board.

2SFTR2   ROAD SAFETY AND MANAGEMENT SYSTEM

Road accidents, Causes, scientific investigations and data collection. Analysis of individual accidents to arrive at real causes; statistical methods of analysis of accident data, application of computer analysis of accident data.

Safety in Road Design – Accident prevention through better planning and design of roads –planning road networks by land use planning, route planning, traffic planning for different land uses etc., designing for safety through link design, design of road geometrics etc., junction design for safety.

Operating the road network for safety, highway operation and counter-measures, road safety audit, principles- procedures and practice, code of good practice and checklists.

Road safety issues and various measures for road safety. Engineering, education and enforcement measures for improving road safety. Short term and long term measures. Road safety education and training. Traffic calming techniques and innovative ideas in road safety.

Economic evaluation of improvement measures by "before and after studies" Counter measures at hazardous locations – accident investigation,

problem diagnosis, development of counter measures, checklists for counter measures.

Traffic management techniques. Local area management. Transportation sy stem management. Low cost measures, area traffic control. Various types of medium and long term traffic management measures and their uses. Evaluation of the effectiveness and benefits of different traffic management measures, management and safety practices during road works. Case studies.

REFERENCE BOOKS:

1. BABKOV, V.F. 'Road conditions and Traffic Safety', MIR publications, - 1975.

2. K.W. Ogden, 'Safer Roads – A Guide to Road Safety Engg.' Averbury Technical, Ashgate Publishing Ltd., Aldershot, England, 1996.

3. Kadiyali, L.R., 'Traffic Engineering and Transport Planning', Khanna Publications.

4. Pignataro, Louis, 'Traffic Engineering - Theory and Practice', John Wiley.

5. RRL, DSIR, 'Research on Road Safety', HMSO, London.

6. IRC Third 'Highway Safety Workshop', Lecture Notes 1978 and other IRC publications.

7. Papacoastas 'Introduction to Transportation Engineering' – Prentice

2SFTR3 ENVIRONMENTAL IMPACT ASSESSMENT

Introduction: Concepts of environmental impact analysis, key features of National environmental policy act and its implementation, screening in the EIA process, utility and scope of EIA process, Environmental protection acts EIA at national level.

Conceptual approach for environmental impact studies, planning and management of impact studies, matrix and network methodologies for impact identification, description of the affected environmental – environmental indices.

Prediction and Assessment of Impact on Air Environment: Basic information on air quality, sources of air pollutants, effects of air pollutants, key legislations and regulations, conceptual approach for addressing air environment impacts, impact prediction approaches, assessment of significance of impacts, identification and incorporation of mitigation measures.

Prediction & Assessment of Impact on Noise & Social Environment: Basic information on noise, key legislation and guidelines, conceptual approach for addressing noise environment impacts, impact prediction methods, assessment of significance of impacts, identification and incorporation of mitigation measures, Conceptual approach for addressing socio-economic impacts, traffic and transportation system impacts, visual impacts, scoring methodologies for visual impact analysis

Decision Methods for Evaluation of Alternative: Development of decision matrix. Public participation in environmental decision making, Regulatory requirements, environmental impact assessment process, objectives of public participation, techniques for conflict management and dispute resolution, verbal communication in EIA studies

REFERENCE BOOKS:

1. Canter L.W., *Environmental Impact Assessment*, McGraw-Hill, 1997

2. Betty Bowers Marriott, *Environmental Impact Assessment: A Practical Guide*, McGraw-Hill Professional, 1997.

3. Peter Morris & Riki Therivel, *Methods of Environmental Impact Assessment*, Routledge, 2001.

4. Denver Tolliver, *Highway Impact Assessment*, Greenwood Publishing Group, 1993.

5. R. K. Jain, L. V. Urban, G. S. Stacey, H. E. Balbach, *Environmental Assessment*, McGraw-Hill Professional, 2001.

6. Relevant IRC & CPCB codes.

ELECTIVE-II
2SFTR4 (1) GEOMETRIC DESIGN OF TRANSPORTATION FACILITIES

Introduction: Classification of rural highways and urban roads. Objectives and requirements of highway geometric design.: Design Control and Criteria

Design Elements: Sight distances - types, analysis, factors affecting, measurements, Horizontal alignment - design considerations, stability at curves, superelevation, widening, transition curves; curvature at intersections, vertical alignment - grades, ramps, design of summit and valley curves, combination of vertical and horizontal alignment including design of hair pin bends, design of expressways, IRC standards and guidelines for design. problems.

Cross Section Elements: Right of way and width considerations, roadway, shoulders, kerbs traffic barriers, medians, frontage roads;

Facilities for pedestrians, bicycles, buses and trucks, Pavement surface characteristics - types, cross slope, skid resistance, unevenness.

Design Considerations: Design considerations for rural and urban arterials, freeways, and other rural and urban roads - design speeds, volumes, levels of service and other design considerations.

Design Of Intersections: Characteristics and design considerations of at-grade intersections; Different types of islands, channelization; median openings; Rotary intersections; Grade separations and interchanges - types, warrants, adaptability and design details; Interchanges - different types, ramps. Computer applications for intersection and interchange design.

Note : Computer Lab. using highway geometric design software for design of intersections, interchanges and parking lots to be carried out.

REFERENCE BOOKS:

1. AASHO, "A Policy on Geometric Design of Highways and Streets', American

   Association of State Highway and Transportation Officials, Washington D.C.

2. Khanna S.K. and Justo, C.E.G.'Highway Engineering', Nem Chand and Bros.,2000.

3. DSIR, 'Roads in Urban Areas', HMSO, London.

4. Jack E Leish and Associates, 'Planning and Design Guide: At-Grade Intersections'. Illinios.

5. Relevant IRC publications

ELECTIVE-II
2SFTR4 (2) THEORY AND APPLICATION OF GEOGRAPHIC INFORMATION SYSTEMS (GIS)

Geographic information concepts and spatial models – Introduction, spatial information, temporal information, conceptual models of spatial information, representation of geographic information.

GIS Functionality – Introduction, data acquisition, preliminary data processing, data storage and retrieval, spatial search and analysis, graphics and interaction.

Computer Fundamentals of GIS and Data storage Fundamentals of computers vector/ raster storage character files and binary files, file organization, linked lists, chains, trees. Coordinate systems and map projection: Rectangular, polar and spherical coordinates, types of map projections, choosing a map projection.

GIS Data models and structures – Cartographic map model, Geo-relation model, vector/ raster methods, non – spatial data base structure viz.. hierarchal network, relational structures. Digitizing Editing and Structuring map data – Entering the spatial (Digitizing), the non- spatial, associated attributes, linking spatial and non- spatial data, use of digitizers and scanners of different types.

Data quality and sources of error – Sources of errors in GIS data, obvious sources, natural variations and the processing errors and accuracy. Principles of Spatial data access and search, regular and object oriented decomposition, introduction to spatial data analysis and overlay analysis, raster analysis, network analysis in GIS.

GIS and remote sensing data integration techniques in spatial decision support system land suitability and multioriteria evaluation, rule based systems, network analysis, special interaction modeling, Virtual GIS.

Data base positioning systems, desirable characteristics of data base management systems, components of a data base management system, understanding the data conceptual modeling. Global positioning system, hyper spectral remote sensing, DIP techniques, hardware and software requirements for GIS, overview of GIS software.

REFERENCE BOOKS:
1. Peter A Burrough Rachael A Mc Donnel, **"Principles of GIS"** (Oxford), 2000.
2. Christopher Jones, **"GIS and Computer cartography"** (Longman),2000.
3. Lillesand, **"remote sensing and image interpretation** "(John Wiley and Sons),2000.
4. James L Riggs, **'Engineering Economics'** 4th Edition, Tata McGrawhill, New Delhi, 2005
5. Prasanna Chandra, **Financial Management** 5th Edition, Tata McGrawhill, ND05

ELECTIVE-III
2SFTR5 (1) TRANSPORTATION ECONOMICS AND EVALUATION

Introduction: Concepts and Principles of Engineering Economics, Identification and Measurements of Highway Benefits, Highway Transportation Costs, Road User Costs and Benefits, Road User Cost Study in India.

Cost and Benefits: Capital Cost, Inflation cost, Interest during construction, maintenance cost, Road user cost, Vehicle Operating cost, Accident Cost, Congestion Cost, and Pricing. Non user cost and consequences. Saving and Benefits, Road user benefits, and Consumer surplus. Social Costs and benefits from transportation projects.

Methods of Economic Analysis: Methods- BCR-NPV-IRR –Their Basic Characteristics, Illustrative applications on above Methods of Economic Analysis, Comparison of the Methods of Analysis when Applied to a Group of Mutually Exclusive Alternatives.

Economic Evaluation of Null Alternative, Characteristics and Limitations of the Different Methods of Economic Analysis, Ranking of Independent Projects, Sensitivity Analysis. case studies and problems .

Depreciation Concepts: Depreciation Cost, accounting Methods, Salvage Value Estimation, Depreciation, Taxes, Problems .

Supply and Demand: Concept-Definition-Factors affecting Demand and Supply- Shift in Demand and Supply- Transportation demand Model-Equilibrium-Sensitivity of Travel Demand- Elasticities-Consumer Surplus- Marginal Cost- Average Cost- Pricing .

REFERENCE BOOKS:
1. Robley Winfrey,'**Economic Analysis for Highways'**, International Textbook Company,Pennsylvania.1990.
2. Jotin Khisty and Kent Lall ' **Introduction to Transportation Engineering'** PHI, New Delhi,2001.
3. Kadiyali.L.R.' **Traffic Engineering and Transport planning'**, Khanna publications,New Delhi,2000.
4. Kenneth J. Button, Transport Economics, Elgar
5. David A. Hensher, Ann M. Brewer, Transport : An Economics and Management Perspective, Oxford University Press
6. Emile Quinet, Roger Vickerman, Principles Of Transport Economics, Edward Elgar Pub
7. Road User Cost Study, Central Road Research Institute
8. Dickey J.W, Project Appraisal for Developing Countries, JohnWiley
9. Ian G. Heggie, Transportation Engineering Economics, McGraw Hill

ELECTIVE-III
2SFTR5 (2) TRANSPORTATION SYSTEMS

<u>**Technological characteristics**</u> of different systems Principles and functions of important systems elements in Highway, Railways, Water ways, Airways, & Rope ways etc.

Historical development of transport in India - 20 year Road Plans, National Transport Policy Recommendations, IRC, CRRI, Vision 2021, NHDP, PMGSY. Characteristics of different modes of transport and their integration and interactions - impact on environment.

Planning of railway - Passenger and goods terminals - layout - passenger facilities – traffic control.

Airport Planning, requirements and components. Design of runway and taxiway - Apron - parking configuration - terminal requirements - Airport marking and lighting - Air traffic control.

Planning of Harbours and ports - cargo handling - Containerization - Navigation aids – Inland waterways - Pipeline transportation.

Urban transportation systems - Mass rapid transit system - Light rail transit - Personal rapid transit, guided way systems, cabin taxi, dual mode bus - Para transit systems – Demand responsive system - Intermediate public transport.

REFERENCE BOOKS :
1. **"An Introduction to Transportation Engineering"** Willian & Hay. John Wiley & Co.
2. **"An Introduction to Transportation Engineering & planning by Edward**. K. Modok. John Wiley & Co"
3. **"An Introduction to Transportation Engineering**" by Evere H.C.Carier. & Wolfgang. S. Homburger Reston Publishing inc.
4. Paquette, R.J., et al, Transportation Engineering Planning and Design, John Wiley & Sons, New York,1982.
5. 5Alan Black, Urban Mass Transportation Planning, McGraw-Hill, 1995.

2SFTR6 ROAD SAFETY AND MANAGEMENT SYSTEM - LABORATORY

The field studies on following topics :
1. Transportation management
2. Parking management
3. Road accident studies
4. Public transport route evaluation
5. Traffic signal - capacity evaluation
6. Rotary design

2SFTR7 ENVIRONMENTAL IMPACT ASSESSMENT - LABORATORY
1. Noise emitted by road traffic motor vehicles.
2. Detrimental effects of road traffic motor vehicles on human health.
3. Measurement using sound level meter and methods of prediction of highway traffic noise.

4. Noise pollution and Techniques of road traffic noise reduction.

5. Measurement of air pollution.

6. Perception survey with reference to Noise and Air .

THIRD SEMESTER
3 SFTR1   Seminar & Dissertation

FOURTH SEMESTER
4SFTR1   Seminar & Dissertation
As per given scheme

*****

SYLLABUS PRESCRIBED FOR
TWO YEAR P. G. DEGREE COURSE IN M.E. (F.T.)
THERMAL ENGINEERING (C.G.S.)
FIRST SEMESTER
1MTE1   ADVANCED MATHEMATICS
SECTION – A

Partial Differential Equations: Linear partial differential equations with constant coefficients and its solution, complimentary function and particular integral.

Applications of Partial Differential Equations: Method of separation of variables, solution of wave equation, one dimensional and two dimensional heat flow equation in steady state (Laplace Equation) and its solution.

SECTION – B

Statistics: -Method of least squares, curve fitting by graphical method. Co-relation regression, probability, axioms of probability, Baye's theorem, conditional probability, probability distribution; Binomial, Poisson's and Normal Distribution

Interpolation: -Newton's interpolation formulae, Newton's and Gauss's forward and backward interpolation formulae, Interpolation with unequal intervals, Lagrange's formula for unequal intervals. Newton's divided difference formula. Inverse interpolation

Numerical Methods: Numerical integration, Newton-Cote's formula, Trapezoidal rule, Simpson's one third and three eighth rule, Waddle's

rule. Numerical solution of ordinary differential equations; Taylor's series, Runge-Kutta's fourth order method, Euler's method, Milne's predictor-corrector method

TEXT BOOKS :
1.   Advance Engineering Mathematics by Erwin Kreyszig, 7th and 8th Edition. Wiley Eastern.
2.   Higher Engineering Mathematics by B. S. Grewal,

REFERENCE BOOKS :
1.   Fundamentals of Statistics by S. C. Gupta.

1MTE2   ADVANCED THERMODYNAMICS
SECTION –A

Introduction And Overview: Introductory Concepts and Preliminaries; Properties of Pure Substances; Energy and the First Law of Thermodynamics, Energy Transfer by Heat, Work, and Mass; Second Law of thermodynamics, Entropy: A Measure of Disorder, Exergy – A Measure of Work Potential.

The Two Laws Combined: Review on some consequences of first Law, Limitations of first Law, Thermodynamic Tempera-ture Scale, Clausius-Clapeyron Equation, Stefan' s Law, Helmholtz and Gibbs Func-tions, Availability in Steady Flow, Irreversibility and Effectiveness, Combined First and Second Laws, Isothermal and Adiabatic Compressibility; Joule-Kelvin Coefficient, Maxwell Equation, Vander Wall's Gas Equation;

The Destruction Of Energy: Lost Available Work, Mechanisms of Entropy Generation or Energy Destruction, Entropy Generation Minimization.

SECTION -B
Multi Phase Systems: General considerations, Dalton & Amagat Model, Mixture of gases and vapors. Changes in Molal Properties upon Mixing, Gibbs Entropy Equation and Gibbs -Duhem Equation

Chemically Reactive Systems: Thermodynamics of reactive Systems and Criterion of Equilibrium, Phase rule. Combustion Process, Enthalpy of formation; First Law Analysis of Reacting Systems; Second Law analysis of Reacting Systems, Equilibrium Constant and its temperature Dependence.

Thermodynamic Optimization: Energy analysis of Vapor and Gas Power Cycles, Guideline for improving Thermodynamic Effectiveness; Energy analysis of Simple Power Plant (Steam Plant)

TEXT BOOKS:
1.   Advanced Engineering Thermodynamics, Adrian Bejan, Wiley-Interscience Publication, Second Edition, ISBN 0-471-14880-6.
2.   Fundamentals of Engineering Thermodynamics, Michael Moran & Howard Shapiro, Wiley & Sons, Sixth Edition, ISBN 978-0-471-787358

3. Fundamental of thermodynamics, <u>Richard E. Sonntag</u>, <u>Gordon J. Van Wylen</u>, <u>Claus Borgnakke</u>, John Wiley & Sons publication.

REFERENCE BOOKS:
1. Fundamentals of Classical Thermodynamics, Richard Sonntag, Claus Borgnakke, John Wiley & Sons, Seventh Edition, ISBN: 978-0-470-04192-5.
2. Thermodynamics: An Engineering Approach, Yunus A. Cengel & Michael A. Boles, Sixth Edition, ISBN-13 9780073305370.

1MTE3   FLUID DYNAMICS

SECTION - A

Fluid flow concepts: Euler's equations of motion, Navier stoke equation, equation of continuity, Rotational irrotational flows, potential and stream functions, and flow nets circulations. Vorticity.

Basic Function: Uniform stream, sink, vortex, doublet, superposition of functions, flow over half bodies, Rankine bodies, circular cylinder, Magnus effect.

Conformal Mapping: Simple transformation and inverse transformations.

SECTION - B

Boundary layer theory: Boundary layer theory for laminar and Turbulent flow, Blasius solution for flat plate, approximate methods, boundary layer separation and control, Effect of roughness.

Turbulent flow, Semi empirical theories of turbulence, eddy viscosity, Prandtl's mixing length theory, Karman's Similarity hypothesis, Taylor's Vorticity transfer theory.

Compressible Flow: Review of one dimensional compressible flow, approximation to two and three dimensional such as sonic, supersonic flows, small perturbation theory, Shock Waves, Prandtl Mayor's Equation.

TEXT BOOKS :
1. Foundations of Fluid Mechanics, Yuan, S.W., Prentice Hall,
2. Cengel, Y.A. and J.M. Cimbala, Fluid Mechanics, McGraw-Hill, Boston, MA
3. Mechanics of Fluids, Shames, McGraw-Hill.

REFERENCE BOOKS:
1. Boundary Layer Theory, Schlichting, H., McGraw-Hill,.
2. *Fluid Mechanics*, Kundu, P. K., and Ira M. Cohen, 4th ed., Academic Press
3. The Dynamics and Thermodynamics of Compressible Flow, Shappiro, Ronald Press.

1MTE4   ADVANCED HEAT TRANSFER

SECTION – A

Steady state conduction: Basic fundamentals, One dimensional steady state conduction: critical radius of insulation, Cylinder with heat sources, Fins of non-uniform cross section. Multi dimensional steady state conduction: Two dimensional heat conduction analytical, graphical analysis, Conduction shape factor, Numerical analysis, formulation in terms of resistances of elements, Accuracy considerations

Unsteady state heat conduction: Applicability of Heisler charts, Semi-infinite slab and cylinder suddenly exposed to convection, Transient numerical methods. Thermal resistance and capacity formulation .

Convection heat transfer: Energy equation of the boundary layer, thermal boundary layer, turbulent boundary layer heat transfer and thickness, Empirical relations for flow across cylinders and tube banks, Liquid metal heat transfer.

Natural convection systems, heat transfer on a vertical plate, free convection from horizontal cylinders and inclined surfaces, combined free and forced convection, criteria for free or forced convection.

SECTION - B

Radiation: Introduction to basic fundamentals, Radiation shape factor**,** Heat exchange between non-black bodies using network approach, gas radiation, radiation network for an absorbing and transmitting medium, Effect of radiation on temperature measurement, Radiation heat transfer coefficient.

Condensation, Boiling and Heat pipe: heat transfer coefficient during condensation on tube bank Simplified relations for boiling heat transfer with water, transpiration cooling, and ablation; classification,construction and applications of heat pipe.

Note: Heat transfer data book will be permitted in Exam hall

TEXT BOOKS :
1. Heat Transfer by J.P. Holman, Tata McGraw Hill Publication, 9th ed. 2002.
2. Heat Transfer by S.P. Sukhatme, Tata McGraw Hill Publication, 1994.

REFERENCE BOOKS :
1. Heat Transfer by P.K. Nag, Tata McGraw Hill Publication, 2005.
2. Heat and Mass Transfer Data Book Book by C P Kothandaraman, S Subramanyam, New Age International,1994
3. Heat Transfer data book Convective heat & mass transfer by Kays and Crawford, Tata

ELECTIVE - I

1MTE5 1. WASTE MANAGEMENT AND ENERGY GENERATION SYSTEMS

SECTION – A

SOLID WASTE :

Definitions - Sources, Types, Compositions, Properties of Solid Waste - Municipal Solid Waste - Physical, Chemical and Biological Property - Collection - Transfer Stations – Waste Minimization and Recycling of Municipal Waste

WASTE TREATMENT :

Size Reduction - Aerobic Composting - Incineration - Furnace Type & Design, Medical / Pharmaceutical Waste Incineration - Environmental Impacts - Measures of Mitigate Environmental Effects due to Incineration

WASTE DISPOSAL :

Land Fill Method of Solid Waste Disposal - Land Fill Classification, Types, Methods & Siting Consideration - Layout & Preliminary Design of Land Fills - Composition, Characteristics, generation, Movement and Control of Landfill Leachate & Gases - Environmental Monitoring System for Land Fill Gases

SECTION - B

HAZARDOUS WASTE MANAGEMENT

Definition & Identification of Hazardous Waste - Sources and Nature of Hazardous Waste - Impact on Environment - Hazardous Waste Control - Minimization and Recycling - Assessment of Hazardous Waste Sites - Disposal of Hazardous Waste, Underground Storage Tanks Construction, Installation & Closure

ENERGY GENERATION FROM WASTE

Types - Biochemical Conversion - Sources of Energy Generation - Industrial Waste, Agro Residues - Anaerobic Digestion - Biogas Production - Types of Biogas Plant Thermochemical Conversion - Sources of Energy Generation - Gasification - Types of Gasifiers - Briquetting - Industrial Applications of Gasifiers - Utilization and Advantages of Briquetting - Environment Benefits of Biochemical and Thermochemical Conversion

TEXT BOOKS :

1. Parker, Colin, & Roberts, Energy from Waste - An Evaluation of Conversion Technologies, Elsevier Applied Science, London, 1985

2. Shah, Kanti L., Basics of Solid & Hazardous Waste Management Technology, Printice Hall, 2000

REFERENCE BOOKS :

1. Manoj Datta, Waste Disposal in Engineered Landfills, Narosa Publishing House, 1997
2. Rich, Gerald et.al., Hazardous Waste Management Technology, Podvan Publishers, 1987
3. Bhide AD., Sundaresan BB, Solid Waste Management in Developing Countries, INSDOC New Delhi, 1983.
    Websites:1. http://www.bical.net ,2. http://www.volund.dk,3. http://www.iswa.org,4. www.wmrc.uiuc.edu

ELECTIVE - I
1MTE5 2. ENERGY CONSERVATION AND POWER PLANT ECONOMICS

SECTION-A

Energy Conservation :   Energy Sources – Review of Present Status of Conventional and Renewable Energy Sources, Common areas of inefficiency in energy use, principles of energy conservation , energy conservation planning, energy conservation in industries, household, commercial, transport and agricultural fields, energy conservation technologies, energy conservation legislation.

Energy Audit: Energy flow diagram, comparison with standards, energy management team, energy audit of illumination systems and electrical systems, energy audit of various compressed air systems, buildings, steam generation and distribution systems.

Demand Side Management: Scope of Demand Side Management, load management as a Demand Side Management strategy, tariff options of Demand Side Management, Demand Side Management and environment, different types as a captive power plants, energy banking and wheeling, role of private sector in energy management.

SECTION-B

Power Plant Economics: Economic analysis of power plants and targets, Load curves, load duration curve, different terms and definitions; Effect of fluctuating load on operation and design of the plant, methods of meeting fluctuating load, cost of electrical energy; operating costs, generation costs, depreciation cost. Cost benefit analysis, Selection of type of generation; Performance and operating characteristics of power plants; Selection of the generating equipments, Combined operation of power plants; load division between stations, effect of load factor on energy cost, different types of tariffs.

Environmental Aspects of Energy Generation : Well-to-Wheel Emission analysis of Energy Sources, Social and economical issues of the power plants, Greenhouse effect, Acid precipitation- acid rain and acid snow, dry

deposition and acid fog. Thermal pollution, air pollution, Radiation from nuclear power plant effluents, clean coal technologies, hydro power plants , environmental clearances.

TEXT BOOKS :

1. Power Station Engineering and Economics **,** B G A Skrotzki , W A Vopat :   Tata McGraw Hill Publishing Company Limited, New Delhi,1972.

2. Power Plant Engineering, P K Nag, Tata McGraw Hill Publishing Company Limited, New Delhi ,2006.

REFERENCE BOOKS :

1. Electrical Power Distribution , A S Pabla **,** Tata McGraw Hill Publishing Company Limited, New Delhi ,2004.

2. Generation of Electrical Energy **,** B R Gupta, Eurasia Publishing House Private Limited, New Delhi, 2007.

3. Patterns of Energy Use in Developing Countries, Ashok V Desai, Wiley Eastern limited, Tokyo, 1991

ELECTIVE -I
1MTE5   3. MODERN ENERGY SOURCES

SECTION -A

Solar Energy: Flat plate and concentrating collectors- design, analysis and performance, applications. Thermal Power, Photovoltaic power; Economic Analysis

Tidal and Ocean   Energy: Applications, Design aspects, Power generation methods, various cycles and analysis.

SECTION - B

Wind Energy: Atmospheric circulation, classification, factors influencing wind, wind shear, turbulence, wind speed monitoring, Betz limit, WECS: classification, characteristics, application, design aspects

Geothermal Energy And Magneto Hydrodynamics: Study of various components, Performance and methods of energy conversion.

Nuclear Energy: Fusion and fission, study of various components, Design aspects, performance and methods of power generation.

TEXT BOOKS :

1. Power Plant Technology by El- Wakil, McGraw Hill publication.

2. Solar Energy : Fundamentals and Applications (1st Revised Edition), Tata McGraw-Hill,

REFERENCES :

1. Solar Energy: Principles of thermal collection and Storage by Suhas P. Sukhatme ,Second Edition, Tata McGraw-Hill, 2006

2. Principles of Solar Thermal Engineering by F.Kreith & J .F.Kreider, McGraw Hill Publications 1978.

3. Solar Engineeering of thermal Processes by J .A.Duffie and W.A.Beckman, John Wiley & Sons publication 1999.

4. Applied Solar Energy by A.B.Meinal & F.P.Meinal, Addison Wesley 1976 publication.

ELECTIVE-I
1MTE5   4. ENVIRONMENT POLLUTION CONTROL
SECTION-A

Air Pollution : Sources and Effect - Acid Rain - Air Sampling and Measurement - Analysis of Air Pollutants - Air Pollution Control Methods and Equipments - Issues in Air Pollution control.
SOLID WASTE MANAGEMENT
Sources and Classification - Characteristics of solid waste-Potential methods of solid waste Disposal – Process and Equipments for Energy Recovery from Municipal Solid Waste and Industrial Solid Waste.

WATER POLLUTION
Sources and Classification of Water Pollutants - Characteristics - Waste Water Sampling Analysis - Waste Water, Treatment - Monitoring compliance with Standards - Treatment, Utilization and Disposal of Sludge.

SECTION - B
OTHER TYPES OF POLLUTION
Noise Pollution and its impact - Oil Pollution - Pesticides - Radioactivity Pollution Prevention and Control

POLLUTION FROM THERMAL POWER PLANTS AND CONTROL METHODS
Instrumentation for pollution control - Water Pollution from Tanneries and other Industries and their control

TEXT BOOKS :

1. G.Masters (1991): Introduction to Environmental Enginering and Science, Prentice -Hall International Editions.

2.. H.S.Peavy, D.R..Rowe, G.Tchobanoglous (1985):Environmental Enginering - McGraw- Hill Book Company,NewYork.

REFERENCE BOOKS :

1. **Environmental Considerations in Energy Development, Asian Development Bank (ADB), Manilla(1991)**

2.   H.Ludwig, W.Evans (1991): Manual of Environmental Technology in Developing   Countries, W.Y.

3.   Brockelman and B.N.Lohani, International Book Company, Absecon Highlands, N.J.

SECOND SEMESTER

2MTE1   ADVANCED INTERNAL COMBUSTION ENGINES
SECTION - A

SPARK IGNITION ENGINES

Spark ignition engine mixture requirements – Fuel – Injection systems – Monopoint, Multipoint injection, Direct injection – Stages of combustion – Normal and abnormal combustion – Factors affecting knock – Combustion chambers.

COMPRESSION IGNITION ENGINES

States of combustion in C.I. Engine – Direct and indirect injection systems – Combustion chambers – Fuel spray behaviour – Spray structure, Spray penetration and evaporation – Air motion – Introduction to Turbo charging.

SECTION - B

POLLUTANT FORMATION AND CONTROL

Pollutant – Sources – Formation of carbon monoxide, Unburnt hydrocarbon, NOx, Smoke and Particulate matter – Methods of controlling Emissions – Catalytic converters and Particulate Traps – Methods of measurements and Introduction to emission norms and Driving cycles.

ALTERNATIVE FUELS

Alcohol, Hydrogen, Natural Gas and Liquefied Petroleum Gas-Properties, Suitability, Merits and Demerits as fuels, Engine Modifications.

RECENT TRENDS

Lean Burn Engines – Stratified charge Engines – homogeneous charge compression ignition engines – Plasma Ignition – Measurement techniques – Laser Doppler, Anemometry.

TEXT BOOK :

1. K.K. Ramalingam, Internal Combustion Engine Fundamentals, Scitech Publications, 2002.
2. R.B.Mathur and R.P. Sharma, Internal combustion Engines.
3. V. Ganesan, Internal Combustion Engines, II Edition, Tata McGraw-Hill, 2002.

REFERENCE BOOKS :

1. Duffy Smith, Auto fuel Systems, The Good Heart Willox Company, Inc.
2. John B. Heywood, Internal Combustion Engine Fundamentals first edition
3. Willard W. Pulkrabek, engineering fundamentals of the Internal Combustion Engine second edition

2MTE2   ADVANCED REFRIGERATION ENGINEERING
SECTION – A

Review of Basic Refrigeration Cycles: Reverse Carnot Cycle, Second Law of Thermodynamics. Vapor Compres-sion Refrigeration. Standard and Actual Compression Cycle.

Multi Pressure Systems: Refrigeration Component Matching and System Integration, Thermodynamics of Va-por Absorption Refrigeration, Non Conventional Refrigeration Systems with elementary analysis.

SECTION - B

Properties of Refrigerants: Green House Effect, Numbering and Color Coding of Refrigerants, Recent Trends in Refrigerants. Air as refrigerant and air refrigeration cycles, Refrigerant Component Matching and Designing Refrigeration Components like Compressor, Condenser, Cap-illary, Condenser, Etc.

TEXT BOOKS :

1. Refrigeration and air conditioning, Ahmadul Ameen, Prentice Hall of India, New Delhi, 2006
2. Refrigeration and air conditioning, C P Arora, Tata McGraw-Hill, 2nd ed ,2003

REFERENCE BOOKS :

1. 1.Refrigeration and Air Conditioning Technology, Tomczyk, J. A., Whitman, W. C., Johnson, W. M., Pub: Delmar S.Africa, 4th edition, 2000.
2. 2.Electricity For Refrigeration, Heating, and Air Conditioning, Russell E. Smith, Delmar Cengage Learning; 7th edition, 2006
3. The ASHRAE Handbooks with CDs, 2005-2008.

2MTE3 RESEARCH METHODOLOGY
SECTION – A

Research Concept: Concept, meaning, objectives, motivation; Types of research, approaches (descriptive research, conceptual, theoretical, applied and experimental research)

Formulation of Research Task: Literature Review: importance & methods, sources, field study, laboratory experiments, critical analysis of already generated facts, hypothetical proposal for future development and testing, selection of research task, prioritization of research, introduction to hypothesis testing.

Mathematical Modeling and Simulation: Concept of modeling, classification of mathematical models, modeling with ordinary differential equations, differential equations, partial differential equations, graphs. Simulation concept, types (quantitative, experimental, computer, statistical), process of formulation of model based on simulation.

Experimental Modeling: Definition of experimental design, examples, single factor experiments, guidelines for designing experiments.

SECTION - B

General model of process: Input factors/variables, Output parameters/ variables, controllable/ uncontrollable variables, dependent/independent variables, compounding variables, extraneous variables and experimental validity.

Process optimization and designed experiments: methods for study of response surface, First order design. Determining optimum combination of factors, determination of steepest ascent, Taguchi approach to parameter design.

Analysis of Results (Parametric and Non parametric, Descriptive and Inferential Data): types of data, Methods and techniques of data collection, sampling and sample design, Non parametric test, error analysis, analysis of variance, significance of variance, analysis of co-variance, multiple regression, Introduction to Analytical hierarchical process, Factor analysis, Cluster analysis, Fuzzy logic, testing linearity/ non linearity of model, testing adequacy of model.

Report Writing: types of report, layout of research report, interpretation of results, layout and format, style of writing, typing, references, pagination, tables, figures, conclusions, appendices.

Landscape of Creativity: Convergent Vs. divergent thinking, creativity, creativity Vs intelligence, creativity abilities, determination of Creativity, increasing creativity, creative achievement, techniques of creativity, collective creativity.

TEXT BOOKS :
1. Research in Education, John W Besr & James V Kahn, Prentice HalI of India, New Delhi.
2. Theories of Engineering Experiments, Schank Fr, Tata McGraw Hill Publishing Ltd., New Delhi.
3. Experimental design by Cochran & Cocks, John Wielly & sons, New Delhi, 2005.

REFERENCE BOOKS :
1. Research Methodology, C R Kothari, Wiley Eastern publishers, New Delhi, 10th edition, 2006.
2. Design of Experiments, Douglas Montgomary, 1995.
3. Formulation of Hypothesis, Willkinson K, P L Bhandarkar, Himalaya Publishing House, Mumbai, 2005.

ELECTIVE – II
2MTE4 (1) HEAT EXCHANGER DESIGN
SECTION-A

Constructional Details And Heat Transfer
Types - Shell and Tube Heat Exchangers - Regenerators and Recuperators - Industrial Applications Temperature Distribution and its Implications - LMTD – Effectiveness.

Flow Distribution And Stress Analysis
Effect of Turbulence - Friction Factor - Pressure Loss - Channel Divergence Stresses in Tubes - Heater sheets and Pressure Vessels - Thermal Stresses - Shear Stresses - Types of Failures.

SECTION-B

Design Aspects
Heat Transfer and Pressure Loss - Flow Configuration - Effect of Baffles - Effect of Deviations from Ideality - Design of Typical Liquid - Gas-Gas-Liquid Heat Exchangers

Condensers And Evaporators Design
Design of Surface and Evaporative Condensors - Design of Shell and Tube - Plate Type Evaporators

Cooling Towers
Packings - Spray Design - Selection of Pumps - Fans and Pipes - Testing and Maintenance – Experimental Methods.

TEXT BOOKS :

1. Fundamentals of Heat Exchanger Design by Ramesh K. Shah, Dusan P Sekulic, 1st edition, Wiley, 2002.

2. Process Heat Transfer by D.Q. Kern, Tata McGraw Hill Publication, 1999.

3. Mechanical design of hear exchanger design & Pressure vessel component, by Sing K.P. A. I.; Arcturus Publishers Cherry Hill, 2006.

REFERENCE BOOKS :

1. Heat Exchanger Design by Frass & Ozisik, John Wiley and Sons, Newyork, 1997.

2. Convective Heat transfer by Kays and London, Tata McGraw Hill Publication, 1997.

3. ANSI Standards for pipe and nozzle selection, 1996.

4. ASME Section VIII Division for pressure Vessel and Boiler Design Code, 1995.

5. ASME section II, Material Specifications, 1995.

ELECTIVE – II

2MTE4 (2) ADVANCED AIR CONDITIONING SYSTEMS

SECTION - A

Properties of Air Water Mixture, Psychometric Air Conditioning Processes, Dehumidification Processes, Com-fort Air Conditioning, Parameters Affects Comfort Conditions, Cooling Load Calculations, Design Of Air Delivery Sys-tem To Hospital, Auditorium, Hotels Etc., Noise And Vibration Control In Air Conditioning Hall.

SECTION - B

Air Conditioning Component Selection (Component Matching), Designing Air Ducts, Window Air Conditioner / Split Air Conditioner Performance Testing, Energy calculations- Degree-Day procedure, Bin Method, Comprehensive Simulation methods method, Flow- Pump - and piping Design.

Electrical Circuits And Components In Air Conditioner Like Olp, Capacitor, Performance Study Of Motors Used For Fan, Blower, Compressor,

TEXT BOOKS :

1. Refrigeration and air conditioning, Ahmadul Ameen, Prentice Hall of India, New Delhi, 2006

2. Refrigeration and air conditioning, C P Arora, Tata McGraw-Hill, 2nd ed, 2003

3. Air Conditioning Principles and Systems, E G Pita, Prentice Hall of India, 4th edition, 2005.

REFERENCE BOOKS :

1. The ASHRAE Handbooks with CDs, 2005-2008

2. Refrigeration and Air Conditioning Technology, Tomczyk, J. A., Whitman, W. C., Johnson, W. M., Pub: Delmar S. Africa, 4th edition, 2000.

ELECTIVE -II

2MTE4 (3) FINITE ELEMENT METHODS

SECTION - A

Introduction

Overview of numerical methods - Discretised representation of physical systems - thermal resistance, flow resistance networks, thermal capacitance - Governing equations and Boundary conditions for thermal and flow systems.

One Dimentional Heat Conduction

Principles of variations calculus - applications of vibrational approach to one dimensional heat conduction -element matrix contribution and assembly.

Heat Functions And Analysis

Weighted residual methods - Galerkin's approach - Shape functions and interpolations - Application of Galerkin's weighted residual approach to one dimensional heat conduction - Three nodded triangular elements, 2 D steady state, state conduction using triangular elements - Radiation and natural convective boundary conditions - incorporation of variations in thermal properties.

SECTION - B

Convective Heat Transfer

Higher order elements and numerical integration solution of heat conduction and creeping flow using higher order element - Solution of convective heat transfer.

Heat Exchanger Applications

Incompressible laminar flow simulation - Stream function/Vorticity methods,Velocity Pressure formulation, mixed order interpolation for incompressible flow,modifications for turbulent flow. Application to heat exchanger.

Software Codes

Description of programs for heat conduction, fluid flow,Assignment problems using these codes.

TEXT BOOKS :

1. The Finite Element Method in Engg., 2nd ed. S.S.Rao Pergamon Press, 1990.

2. Applied Finite Element Analysis, 2nd ed, Larry Segerlind John Wiley & Sons, 1988.

3. Finite Element Analysis Theory and Programming 2nd ed, C.S.Krishnamoorthy, Tata mcgraw-Hill 1991.

4. Finite Elements Methods, J.N.Reddy, mcgraw-Hill 1988.

5. Finite Element Methods O.C.Zienkiewiez, mcgraw-Hill 1980.

6. Introduction to Finite Elements in Engg., T.R.Chandrapatla and Belegundu, Prentice Hall of India.

7. Finite Element Computational Fluid Mechanics - A.J.Baker, mcgraw-Hill.

ELECTIVE-II
2MTE4   (4) GAS TURBINES & JET PROPULSION

SECTION - A

General Concepts related to Turbo machinery: Classification; Euler's Equation for Turbo machinery; Velocity triangle; Cascade analysis & nomenclature. Shaft Power & Aircraft Propulsion Cycles.

Centrifugal Compressors: Work done and pressure rise; Slip; Compressibility effects; Compressor characteris-tics. Axial Flow Compressors: Stage pressure rise; Blockage in compressor annulus; Degree of reaction; 3- D flow; Stage performance; h-s diagram & efficiency; off design performance; Performance characteristics; Design process. Combus-tion System.

Axial Flow Turbines: Stage performance; Degree of reaction; h-s diagram & efficiency; Vortex theory; Overall turbine performance; Performance characteristics; Blade cooling; Design process. Prediction of performance of simple gas turbines; Off Design performance; Gas turbine blade materials; matching procedure.

Combined cycles: Differences between Single and combined Cycles, characteristics of combined cycles, Performance calculations for Combined Cycle.

SECTION - B

Thermodynamics Of Aircraft Jet Engines
Theory of Jet Propulsion - Thrust and efficiency - Ram Jet - Turbojet and Turbofan engines - Turboprop and Turboshaft Engines - Thrust augmentations - Typical engine performance - Engine - Aircraft matching.

Aero-Thermodynamics Of Jet Propulsion Subsystems
Subsonic inlets - Supersonic inlets - Gas turbine combustors - After burners and Ramjet Combustors -Supersonic Combustion - Exhaust Nozzles.

TEXT BOOKS :

1. Philip G. Hill and Carl R. Peterson, Mechanics and Thermodynamics of Propulsion, Second Edition,

2. Bonney E.A. Zucrow N.J. Principles of Guided Missile Design, Van Nostranc Co., 1985.

3. S.M. Yahya, Gas Dynamics and Jet Propulsion.

REFERENCE BOOKS :

1. Addition - Wesley Publishing Company, New York, 1992.

2. Zucrow N.J. Principles of Jet Propulsion and Gas Turbines, John Wiley and Sons Inc, New York, 1970.

3. Zucrow N.J. Aircraft and Missile Propulsion, Vol.I and Vol.II, John Wiley and Sons Inc, New York, 1975.

ELECTIVE -III
2MTE5   (1) FUEL & COMBUSTION

SECTION - A

Introduction
General, Conventional Energy Sources, Solar Energy, Nuclear Power, Energy from Biomass, Wind Power, Tidal Power, Geothermal Energy, Energy Survey of India, Rocket Fuels

Solid, Liquid & Gaseous Fuels
General, Family of Coal, Origin of Coal, Gasification of Coal, Analysis and Properties of Coal, Action of Heat on Coal, Classification of Coal, Oxidation of Coal, Hydrogenation of Coal, Efficient use of Solid Fuels. Manufactured Fuels, Agro Fuels, Solid Fuel Handling, Properties Related to Combustion, Handling Storage

Theory Of Combustion Process
Origin and Classification of Petroleum, Refining and Other Conversion Processes, Composition of Petroleum with respect to Combustion, Property & Testing of Petroleum Products, Various Petroleum Products, Nature of Indian Crudes & Petroleum Refining in India, Liquid Fuels from Other Sources, Storage and Handling of Liquid Fuels, Liquid Fuels Combustion Equipment. Types of Gaseous Fuels, Natural Gases, Methane from Coal Mines, Manufactured Gases, Producer Gas, Water Gas, Carburetted Water Gas, Blast Furnace Gas Fuels, Through Non-Thermal Route - Biogas, Refinery Gas, LPG, Cleaning and Purification of Gaseous Fuels.

SECTION - B

Stoichiometry
Stoichiometry and Thermodynamics, Combustion Stoichiometry General, Rapid Methods of Combustion
Stoichiometry, Combustion Thermodynamics, Problem, Combustion Problems with Chemical Reactions Burners Stoichiometry Relations, Theoretical Air Required for Complete Combustion, Calculation of Minimum Amount of Air Required for a Fuel of known Composition, Calculation of Dry Flue Gases if Fuel Composition is Known, Calculation of the Composition of Fuel & Excess Air Supplied,from Exhaust Gas Analysis, Dew Point of Products, Flue Gas Analysis (O_2, CO_2, CO, NO_x, SO_x).

Burner Design
Ignition, Concept of Ignition, Auto Ignition, Ignition Temperature. Flame Propagation, Various Methods of Flame Stabilization, Incorporation in Burner Design, Basic Features and Types of Solid, Liquid and Gaseous Fuel Burner, Design Consideration of Different Types of Coal - Oil and Gas Burners, Recuperative & Regenerative Burners

TEXT BOOKS :
1. Samir Sarkar, Fuels & Combustion, 2nd Edition, Orient Longman, 1990
2. Bhatt ,vora Stoichiometry, 2nd Edition, Tata Mcgraw Hill, 1984
3.. Sharma SP, Mohan Chander, Fuels & Combustion, Tata Mcgraw Hill, 1984

REFERENCE BOOKS :
1. Blokh AG, Heat Transfer in Steam Boiler Furnace, Hemisphere Publishing Corpn, 1988
2. Civil Davies, Calculations in Furnace Technology, Pergamon Press, Oxford, 1966
    Websites:
    http ://shop.ieee.org.
    http ://opus.utah.edu
    http ://www.creada..org

ELECTIVE-lll
2MTE5 (2) SOLAR ENERGY
SECTION -A

Radiative Properties and Characteristics of Materials
Reflection from ideal specular, ideal diffuse and real surfaces, Selective Surfaces: Ideal coating characteristics; Types and applications; Anti-

reflective coating; Preparation and characterization. Reflecting Surfaces and transparent materials.

Solar Thermal Energy Storage
Types: Sensible storage; Latent heat storage; Thermo-chemical storage. Design of storage System. Solar Thermal Energy system: Solar still; Solar cooker: Solar pond; Solar passive heating and cooling systems: Trombe wall; Greenhouse technology: Fundamentals, design, modeling and applications.

PHOTOVOLTAIC SOLAR CELL
P:N Junction - Metal - Schottky Junction, Electrolyte - Semiconductor Junction, Types of Solar Cells - their Applications - Experimental Techniques to determine the Characteristics of Solar Cells - Photovoltaic Hybrid Systems Photovoltaic Thermal Systems – Storage Battery - Solar Array and their Characteristics Evaluation - Solar Chargeable Battery.

Solar Energy for Industrial Process Heat
Industrial process heat: Temperature requirements, consumption pattern; Applications of solar flat plate water heater & air heater for industrial process heat; Designing thermal storage; Transport of energy.

SECTION-B

Solar Heating & Cooling System
Solar water heating systems, Liquid based systems for buildings, Solar air heating systems, Methods of modeling and design of Solar heating system, Cooling requirements of buildings, Vapour absorption refrigeration cycle; Water, ammonia & lithium bromide-water absorption refrigeration systems; Solar desiccant cooling.

Performances of solar collectors
ASHRAE code; Modeling of solar thermal system components and simulation; Design and sizing of solar heating systems: f – chart method and utilizability methods of solar thermal system evaluation; Development of computer package for solar heating and cooling applications;

Flat-plate Collectors
Energy balance for Flat Plate Collectors; Thermal analysis; Heat capacity effect; Testing methods; Types of Flat Plate Collectors: Liquid Flat Plate Collectors, Air flat-plate Collectors- Thermal analysis; Evacuated tubular collectors.

Concentrating Collector Designs
Classification, design and performance parameters; Tracking systems; Compound parabolic concentrators; Parabolic trough concentrators; Concentrators with point focus; Heliostats; Comparison of various designs: Central receiver systems, parabolic trough systems; Solar power plant; Solar furnaces

TEXT BOOKS :

1. S.P.Sukhatme-Solar Energy: principles of Thermal Collection and Storage, Tata McGraw-Hill
2. J.A.Duffie and W.A.Beckman-Solar Engineering of Thermal Processes-John Wiley, (1991).

REFERENCE BOOKS :

J.F.Kreider and F.Kreith-Solar Energy Handbook McGraw-Hill (1981).

ELECTIVE-III
2MTE5 (3) MECHATRONICS
SECTION - A

Introduction: Scope, sensors, transducers, selection, contact & non contact optical types, performance, examples.

Actuators : Principal, types-hydraulic, pneumatic, electrical, contact speed,multispeed, step and continuous variable, actuators with stepping motors.

Computer process controls : Computer process interface, interface hardware, direct digital control, supervisory computer control.

Design of mechatronics elements: Measuring system, control software and user interface, gauging, tool monitoring system, spindle drives, feed drives, servo principles, configuration CNC systems, interfacing, monitoring, diagnostics.
Automatic loading and unloading devices, magazines, bunkers, orientors, feeders, separators, etc.

SECTION - B

Pneumatic systems: Different control components of pneumatic systems and there conversion valves, auxiliary devices, synchronizing, clamping, declamping, application to robotics.

Hydraulic systems: Different control components of hydraulic systems, valves and auxiliary devices, design and analysis of hydraulic circuits sequencing, synchronizing, pneumo-hydraulic, CNC lubrication, machine tool applications.

TEXT BOOKS :

1. Industrial Automation by Turgam, Mir Publication.
2. Pneumatics and Hydraulics by Stewar

REFERENCE BOOKS :

1. Mechatronics by HMT
2. Introduction to Mechatronics and Measurment Systems by Michal B. Histand & David G. Aiciatore.

ELECTIVE -III
2MTE5 (4) COMPUTATIONAL FLUID DYNAMICS
SECTION – A

Review of Governing Equations: Governing Equations of Fluid flow and heat transfer, review of numerical methods.

Discretization: Introduction to finite differences, difference equations, explicit and implicit approaches: definition and contrasts, errors and analysis of stability.

Classification of Partial Differential Equations: Explicit and Implicit methods, solution of select model equations; Laplace heat and wave equation, laminar boundary layer solution

SECTION - B

CFD Techniques: The lax -wendroff technique, Mac Cormack's technique, Relaxation technique and its use with low speed inviscid flows, aspects of numerical dissipation and dispersion; artificial viscosity, Alternating Direction Implicit (ADI) technique, pressure correction technique with application to incompressible viscous flow.

Initial And Boundary Value Problems: Free falling of a spherical body, two dimensional motions of a body through a fluid radial flow.

TEXT BOOKS :

1. Computational Fluid Flow and Heat Transfer, Muralidhar, K. and Sundararajan, T., Narosa Pub., 2004.
2. Computational Fluid Dynamics: The Basics with Applications, Anderson, J. D., Jr. McGraw Hill, 2002.
3. Computational Fluid Dynamics: An Introduction for Engineers, Abbot, M. B. and Basco, D. R., John Wiley & Sons, 2006.
4. Computational Fluid Dynamics: Principles and Applications, Blazek, J., Elsevier Science, 2001.

THIRD SEMESTER
3 MTES Seminar & Dissertation

FOURTH SEMESTER
4MTEP Seminar & Dissertation
As per given scheme

*****

SYLLABUS PRESCRIBED FOR
TWO YEAR P.G. COURSE IN
MASTER OF ENGINEERING (FULL TIME)
MECHANICAL ENGINEERING (ADVANCED MANUFACTURING
& MECHANICAL SYSTEMS DESIGN)

SEMESTER-I

1MMD1 ADVANCED MANUFACTURING PROCESSES

SECTION - A

Advance machining theory: mechanics of chip formation, shear angle relations, and theoretical determination of cutting force in orthogonal cutting, analysis of turning, drilling, and milling operations. Mechanics of grinding, dynamometry, thermal aspects of machining, tool life and tool wear, economics of machining.

NC/CNC: basic concept, NC control, special features of CNC machine: turret head, tool magazine, servomotors, ball lead screw, automatic tool changer (ATC), and classification of CNC machines, cutting tool and tool holders, point to point, straight cut and continues path, control codes, machine control units, closed system, NC, machine components, CNC, DNC, Manual part programming, formats, coding, programming languages. APT, ADAPR, EXAPT etc. sensors and adaptive control, Manual part programming for drilling, milling and lathe, examples in APT. applications and economics of CNC.

Metal casting: Metal casting processes, pattern and mould, moulding materials, elements of gating system design, riser design, solidification structure, solidification shrinkage structure, defects and properties of finished casting, heat treatment.

SECTION - B

Welding process, heat flow in welding, metallurgy of fusion weld, welding stresses and distortions, preheat and post weld heat treatment weld ability tests, weld defects, weld inspection and quality control. Electron beam welding, ultrasonic welding, laser beam welding.

Metal forming: Nature of plastic deformation, fundamentals of plasticity, mechanics of metal forming processes like rolling, forging, drawing, extrusion etc. various forming operations, defects in metal forming, local instability and tearing, bending of sheets, hydro forming. Electro magnetic forming, explosive forming, electro hydraulic forming, stretch forming, contour roll forming.

Unconventional machining process: parametric study, applications and fundamentals of Ultrasonic Machining USM, Abrasive Jet Machining AJM, Water Jet Machining WJM, Abrasive Water Jet Machining AWJM, Electro- chemical Machining ECM, Electro Discharge Machining EDM, Electron Beam Machining EBM, Laser Beam Machining LBM.

Books Recommended:
TEXT BOOKS:
1. Juneja, Fundamentals of metal cutting
2. A. Ghosh, and A. K. Mallik, Affiliated East-West Press Pvt. Ltd. New Delhi "Manufacturing Science"

REFERENCE BOOKS:
1. Arshinov, Metal cutting theory & cutting tool design
2. Mikhal Groover, CAD/CAM
3. N. K. Mehta, Machine tool design
4. E. P. DeGarmo, J. T Black, R. A. Kohser, Prentice Hall of India, New Delhi (ISBN 0-02-
5. 978760) "Materials and Processes in Manufacturing" (8th Edition), ,
6. G.F. Benedict, Marcel Dekker, Inc. New York (ISBN 0-8247-7352-7) "Nontraditional Manufacturing Processes".

1MMD2   ADVANCED MACHINE DESIGN
SECTION-A

Introduction: Role of failure prevention analysis in mechanical design, Modes of mechanical failure, Review of failure theories for ductile and brittle materials including Mohr's theory and modified Mohr's theory, Numerical examples.

Fatigue of Materials: Introductory concepts, High cycle and low cycle fatigue, Fatigue design models, Fatigue design methods, Fatigue design criteria, Fatigue testing, Test methods and standard test specimens, Fatigue fracture surfaces and macroscopic features, Fatigue mechanisms and microscopic features.

Stess-Life (S-N) Approach: S- N curves, Statistical nature of fatigue test data, General S-N behavior, Mean stress effects, Different factors influencing S-N behaviour, S-N curve representation and approximations, Constant life diagrams, Fatigue life estimation using S-N approach.

Strain-Life(-N)approach: Monotonic stress-strain behavior ,Strain controlled test methods ,Cyclic stress-strain behavior, Strain based approach to life estimation, Determination of strain life fatigue properties, Mean stress effects, Effect of surface finish, Life estimation by N approach.

SECTION-B

LEFM Approach: LEFM concepts, Crack tip plastic zone, Fracture toughness, Fatigue crack growth, Mean stress effects, Crack growth life estimation.

Statistical Aspects of Fatigue: Definitions and quantification of data scatter, Probability distributions, Tolerance limits, Regression analysis of fatigue data, Reliability analysis, Problems using the Weibull distribution.

Fatigue from Variable Amplitude Loading: Spectrum loads and cumulative damage, Damage quantification and concepts of damage fraction and accumulation, Cumulative damage theories, Load interaction and sequence effects, Cycle counting methods, Life estimation using stress life approach.

Surface Failure: Introduction, Surface geometry, Mating surface, Friction, Adhesive wear, Abrasive wear, Corrosion wear, Surface fatigue spherical contact, Cylindrical contact, General contact, Dynamic contact stresses, Surface fatigue strength.

Books Recommended:
TEXT BOOKS:
1. Robert L. Norton, Pearson: "Machine Design"
2. S. Suresh: "Fatigue of Materials" - Press, Cambridge, U.K.

REFERENCE BOOKS:
1. Jack. A. Collins, John Wiley, Newyork: "Failure of Materials in Mechanical Design"- 1992.
2. Julie. A. Benantine: "Fundamentals of Metal Fatigue Analysis"- Prentice Hall,1990
3. ASM Hand Book: "Fatigue and Fracture"- Vol. 19, 2002.
4. Ralph I. Stephens, Ali Fatemi, Robert .R. Stephens, Henry Fuchs, John: "Metal Fatigue in Engineering"- Wiley Newyork, Second edition. 2001.

1MMD3   COMPUTER AIDED DESIGN AND ENGINEERING
SECTION - A

CAD – Introduction, typical Product Cycle, Implementation of a typical CAD process, Application of CAD and their Advantages
3D modeling and viewing: Introduction, Modeling Approaches, Types of Geometric Models, Coordinate System, sketching and Sketch Planes,

Parameters and Dimensions, Basic Features, Datum Features, Geometric Constraints, Modeling Operations and Strategies

Modeling Aids and Tools: Introduction, Geometric Modifiers, Layers, Colors, Grids, Groups, Dragging and Rubbering, Clipping, Entity Selection methods, Geometric Arrays, Transformations, Editing.

Geometric Modeling: Types of Curves and Curve Manipulations, Types of Surfaces and Surface Manipulations, Solids: Introduction, Geometry and Topology, Solid Entities, Fundamentals of Solid Modeling, Boundary Representation (B-rep), Constructive Solid Geometry (CSG) examples, Sweeps and Solid Manipulations, Feature based Modeling: Introduction, Feature Entities, Parametrics, Feature Manipulations

CAD/CAM Data exchange and data storage: Introduction, graphics and computing standards, data exchange standards like IGES, STEP

Assembly Modeling: Introduction, Assembly Modeling, Assembly Tree, Assembly Planning, Mating Conditions, Bottom – Up and Top – Down Assembly Approaches with examples, Tolerance Analysis and Mass Property calculations

SECTION - B

Review of One Dimensional FEM: FEM Methodology – Modeling and discretization Interpolation, elements, nodes and degrees-of-freedom-applications of FEA. One-Dimensional Elements: Bar element – truss element – assembly of elements – properties of stiffness matrices-boundary conditions-solution of equations-mechanical loads and stresses-thermal loads and stresses-example problems.

Review of Two and Three Dimensional FEM: Interpolation and shape functions - element matrices-linear triangular elements (CST)-quadratic triangular elements – bilinear rectangular elements solid elements-higher order elements – stress calculations.

Applications to Field Problems: Solution to problems in linear elasticity- plane problems in elasticity- plates and shells- solution of problems in heat-transfer and fluid mechanics- numerical examples-discussion on error estimates

Books Recommended:
TEXT BOOKS:
1. Ibrahim Zeid, Matering CAD/CAM, Tata McGraw Hill Publishing Co. Ltd., New Delhi.

2. Chandrupatla & Belagundu, Finite Elements in Engineering, Prentice Hall of India Private Ltd., 1997.

REFERENCE BOOKS:

1. P. N. Rao, CAD/CAM, Prentice Hill, International

2. Daryl L. Logan, A first course in the Finite Element Method, Fourth edition, Thomson

3. Ibrahim Zeid, CAD/CAM – Theory and Practice, MGH International

4. Mikell P Groover and Emory W Zimmers Jr., CAD/CAM – Computer Aided Design and Manufacturing, Prentice Hill, International

5. P. Radhakrishnan, S. Subramanayan and V.Raju, CAD/CAM/CIM, New Age International (P) Ltd., New Delhi.

6. Rogers, D.F. and Adams, A., Mathematical Elements for Computer Graphics, McGraw Hill Inc, NY, 1989

7. Cook, Robert Davis et al "Concepts and Applications of Finite Element Analysis ", Wiley, John & Sons, 1999.

8. Bathe, K.J., Finite Element Procedures in Engineering Analysis, 1990.

9. S. S. Rao, Finite Element Analysis, 2002 Edition.

10. David V Hutton, Fundamentals of Finite Element Analysis, McGraw-Hill International Edition, 2004.

1MMD4   DESIGN OF MATERIAL HANDLING EQUIPMENTS

SECTION-A

Introduction: Transmission and its requirements. Matching of load and prime mover. Types of material equipment's – Characteristics applications selection of the system.

Design Of Hoists: Design of hosting elements – ropes, chains, pulleys, sheaves, hoists of different types. **Design Of Elevators**: Types – Design of chair and bucket elevators – belt and bucket elevators - discharges.

SECTION-B

Design Of Conveyors: Types of conveyors – design of belt, pneumatic, hydraulic, screw and vibratory conveyors – selection of the conveyors.

Selection Of Drives: Types of drives – rails traveling mechanism – slewing with rotary pillar, fixed pillar and turn tablets – traveling gear. Selection of

Grabbing Attachments: Cranes grabs – grabbing attachments for loose pieces – lifting magnets grab buckets and liquid handling buckets. Design of Arresting Mechanism: Brakes – Shoes, Band, cone disc and Centrifugal types.

Books Recommended:

TEXT BOOKS:

1. Spivakovsky, A. & Dychnov, V.K., "Conveying Machines Volumes I & II", MIR Publishers Moscow.

2. Rudenko, N., "Material Handling Equipments", MIR Publishers, Moscow

REFERENCE BOOKS:

1. Boltz, Hord, A., "Material Handling Handbook ", The Ronald Press CO.

2. V. Dobrovolsky et. al, "Design of Machine Elements", MIR Publishers

3. Spivakovsky, F. and Dyachkov, V.,"Conveyours and Related Equipments". MIR Pulishers, Moscow.

4. Duglas, R WOODLEY, "Encyclopaedia of Materials Handling – Vol 1 Pregmen.

5. Hudson Wilbur, G., "Conveyors and Related Equipments ", Join Wiley and Sons.

6. M. F. Spotts and T. E. Shoup, " Design of Machine Elements", PHI

7. J.E.Shiegley, "Mechanical Engg Design", Mc-Graw Hill Book Co

8. D.N. Reshetov, "Machine Design", MIR Publishers.

1MMD5   ELECTIVE-I
(1) RELIABILITY, MAINTENANCE MANAGEMENT & SAFETY

SECTION-A

Reliability Engineering: System reliability - series, parallel and mixed configuration, Block diagram, r-out-of-n structure,Solving problems using mathematical models. Reliability improvement and allocation-Difficulty in achieving reliability,Method of improving reliability during design, different techniques available to improve reliability, Optimization, Reliability – Cost trade off, Prediction and analysis, Problems.

Maintainability, Availability & Failure Analysis: Maintainability & Availability – Introduction, formulae, Techniques available to improve

maintainability & availability, trade off among reliability, maintainability & availability, simple problems, Defect generation – Types of failures, defects reporting and recording, Defect analysis, Failure analysis, Equipment down time analysis, Breakdown analysis, TA, FMEA, FMECA.

Maintenance Planning and Replacement: Maintenance planning – Overhaul and repair; Meaning and difference,Optimal overhaul/Repair/ Replace maintenance policy for equipment subject to breakdown, Replacement decisions –Optimal interval between preventive replacements of equipment subject to breakdown, group replacement.

SECTION-B

Maintenance Systems: Fixed time maintenance, Condition based maintenance, Operate to failure, Opportunity maintenance, design out maintenance, Total productive maintenance, Inspection decision – Optimal inspection frequency, non-destructive inspection, PERT & CPM in maintenance, Concept of terrotechnology.

Condition Monitoring: Techniques-visual monitoring, temperature monitoring, vibration monitoring, lubricant monitoring, Crack monitoring, Thickness monitoring, Noise and sound monitoring, Condition monitoring of hydraulic system, Machine diagnostics - Objectives, Monitoring strategies, Examples of monitoring and diagnosis, Control structure for machine diagnosis.

Safety Aspects: Importance of safety, Factors affecting safety, Safety aspects of site and plant, Hazards of commercial chemical reaction and operation, Instruments for safe operation, Safety education and training, Personnel safety, Disaster planning and measuring safety effectiveness, Future trends in industrial safety.

Books Recommended:
TEXT BOOKS :
1. Concepts in Reliability Engineering L.S. Srinath Affiliated East West Press
2. Maintainability and Reliability Handbook Editors: Ireson W.A. and C.F. Coombs McGraw Hill Inc.

REFERENCE BOOKS:
1. Failure Diagnosis and Performance Monitoring L.F. Pau Marcel Dekker
2. Industrial Maintenance Management S.K. Srivastava S. Chand & Co Ltd.
3. Management of Industrial Maintenance Kelly and M.J. Harris Butterworth and Co.

4. Maintenance, Replacement and Reliability A.K.S. Jardine Pitman Publishing
5. Engineering Maintainability: How to Design for Reliability and Easy Maintenance B.S. Dhillon Prentice Hall of India

1MMD5 ELECTIVE-I
(2) NEW PRODUCT DESIGN
SECTION - A

Introduction: Types of design, importance of design, design considerations, product life cycle, technology life cycle, benchmarking and mass customisation, stages, objectives, success factors, concurrent approach in NPD

Product Development Process & Methodologies: Integrated Product development process - *Identifying Customer Needs***:** Gather raw data from customers, interpret raw data in terms of customer needs, organize the needs into a hierarchy, establish the relative importance of the needs and reflect on the results and the process, *Conceive* – Specification, Concept design: the activities of concept generation, Concept Selection**:** Overview of methodology, concept screening, and concept scoring, *Design* - Detailed design, Validation and analysis (simulation), Tool design, *Realize* - Plan manufacturing: Factors influencing material and process selection, approaches, tools and software used in selection, Manufacture, Build/ Assemble, Test (quality check), *Service* - Sell and Deliver, Use, *Maintain and Support*, *Dispose*

Product Development Approaches: Bottom-up design, Top-down design, Front-loading design workflow, Design in context, Modular design. Concurrent engineering, partnership with supplier, collaborative and Internet based design, work structuring and team deployment, Product and process systemization, problem, identification and solving methodologies, improving product development solutions

SECTION - B

Prototyping: Prototyping basics, principles of prototyping, technologies, planning for prototypes, practical examples

Design Analysis Tools: Product Reliability, Mortality Curve. Design for Manufacturing: machining, casting, forging and metal forming, optimum design, Design for Assembly and Disassembly, Design for Six Sigma, Design for reliability, Design for product life cycle Deign for maintainability and serviceability, Design for environment, Design for aesthetic, Design for packaging, Design for handling, Design for safety, etc., Estimation of Manufacturing costs, Reducing the component costs and assembly costs, Minimize system complexity.

Probabilistic Design Concepts: FMEA, QFD, Taguchi Method for design of experiments, Estimation of Manufacturing costs, Reducing the component costs and assembly costs, Minimize system complexity.

Books Recommended:

TEXT BOOKS:

1. Dieter George E., Engineering Design, McGraw Hill Pub. Company, 2000.
2. Chitale A. K. and Gupta R. C., Product Design and Manufacture, Prentice-Hall of India, New Delhi.

REFERENCE BOOKS:

1. Ulrich Karl T and Eppinger Steven D., Product design and development, McGraw Hill Pub. Company, 1995.
2. Bralla, James G., Handbook of Product Design for Manufacturing, McGraw Hill Pub. 1986

1MMD5   ELECTIVE-I
(3) LEAN MANUFACTURING
SECTION -A

Introduction: Introduction, background, and lean thinking. Importances of philosophy, strategy, culture, alignment, focus and systems view.

Toyota Production System: Discussion of Toyota Production System. Lean production preparation – System assessment, process and value-stream mapping – Sources of waste.

Lean production processes: Lean production processes, approaches and techniques.—Importance of focusing upon flow. Tools include: Workplace organization, Stability. Just-In-Time – One piece flow – Pull.

SECTION -B

Cellular systems: Cellular systems, Quick change and set-up reduction methods.

Total productive maintenance: Total productive maintenance, Poka-Yoke – mistake proofing, quality improvement. Visual management. Startup of lean processes, examples and applications.

Sustaining improvement: Sustaining improvement and change, auditing, follow-up actions

Books Recommended:

TEXT BOOKS:

1. N. Gopalkrishnan, Simplified Lean Manufacture, PHI Learning Private Limited. New Delhi

2. B.S Nagendra Parashar, Cellular Manufacturing system: An integrated approach, PHI Learning Private Limited. New Delhi

REFERENCES BOOKS:

1. William M. Feld , Lean Manufacturing: Tools, Techniques, and How to Use Them ,The st Lucie Press.
2. Lonnie Wilson, How To Implement Lean Manufacturing: by McGraw Hill, August 2009.
3. Walter W Mc Intyre, Lean and Mean Process Improvement:
4. Dale H. Besterfield, Total Quality Management, Pearson Educations.

1MMD5   ELECTIVE-I
(4) DESIGN FOR MANUFACTURING AND ASSEMBLY
SECTION – A

Introduction: Design philosophy steps in Design process , General Design rules for manufacturability , basic principles of design Ling for economical production , creativity in design. Materials: Selection of Materials for design Developments in Material technology , criteria for material selection , Material selection interrelationship with process selection process selection charts.

Machining process: Overview of various machining processes , general design rules for machining - Dimensional tolerance and surface roughness , Design for machining , Ease ,Redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.

Metal casting: Appraisal of various casting processes, selection of casting process, - general design considerations for casting , casting tolerances , use of solidification simulation in casting design , product design rules for sand casting.

SECTION – B

Metal joining: Appraisal of various welding processes, Factors in design of elements, general design guidelines , pre and post treatment of welds , effects of thermal stresses in weld joints , design of brazed joints. Forging, Design factors for Forging , Closed die forging design , parting lines of die5 drop forging die design , general design recommendations. Extrusion & Sheet Metal Work: Design guidelines for extruded sections - design principles for Punching, Blanking, Bending, Deep Drawing, Keeler Goodman Forming Line Diagram, and Component Design for Blanking.

Assemble advantages: Development of the assemble process, choice of assemble method assemble advantages social effects of automation.

Automatic assembly transfer systems: Continuous transfer, intermittent transfer, indexing mechanisms, and operator - paced free – transfer machine.

Design of manual assembly: Design for assembly fits in the design process, general design guidelines for manual assembly, development of the systematic DFA methodology, assembly efficiency, classification system for manual handling, classification system for manual insertion and fastening, effect of part symmetry on handling time, effect of part thickness and size on handling time, effect of weight on handling time, parts requiring two hands for manipulation, effects of combinations of factors, effect of symmetry effect of chamfer design on insertion operations, estimation of insertion time.

Books Recommended:

TEXT BOOKS:

1. Geoffrey Boothroyd, "Assembly Automation and Product Design", Marcel Dekker Inc., NY, 1992.

2. Geoffrey Boothroyd, "Hand Book of Product Design" Marcel and Dekken, N.Y. 1990.

REFERENCE BOOKS:

1. Engineering Design – Material & Processing Approach – George E. Deiter, McGraw Hill Intl. 2nd Ed.2000.

2. A Delbainbre "Computer Aided Assembly London, 1992.

1MMD5   ELECTIVE-I
(5) ERGONOMICS OF MANUFACTURING
SECTION -A

Introduction: Introduction and Human performance - Interdisciplinary nature of ergonomics, modern ergonomics. Information input and processing, factors affecting human performance, physical work load and energy expenditure, heat stress, manual lifting.

Work Space Design: Work Space Design, Anthropometry, Workspace designs for standing and seated workers, arrangement of components within a physical space, interpersonal aspect of workplace design.

SECTION -B

Design of Equipments: Design of Equipments, Ergonomic factors to be considered, design of displays and controls, design for maintainability.
Design of Environment: Design of Environment, Illumination – climate – Noise – motion

TEXT BOOKS:

1. Martin Helander,A guide to Ergonomics of Manufacturing, TMH, 1996.

2. Bridger, R.S., "Introduction to Ergonomics", McGraw Hill, 1995.

REFERENCES BOOKS:

3. McCormick, J., Human Factors in Engineering and Design, McGraw Hill, 1992.

4. W Karwowski, Ergonomics in Manufacturing: Raising Productivity through Workplace Improvement, Engineering and management press.

1MMD6   ADVANCED MANUFACTURING PROCESSES -LAB

At least five practicals (study/trials) based on above syllabus, as given below shall be performed and a report there of submitted by the students

List of Practicals:-

1. Demonstration of job setting on CNC turning center and vertical machining center.
2. Preparation of program for plain turning of shaft.
3. Preparation of program for taper turning.
4. Preparation of program for grooving.
5. Preparation of program for threading.
6. Preparation of program for pocket milling.
7. Preparation of program for drilling.
8. Preparation of program for 2D profile cutting.
9. Preparation of program for boring and tapping.

Practical Examination:
Practical examination shall consist of viva voce/performance based on the above syllabus and practical work.

1MMD7 COMPUTER AIDED DESIGN AND ENGINEERING -LAB

At least five practicals (study/trials) based on above syllabus, as given below shall be performed and a report there of submitted by the students

List of Practicals:-

1. Study of at least one CAD software in each of the following category,
   a. High-End CAD like UG/NX, CATIA, Pro/E
   b. Middle-range CAD like Solid Edge, AIP, Solid Edge
   c. Low-end CAD like AutoCAD, Turbo CAD, AutoCAD LT

2. Assembly modeling (for any 2 assemblies or sub-assemblies) using top down and bottom-up approaches inclusive of sketching, parts modeling (using solid and surface modeling/styling toolboxes), drafting (parts and assemblies)

3. Part families and design table creation using spreadsheet interface

4. CAD File/data exchange amongst the various CAD software and software for CMM, CAE, CNC, CAM

5. Customization/Program development for parts modeling and drafting using API and other development tools

6. **FEA:** Using any FEA software packages solve 2 problems each on structural mechanics and heat transfer, Introduction to nonlinear analysis

Practical Examination:

Practical examination shall consist of viva voce/performance based on the above syllabus and practical work.

SEMESTER-II
2MMD1 ADVANCED MATERIALS TECHNOLOGY
SECTION - A

Materials and Classification: Solid materials- Classification, Ceramics, composites and metal glasses, selection and application of tool steel, Magnetic alloys, Copper, aluminum and magnesium alloys, Bearing alloys, Super hard materials, Plastics, Alloying techniques-Thermal, mechanical and chemical methods, Power metallurgy techniques.

Mechanical Properties: Strengthening mechanism of materials, elements of dislocation theories, Strain hardening, Grain size control, Single crystal growth, Reinforcing fibres for polymers, Composite structure, determination of mechanical properties of materials, Dynamic tests, Fracture and toughness tests, Low temperature and high temperature tests, Creepm characteristics, Hot hardness tests.

SECTION - B

Processing of Materials for Casting and Joining: Plastic working of materials, Strain hardening, Recovery and recrystallisation, Formability, Forgibility and drawability of materials, Powder processing of materials, Ceramic processing, Composite processing, Features controlling machinability of materials, thermal treatment for better mach inability of metals, Universal mach inability index.

Modern Materials and Alloys: Super alloys-refractory materials, Ceramic and their applications, Low melting alloys, Shape memory alloys, Advanced Composites-Particulate and dispersioned composites, Metal matrix and ceramic matrix composites, Carbon-Carbon composites, Ti and Ni based alloys for gas turbine applications, Managing and cryogenic steels, smart and nano materials.

Non metallic materials: Polymeric materials - Formation of polymer structure - Production techniques of fibres, foams, adhesives andcoatings - Structure, properties and applications of engineering polymers - Advanced structural ceramics, WC, TiC, TaC, AI2O3, SiC, Si3N4, CBN and diamond – properties and applications.

Books Recommended:

TEXT BOOKS:

1. Engineering Materials and Applications P. Flinn and P.K. Trojan MIR Publications

2. Engineering Materials: Polymers, Ceramics and Composites A.K Bhargava Prentice Hall of India

REFERENCE BOOKS:

1. Manufacturing processes for Engineering Materials Serope Kalpakjian Wesley Publishing Co.

2. An introduction to Physical Metallurgy S.H. Avner McGraw Hill

3. Advances in Materials and Their Applications P. Rama Rao Wiley Eastern

4. Mechanical Metallurgy Dieter McGraw Hill:

5. P.C.Shrma, Production technology

6. Thomas H.Courtney, " Mechanical Behaviour of Materials ", (2nd Edition), McGraw-Hill,

7. Charles J.A., Crane, F.A.A and Furness, J.A.G., " Selection and use of Engineering Materials ",

   (3rd Edition), Butterworth-Heiremann, 1977.

8. Flinn, R.A. and Trojan, P.K., " Engineering Materials and their Applications ", (4th Edition),
   Jaico, 1999.

9. George E.Dieter, " Mechanical Metallurgy ", McGraw Hill, 1988.

10. Metals Hand Book, Vol.10, " Failure Analysis and Prevention ", (10th Edition), 1994.

2MMD2 RAPID PROTOTYPING AND TOOLING
SECTION-A

Introduction: Need for time compression in product development, Product development conceptual design, Development, Detail design, Prototype, Tooling, Applications of RP.

Stereolithography systems: Principle, Process parameters, Process details, Machine details, Applications.

Laser sintering systems: Principle, Process parameters, Process details, Machine details, Applications. Fusion deposition modeling: Principle, Process parameters, Process details, Machine details, Applications.

SECTION-B

Laminated object manufacturing: Principle, Process parameters, process details, Machine details, Applications. Laser engineering net shaping (lens): Ballistic Particle Manufacturing (BPM), 3D printing. Principle, introduction to rapid tooling, Direct and indirect method. Commercial softwares for RP, STL file generation. Rapid tooling techniques- vacuum casting, DMLS, etc. Introduction to reverse engineering.

Books Recommended:
TEXT BOOKS:

1. Ghosh A., "Rapid Prototyping: A Brief Introduction", Affiliated East West,

2. Kenneth G. Cooper, "Rapid Prototyping Technology: Selection and Application", CRC Press, 2001.

REFERENCE BOOKS:

1. Pham, D.T. & Dimov.S.S., "Rapid manufacturing", Springer - Verlag, London, 2001.

2. Terry wohlers, "Wohlers Report 2007", Wohlers Associates, USA, 2007.

3. Chua Chee Kai, Leong Kah Fai, Lim Chu -Sing, "Rapid Prototyping:

4. Principles and Applications", World Scientific, 2003.

2MMD3 MECHATRONICS IN SYSTEM DESIGN
SECTION - A

Fundamentals of Mechantronics: Evolution, Definition and concepts of Mechatronics, Conventional system vs. mechatronic system, Need and Role of Mechantronics in Design, Manufacturing and Factory Automation. Hardware components for Mechatronics. Transducer signal conditioning and Devices for Data conversion programmable controllers.

Sensors and Actuators: Transducers and Sensors – Tactile sensor – Proximity and range sensors – Sensing joint forces –Position and velocity sensing devices – Design of drive systems – Hydraulic and Pneumatic drives – Linear and rotary actuators and control valves – Electro hydraulic servo valves, electric drives – Motors – Robot End effectors– Vacuum, magnetic and air operated grippers, Micro sensors in Mechatronics.

Pneumatic Systems: Physical concepts of pneumatics, electro pneumatic components, operation and application, valves, auxiliary devices, actuation, synchronizing, clamping, declamping etc. Design of pneumatic logic circuit.

SECTION - B

Hydraulic Systems: Study of different control components of Hydraulic Systems, Valves and auxiliary devices, design and analysis of Hydraulic circuits sequencing Synchronizing, hydropneumatics, Design of electrohydraulic circuits.

Programmable Logic Controller: Comparison between microprocessor and microcontroller organization of microcontroller system Review of logic gates, basic structure, features, input/output processing, programming, functional block diagram (FBD), ladder diagram, logic functions, latching, sequencing, jumps, internal relays, counters, shift registers, master and jump control, data handling, data movement, data comparison, arithmetic operations, code conversion, analog input and output, applications of PLC

Books Recommended:
TEXT BOOKS:

1. C.W. De Silva, "Mechatronics: An Integrated Approach, Publisher: CRC.

2. Harry Stewart, "Pneumatics & Hydraulics", D. B. Taraporewala Sons and Co.,

3. M.P. Groover, "Automation, Production Systems and CIM by, PHI

REFERENCE BOOKS :

1. M. B. Histand & D. G. Aiciatore, "Introduction to Mechatronics & Measurement Systems by McGraw Hill.

2. Moh Mazidi and J. Mazidi, "The 8051 Microcontrollers and Embedded Systems", Prentice Hall

3. A. Malov, Y. Ivanov, " Principles of Automation" Automation by, MIR Publication

4. B.W. Anderson, "The Analysis and Design of Pneumatic Systems Wiley Eastern

5. D.V. Hall, "Microprocessor and It's Applications", Tata McGraw Hill

6. Anthony Esposito, "Fluid Power with Applications Prentice Hall of India

7. Phillipe Collet, "Robotic Technology", Prentice Hall

8. Y. Koren, "Robotics for Engineers", McGraw Hill

2MMD4 EXPERIMENTAL STRESS ANALYSIS
SECTION-A

Introduction to Photoelasticity: Photo elasticity, Light and Optics as Related to Photoelasticity Behavior of Light, Plane and circularly polarized light, Bright and dark field setups, Polariscope-Plane Polarizers, Wave Plates, Arrangement of Optical Elements in a Polariscopic, Constructional Details of Diffused Light and Lens, Photo elastic materials

Theory of Photoelasticity: Stress Optic Law in Two Dimensions at Normal Incidence, Effects of a Stressed Model in a Plane Polariscope, Effects of a Plane Model in a Circular Polariscope with Dark and Light Field Arrangements.

Analysis Techniques: Isochromatic Fringe Patterns, Isoclinic Fringe Patterns, Compensation Techniques, separation Techniques, Sealing Model to Prototype Stresses.

Three Dimensional Photoelasticity: Introduction, locking in model deformation, materials for three-dimensional photo elasticity, machining cementing and slicing three-dimensional models, slicing the model and interpretation of the resulting fringe patterns, effective stresses, the shear difference method in three dimensions, applications of the Frozen-stress method, the scattered light method.

SECTION-B

Strain Measurement Methods: Basic Characteristics of a Strain Gauge, Various types of strain gauges , Types of Shell Gauge, Moire Method of Strain Analysis, Grid Method of Strain Analysis.

Electrical Resistance Strain Gauge: Factors Influencing Strain sensitivity in Metallic Alloys, Gauge Construction Temperature Compensation, Factors-Influencing Gauge Section Gauge Sensitivity and Gauge Factor, Correction for transverse Strain Effects, Semiconductor Strain Gauges. Strain gauge circuits-Rosette Analysis - three element rectangular Rosette, the four Element Delta Rosettee, Stress Gauge, Strain Circuits, Potentiometer Circuits, Wheatstone Bridge.

Moire Methods: Introduction, mechanism of formation of Moire fringes, the geometrical approach to Moire-Fringe analysis, the displacement field approach to Moire-Fringe analysis, out of plane displacement measurements, out of plane slope measurements, sharpening and multiplication of Moire-Fringes, experimental procedure and techniques.

Brittle Coating Method: Introduction, Coating Stresses, Failure Theories, Brittle Coating Crack Patterns Produced by Direct Loading, Brittle Coating Crack Patterns Produced by refrigeration Techniques, Brittle Coating Crack, Pattern Produced by Releasing the Load, Double Crack Pattern, Crack Detection, Ceramic based brittle coatings, Resin based brittle coatings, Test procedures for brittle coatings analysis, Calibration procedures, analysis of brittle coating data. Load-Time Relation and Its influence on the threshold Strain Effects of a Biaxial stress Field.

Birefringent Coatings
Introduction, Coating stresses and strains, coating sensitivity, coating materials, application of coatings, effects of coating thickness, Fringe-order determinations in coatings, stress separation methods.

Books Recommended:
TEXT BOOKS:

1. J.W. Dally and W.F. Riley, Experimental Stress Analysis, 2nd Ed. MGH.

2. K. Ramesh, Published by IIT Madras, India, Experimental Stress Analysis, 2009.

REFERENCE BOOKS:

1. A Mubin, Khanna Publications, Experimental Stress Analysis, 2003.

2. Sadhu Singh, Khanna Publishers, Experimental Stress Analysis, 1982

3. Mark B. Moore, Prentice-Hall , Principles of experimental stress analysis, 1954

4. Dureli, An Introduction to Experimental Stress and Strain Analysis.

5. Srinath , An Introduction to Experimental Stress Analysis - MGH.

6. Experimental Stress Analysis - Dally and Riley, McGraw Hill.

7. Photoelasticity Vol I and Vol II - M.M.Frocht,. John Wiley and sons.

8. Strain Gauge Primer - Perry and Lissner.

9. Photo elastic Stress analysis - Kuske, Albrecht and Robertson John Wiley & Sons.

10. Motion Measurement and Stress Analysis - Dave and Adams,

11. Hand Book of Experimental Stress Analysis AS. Kobayassin (Ed), SEMNCH, II edition.

2MMD5   ELECTIVE - II
(1) OPTIMIZATION METHODS IN ENGINEERING DESIGN
SECTION - A

Introduction: Historical Developments, Engineering applications of Optimization

Classical Optimization Techniques: Introduction, Review of single and multivariable optimization methods with and without constraints, Non-linear one-dimensional minimization problems, Examples.

Constrained Optimization Techniques: Introduction, Direct methods - Cutting plane method and Method of Feasible directions, Indirect methods - Convex programming problems, Exterior penalty function method, Examples and problems

Unconstrained Optimization Techniques: Introduction, Direct search method - Random, Univariate and Pattern search methods, Rosenbrock's method of rotating co-ordinates, Descent methods - Steepest Decent methods-Quasi-Newton's and Variable metric method, Examples.

SECTION – B

Geometric Programming: Introduction, Unconstrained minimization problems, solution of unconstrained problem from arithmetic-geometric inequality point of view, constrained minimization problems, generalized polynomial optimization, Applications of geometric problems, Introduction to stochastic optimization.

Novel methods for Optimization: Introduction to simulated annealing, selection of simulated annealing parameters, simulated annealing

algorithm; Genetic Algorithm (GA), Design of GA, Key concepts of GA, Neural Networks, A frame work for Neural Network models, Construction of Neural Network algorithm, Examples of simulated algorithm, genetic annealing and Neural Network method.

Books Recommended:
TEXT BOOKS:

1. Engineering Optimization, S. S. Rao New Age International

2. Optimization for Engineering Design, Kalyanmoy Deb Prentice Hall of India

REFERENCE BOOKS:

1. Applied Optimal Design, E. J. Haug and J.S. Arora Wiley, New York

2. Optimization, G.V. Reklaites, A. Ravindran and K.M. Rogsdeth Wiley, New York

2MMD5 ELECTIVE-II
(2) ADVANCED MACHINE TOOL DESIGN
SECTION - A

Machine Tool Drive: working and auxiliary motion in machine, Machine tool drives, Hydraulic transmission, Mechanical transmission, General requirements of machine tool design, Layout of machine tools.

Regulation of Speed and Feed Rates: Aim of speed feed regulation, stepped regulation of speed, design of speed box, Design of feed box, Special cases of gear box design, Set stopped regulation of speed and feed rates.

Design of Machine Tool Structure: Fundamentals of machine tool structures and their requirements, Design criteria of machine tool structure, Static and dynamic stiffness, Design of beds and columns, Design of housing models, Techniques in design of machine tool structure.

SECTION - B

Design of Guide-ways and power Screws: Function and type of guide-ways, design of slide-ways, Protecting devices for slide-ways, Design of power screws.

Design of Spindles and Spindle Supports: Materials for spindles, Design of spindles, Antifriction bearings, Sliding bearings.

Dynamics of Machines Tools: General procedure of assessing dynamic stability of EES, Cutting processing, Closed loop system, Dynamic characteristics of cutting process, Stability analysis.

Books Recommended:

TEXT BOOKS:

1. N.K. Mehta Tata McGraw Hill "Machine Tool Design"

2. Acherkan, N., "Machine Tool Design", Vol. 3 & 4, MIR Publishers, Moscow, 1968

REFERENCE BOOKS:

1. CMTI Banglore "Machine Tool design Handbook"

2. Koenisberger, F., "Design Principles of Metal cutting Machine Tools", Pergamon Press, 1964.

3. Sen. G. and Bhattacharya, A., "Principles of Machine Tools", Vol.2, NCB.Calcutta, 1973

2MMD5 ELECTIVE - II
(3) TOTAL QUALITY MANAGEMENT
SECTION – A

Introduction: Quality – Basic concepts, dimensions, economics of quality, quality Gurus.

TQM: Definition, evolution, journey from inspection to TQM, comparison at different stages, dimensions of TQM, TQM viewpoints, reasons for adopting TQM.

Introspection to TQM environment: Sphere of TQM, components of TQM, TQM – Managing Total Quality, Factors affecting TQM environment, Classification and interaction among factors, Researchers' viewpoint, TQM as a system, steps in TQM implementation, Roadblocks in TQM implementation, Reasons for TQM failure.

Role of soft options in TQM: Hard vs. Soft factors, Role and expectation of employer, employee, customer and supplier from organization and vice versa. Human factors in TQM, Role of top management commitment, work culture, motivation, coordination, attitude, innovation.

Section – B

Quality initiatives in organizations: Role of tools and techniques in TQM, Classification of tools and techniques – Problem identification, Data analysis, Graphical, Creativity, Companywide. Brief description of Quality awards: – MBNQA, Deming award, European quality award, Australian quality award.

TQM Effectiveness: Impact of TQM, Need and difficulty in measuring TQM effect, Parameters governing effect of TQM.

Books Recommended:

TEXT BOOKS:

1. Oakland "Total Quality Management" Butterworth – Heinamann Ltd.

2. Waller Jenny, Allen Derek and Burna Andrew "The TQM toolkit – a guide to practical techniques for TQM"

REFERENCE BOOKS:

1. Logothetis N. "Managing for total quality from Deming to Taguchi and SPC" by (PHI)

2. Feigenbaum A.V. "Total Quality Control" (MGH)

3. Besterfield Dale H "Total Quality Management" (Pearson Education)

4. John Gilbert "A slice by slice guide to TQM" (Affiliated East West Press)

2MMD5 ELECTIVE-II
(4) COMPUTER ASSISTED PRODUCTION MANAGEMENT
SECTION-A

Computer aided process planning: Approaches to CAPP, basic part representation methods, shape producing capabilities, Process economics

Computer assisted QC: co-ordinate measuring machines construction and types, automated dimensional gauging and in process gauging

Capacity planning: Roll of capacity planning in manufacturing, planning and control systems, hierarchy of capacity planning decisions links to other system modules, capacity planning and control techniques.

SECTION-B

Just in time: JIT in manufacturing planning and control, leveling the production, pull system introduction, product and process design, JIT applications

Computer aided inventory control: Computer aided purchasing procedure, simulation of inventory problems Computer aided materials management: Material requirement planning, computer integrated materials management.

Books Recommended:
TEXT BOOKS:

1. Groover M.P.- Automation, Production Systems and CIM.

2. CAD/CAM theory and concepts, by Kuldeep Sareen and Chandandeep Grewal, S. Chand & company Ltd.

REFERENCE BOOKS:

1. David Bedworth, M.R. Handerson & Philip Wilze- Computer Integrated Design and manufacturing

2MMD5 ELECTIVE - II

(5) CONCURRENT ENGINEERING & PRODUCT

LIFE CYCLE MANAGEMENT

SECTION -A

Introduction: Extensive definition of Concurrent Engineering (CE), CE design methodologies, Review of CE techniques like DFM (Design for manufacture), DFA (Design for assembly), QFD (Quality function deployment), RP (Rapid prototyping), TD (Total design), for integrating these technologies, Organizing for CE, CE tool box, Collaborative product development.

Use of Information Technology: IT support, Solid modeling, Product data management, Collaborative product commerce, Artificial Intelligence, expert systems, Software hardware component design.

Design Stage: Lifecycle design of products, Opportunities for manufacturing enterprises, Modality of concurrent engineering design, Automated analysis Idealization control, CE in optimal structural design, Real time constraints.

SECTION -B

Need for PLM: Importance of PLM, Implementing PLM, Responsibility for PLM, Benefits to different managers, Components of PLM, Emergence of PLM, Lifecycle problems to resolve, Opportunities to seize.

Components of PLM: Components of PLM, Product lifecycle activities, Product organizational structure, Human resources in product lifecycle, Methods, techniques, Practices, Methodologies, Processes, System components in lifecycle, slicing and dicing the systems, Interfaces, Information, Standards.

Books Recommended:

TEXT BOOKS:

1. Anderson and LHein , Integrated Product Development M.M. IFS Publications

2. Prasad , Concurrent Engineering Fundamentals: Integrated Product Development Prentice hall India

REFERENCE BOOKS:

3. I Moustapha , Concurrent Engineering in Product Design and Development New Age International. Michael Grieves, Product Lifecycle Management McGraw Hill

4. Andrew Kusiak , Concurrent Engineering: Automation tools and Technology Wiley Eastern Publications

2MMD6   MECHATRONICS IN SYSTEM DESIGN - LAB

At least four practicals (study/trials) based on above syllabus, as given below shall be performed and a report there of submitted by the students

List of Practicals:-

1. Sensors applications in Mechanical System

2. Design and testing of sequencing circuits.

3. Design and testing of Different types of Speed control Circuits.

4. Design and testing of Continuous reciprocation of Double acting Cylinder.

5. Study of different components of a CNC Machine-tool

6. Application of Microcontroller in a Mechatronic system

Practical Examination:
Practical examination shall consist of viva voce/performance based on the above syllabus and practical work.

2MMD7   EXPERIMENTAL STRESS ANALYSIS - LAB

At least five practicals (study/trials) based on above syllabus, as given below shall be performed and a report there of submitted by the students

List of Practicals:-

1. Determination of Fringe constant of photoelastic material using.

2. Circular disc subjected to diametric compression.

3. Pure bending specimen (four point bending)

4. Determination of 3- dimensional experimental stress analysis using polariscope.

5. Determine slopes of plates by experimental technique.

6. Determination of Principal stresses 1 and 2 in magnitude and direction

7. Study of effect of pressure on principal stresses.

8. Determination of stress concentration using photo elasticity for simple component like plate with a hole under tension. 2D crane hook.

9. Determination of stress frozen and a slice of cross section are taken to analyze stress & no separate loading frame required.

10. Experiments using strain gauges.

11. Measurement of strain, temperature effects

12. Fixing of gauges on surfaces.

13. Experiments using photoelastic bench.

14. Setting of polariscope and calibration of disc, beam and tension model.

Practical Examination:

Practical examination shall consist of viva voce/performance based on the above syllabus and practical work.

SEMESTER - III

3MMDS SEMINAR & DISSERTETION
(As per given Scheme)

Project

SEMESTER-IV

4MMDP PROJECT SEMINAR & DISSERTETION
(As per given Scheme)

*****

**SYLLABUS PRESCRIBED FOR
TWO YEAR P.G. COURSE IN
MASTER OF ENGINEERING (FULL TIME)
M.E. (ELECTRICAL & ELECTRONICS ENGINEERING)**

SEMESTER-I
1EEEME1 ADVANCED CONTROL SYSTEMS

Unit I : Signal Processing in Digital Control: Configuration of the Basic Digital Control Scheme, Principles of Signal Conversion, Basic Discrete-Time Signals, Time-Domain Models for Discrete-Time Systems, z-transform, Transfer Function Models, Frequency Response, Stability on the z-plane and the Jury stability criterion, Sample-and-Hold Systems, Sampled Spectra and Aliasing, Reconstruction of Analog Signals, Principles of Discretization.

Unit II: Models of Digital Control Devices and Systems: z-domain description of Sampled Continuous-Time Plants, z-domain description of Systems with Dead-Time, Implementation of Digital Controllers, Tunable PID Controllers, Digital Temperature Control System, Digital Position Control System, Stepping Motors and their Control.

Unit III: Design of Digital Control Algorithms: Introduction, z-plane specifications of Control System Design, Digital Compensator design using Frequency Response Plots, Digital Compensator design using Root Locus Plots, z-plane synthesis.

Unit IV: Control System Analysis Using State Variable Methods: Vectors and Matrices, State Variable Representation, Conversion of state variable models to transfer functions, Conversion of transfer functions to Canonical State Variable Models, Eigen values and Eigen vectors, Solution of state equations, Concepts of Controllability and Observability.

Unit V: State Variable Analysis of Digital Control Systems: State descriptions of Digital Processors, State Description of Sampled Continuous-Time Plants, State Description of Systems with Dead-Time, Solution of State Difference Equations, Controllability and Observability, Multivariable Systems.

Unit VI: Pole-Placement Design and State Observers: Stability Improvement by State Feedback, Necessary and Sufficient Conditions for arbitrary Pole-Placement, State Regulator

Design, Design of State Observers, State Feedback with Integral Control, Digital Control Systems with State Feedback.

TEXT BOOK:

M. Gopal, Digital Control and State Variable Techniques, TMH.

REFERENCE BOOKS:

1. Katsuhiko Ogata Digital Control Engineering, PHI.
2. Kuo B. C. Digital Control Systems, Wiley & Sons
3. Ioan Dor Landau and Gianluca Zito, Digital Control Systems, Springer.
4. M. Sami Fadali, Antonio Visioli, Digital Control Engineering: Analysis and Design , AP.

1EEEME2 ADVANCED POWER ELECTRONICS

Unit I: Semiconductor Devices: Review of Semiconductor devices like Power BJT, SCR, MOSFET, IGBT, GTO, MCT; Static and dynamic characteristics of these devices; Single quadrant, Two quadrant and bid-directional switches.

Unit II: Switching Voltage Regulators: Linear voltage regulators; Switching voltage regulators; Review of basic dc-dc voltage regulator configurations -Buck, Boost, Buck-Boost converters and their analysis for continuous and discontinuous mode; Fly back converter, Forward converter, Push-pull converter, Cuk converter, Sepic Converter; Design criteria for SMPS; Multi-output switch mode regulator.

Unit III: Design of Magnetic Components: Design of power transformer; high frequency transformers for fly back, forward, half-bridge–full Bridge and push pull converters; Design of inductors for various converter topologies; Design of current transformers; Different types of core materials.

Unit IV: DC-AC converters/Inverters: Classification; Review of line commutated inverters; Bridge inverters with 120°,180°,and 150° modes of operation; Harmonic reduction techniques; Sine-triangular PWM; Space Vector Pulse Width Modulation; Current Source Inverters.

Unit V: Gate and Base drive circuits: Preliminary design considerations; DC coupled drive circuits with uni polar and bipolar outputs; Importance of isolation in driver circuits; electrically isolated drive circuits; Some commonly available driver chips (based

on boot-strap capacitor); Cascade connected drive circuits; Thyristor drive circuits; Protection in driver circuits; Blanking circuits for bridge inverters.

Unit VI : Three phase AC voltage controllers and Cyclo-converters: Review of On-off and phase control; Three phase half-wave and full wave controllers and their analysis with resistive loads; three phase bi-directional delta connected controllers; 3-phase cyclo-converter circuits; circulating current operation; non-circulating current operation; mean output voltage and harmonics in supply current waveform

TEXT BOOK:

1. Ned Mohan, Undeland and Robbins, Power Electronics: Converters, Applications and Design (Wiley)

REFERENCE BOOKS:

1. Rashid M.H., Power Electronics, Pearson Education
2. G.K. Dubey, Doradla, Joshi, Sinha, Thyristorised Power Controllers Wiley
3. Sen P.C., Power Electronics, Tata McGraw Hill.
4. Philip T.Krein, Elements of Power Electronics, Oxford University Press.

1EEEME3 ADVANCED DIGITAL SIGNAL PROCESSING

Unit-I : Review of Discrete time systems, LTI systems, Impulse response and frequency response. Discrete convolution. Discrete Fourier Transform and Fast Fourier Transforms, Inverse DFT, Algorithms for efficient computation of DFT and FFT. Fast convolution. Correlation.

Unit-II : Implementation of DSP algorithms, Block diagram and signal flow graph representations, Basic IIR and FIR filter structures, Cascaded, parallel and lattice realizations, computational complexity. Finite word length effects and quantization errors.

Unit-III : Digital filter design. FIR and IIR filters, linear phase filters, design techniques for IIR filters using analog filter transformation methods, design techniques for FIR filters using windowing method. Analysis of finite word length effects.

Unit-IV : Estimation of Auto-correlation and Power Spectra of random signals. Nonparametric methods – averaging periodograms,

Welch method, Blackman and Tukey method, Parametric methods, AR, MA and ARMA models, Yule Walker method, Levinson-Durbin algorithm.

Unit-V : Multi-rate digital signal processing. Poly-phase decomposition, multistage decimators and interpolators, Digital filter banks. Adaptive filtering, minimum mean square error criterion, Wiener filter, LMS adaptive algorithm.

Unit-VI : General purpose DSP processors, Implementation of DSP algorithms on General purpose processors: issues, advantages & disadvantages . Special purpose DSP processors –Hardware digital filters and FFT processors.

TEXT BOOK:
Proakis and Manolakis Digital Signal Processing: Principles, Algorithms and Applications: 3rd Ed.-Prentice-Hall (India)

REFERENCE BOOKS:

1. S.Mitra, Digital Signal Processing: A Computer Based Approach: Tata McGraw Hill

2. Oppenheim & Schafer, Discrete Time Signal Processing, PHI.

3. Defatta, Digital Signal Processing, Wiley Inter-Science.

4. Ifeachor & Jervis, Digital Signal Processing , Pearson Education

1EEEME4   VLSI DESIGN

Unit-I : VLSI and Moore's Law. CMOS technology. Hierarchical design. The VLSI design process.IP-based design. Fabrication methods. Transistor structures. Characteristics of transistors and wires. Design rules. Layout design. Reliability.

Unit-II : Combinational logic.Static logic gates.Basic Gate Layout. Delay and power consumption .Alternate gate structures: switch, domino. Wire delay models. Design-for-yield. Gates as IP.

Unit III : Combinational Logic Networks: Layouts for logic networks. Delay through networks. Logic and interconnect design. Power consumption and power optimization. Switch logic networks. Combinational logic testing.

Unit-IV: Sequential Machines: Latches and flip-flops. structures and Clocking disciplines.Performance analysis. Sequential system design. Power optimization. Verification and testing of FSMs.

Unit-V : Subsystems Design: Pipelines and data paths. Adders. Multipliers. Memory. PLAs. FPGAs. Image sensors. Buses and networks-on-chips. Data paths.

Unit-VI: Floor planning: Floorplanning styles and methodology.Global routing.
Clock distribution.Power distribution.Packaging and pads. Register-transfer design.Pipelining. High-level synthesis.

TEXT BOOK:
 Wayne Wolf: "Modern VLSI Design", Prentice-Hall.

REFERENCE BOOKS:

1. Vai M.M. "VLSI Design", CRC Press.

2. Weste N, Eshraghian, "Principles of CMOS VLSI Design" , Pearson Education.

3. Chandrasetty V A "VLSI Design", Springer.

4. Esteban Tlelo-Cuautle and Sheldon X.-D. Tan, "VLSI Design", InTech, Croatia.

1EEEME5   MODELING & ANALYSIS OF ELECTRICAL MACHINES

Unit-I: Introduction to the theory of basic two pole machine applicable to DC Machines, Three-phase induction machines and synchronous machine. Kron's primitive machine, Need of modeling, Introduction to modeling of electrical machines, Voltage and Torque equations.

Unit-II: Concept of transformation: change of variable & machine variable and transform variable for arbitrary reference frames. Application to DC machine for steady state and transient analysis, Equation of cross field commutator machine.

Unit-III : Polyphase Induction Machines: Voltage and torque equations, Equivalent circuit, Steady state analysis, Dynamic performance during sudden change in load torque and three phase fault at the machine terminals.

Unit-IV: Polyphase synchronous Machine: Voltage and Torque equations in stator, rotor and air gap field reference frame. Transformation and transformed equations. Park transformation, Voltage and power equation for salient and non-salient alternator, their phase diagrams.

Unit-V: Dynamic analysis of interconnected Machines: Machine interconnection Matrices. Transformation of voltage and torque equation using interconnection matrix. Large signal transient analysis using transformed equations. The DC generator/DC Motor system. The alternator/synchronous system.

Unit- VI : Linearized machine equations: Linearization of machine equation, small displacement stability: Eigen values of typical induction machine and synchronous machine, transfer function formulation.

TEXT BOOK :

Paul C. Krause, O Wasynczuk, S D. Sudhoff, "Analysis of Electric Machinery", IEEE Press.

REFERENCE BOOKS:

1) B. Adkins, "The Generalized theory of Electrical Machine", McGraw-Hill.

2) P.S. Bhimbra , "Generalised theory of Electrical Machines", Khanna Publishers.

3) C. V. Jones, Butterworth "The Unified theory of Electrical Machines" , Wiley.

4) Boldia and S.A. Nasar , "Electrical Machine Dynamics" , Macmillan Press.

1EEEME6 SEMINAR

The Seminar shall be based on the recent trends in the field of electrical and electronics engineering preferably related to the subjects 1EEEME1 to 1EEEME5. It should be surveyed from the technical literature published in international /national journals. A report should be prepared following the guidelines of IEEE paper format, submitted and followed by the presentation.

1EEEME7 VLSI DESIGN - LAB

Minimum Eight experiments based on the syllabus of 1EEEME4 VLSI Design using appropriate hardware and software.

2EEEME1 DIGITAL INSTRUMENTATION

Unit -I : Introduction: The basis of measurement, International unit system, Measurement &Electrical standards, Measurement errors, Factors influencing measurement errors, Enabling technologies: Processor based components and system components, Semicustom and custom ICs, Display devices.

Unit-II : Data converters: Sampled data systems, A-to-D converter errors, Basic SHA operation, ADC architectures, D to A converters, DAC architectures, Data acquisition system interfaces.

Unit-III : Waveform parameters and amplitude related measurements, Digital multimeters. DMM specifications. Pulse parameters and measurements, Fundamentals of oscilloscopes: basic operation, Digital storage oscilloscopes.

Unit-IV : Electronic counters: Basic counter circuitry, Modes of operation, Accuracy of counters, High frequency measurements and down conversion techniques, Modulation domain analysers. Signal generators. Arbitrary waveform generators (AWG).

Unit-V : Spectrum analysis: Dynamic signal analysis, Types of spectrum analyser, Superheterodyne spectrum analyser, Logic analysers: Basic operation, Types of analysis, Probing, Clocking, Triggering. Advanced features and measurement techniques.

Unit-VI : Instrument buses and VLSI testing: IEEE-488 bus, major specifications, GPIB operation, GPIB devices and interface functions, GPIB applications. VXIbus. The RS 232 interface. VLSI testing and automatic test equipment. Digital telecommunication transmission systems and associated Measurements: ADSL standard – ANSI T1.413, ADSL measurements.

TEXT BOOK:

Nihal Kuluratna "Digital and Analog Instrumentation" The Institution of Engineering and Technology, London.

REFERENCE BOOKS:

1. Bouwens ,A.J."Digital instrumentation." McGraw Hill, 1984.

2. John Lenk,D."Handbook of Microcomputer based instrumentation and control",PHI1984

3. Doebelin "Measurement System ,Application and Design",(4/e),McGraw Hill,1990.

4. Evans D. S. " Fundamentals of Digital Instrumentation", Hilger & Watts.

2EEEME2   EMBEDDED SYSTEMS DESIGN

Unit-I : Embedded systems introduction: Processor technologies, implementation technologies, and design technologies. General-purpose processors and the 8051: Architecture, instruction set and programming environment.

Unit-II: Single-purpose processors: Standard peripheral processors :timers/counters, UARTs, A/D, D/A, PWM, etc. and designing custom processors ,combinational logic design, sequential logic design, custom processor design.

Unit-III : System Integration: Memories (ROM, RAM, compositions), Interfacing (serial/parallel, interrupt-driven, parallel), Arbiters. Common interfacing protocols: PCI, ISA, I2C, CAN.

Unit-IV: Computational models and describing behavior: sequential program, state machines, dataflow. Finite state machines. Concurrent process model. Implementation technologies: Custom VLSI, standard cell and gate array, programmable logic devices (including FPGAs).

Unit-V : Real time Operating System Concept: Architecture of kernel, task scheduler, Process and Threads. ISR, Inter Process Communication through Semaphores, mailbox, message queues, pipes. Events, timers and memory management, RTOS services in contrast with traditional OS.

Unit-VI : Embedded Linux; Introduction to the Linux kernel, Configuring and booting the kernel, the root file system, Root file directories, Linux file systems, Types of file system: Disk, RAM, Flash, Network. TCP/IP Networking- Network configuration, Device control from user space- Accessing hardware directly, Inter Process Communication- Linux process model and IPCs.

TEXT BOOKS:
Frank Vahid, Tony Givargis "Embedded System Design ", PHI.

REFERENCE BOOKS:
1.   Rajkamal, " Embedded Sytems " TMH
2.   David Simon "Embedded Systems Software Primer" Pearson.
3.   Steve Heath, "Embedded System Design", Elsevier.
4.   Marwedel, Peter. "Embedded Systems Design" , Springer.

2EEEME3   NEURO FUZZY CONTROL

Unit-I : Fuzzy Logic for Control :Fuzziness and linguistic rules , Fuzzy sets in control ,Combining fuzzy sets , Sensitivity of functions Combining fuzzy rules ,Truth tables for fuzzy logic , Fuzzy partitions , Fuzzy relations ,Defuzzification Level curves and alpha-cuts ,Universal approximation.

Unit-II : Fuzzy Control: A fuzzy controller for an inverted pendulum, Main approaches to fuzzy control, Stability of fuzzy control systems. Fuzzy controller design.

Unit-III : Neural Networks for Control: Introduction to neural network, Implementing neural networks , Learning capability ,The delta rule ,The back propagation algorithm ,Practical issues in training.

Unit-IV : Neural Control : Neural networks in control ,Inverse dynamics ,Neural networks in direct neural control A neural network for temperature control , Simulating PI control with a neural network Neural networks in indirect neural control ,System identification, Instantaneous linearization.

Unit-V : Fuzzy-Neural and Neural-Fuzzy Control : Fuzzy concepts in neural networks, Basic principles of fuzzy-neural systems ,Basic principles of neural-fuzzy systems ,Adaptive network fuzzy inference systems ,ANFIS learning algorithm ,Generating fuzzy rules

Unit-VI : Applications of neural control to current control and speed control of induction motors, Fuzzy logic control of a synchronous generator set. Applications of neuro fuzzy control: Cooling scheme for laser materials, Color quality processing, Identification of trash in cotton and Integrated pest management systems.

TEXT BOOKS:
1.   Hung T. Nguyen,   A first course in Fuzzy and Neural Control, CRC Press.
2.   M.N. Cirstea, A. Dinu, J.G. Khor,M. McCormick, Neural and Fuzzy Logic Control of Drives and Power Systems,   Newnes Press.

REFERENCE BOOKS:
1.   Fuller Robert; Introduction to Neuro Fuzzy Systems, Springer.
2.   Lamba V. K. Neuro Fuzzy Systems, Laxmi Publications.
3.   Jang, sun & Mizutani , Neuro-fuzzy And Soft Computing, PHI.
4.   D. Nauck, F. Klawonn, R. Kruse: Foundations of Neuro-Fuzzy Systems, John Wiley.

2 EEEME4   ELECTIVE-I
(1) POWER ELECTRONIC CONTROLLED DRIVES

Unit I : Phase-Controlled DC Motor Drives: Principles of DC Motor Speed Control, Armature and Field Controls, Four Quadrant operation, Phase controlled converters, Control modeling of the Three-Phase converter, Converter configuration for a Four-Quadrant DC Motor Drive, Three-Phase Converter-Controlled DC Motor Drive, Design of Controllers.

Unit II : Chopper-Controlled DC Motor Drive: Principle of operation of the Chopper, Four quadrant Chopper circuit, Model of the Chopper, Steady-State analysis of Chopper-Controlled DC Motor Drive, Pulsating Torques, Closed-Loop operation, Speed-Controlled DC Motor Drive.

Unit III : Phase-Controlled Induction Motor Drives: Stator-Voltage Control, Steady-state analysis, Approximate analysis, Torque-Speed Characteristics with Phase Control, Slip-Energy Recovery Scheme, Steady-state analysis, Starting, Rating , Closed-Loop Control.

Unit IV : Frequency-Controlled Induction Motor Drives: Voltage-Source Inverter, Voltage-Source Inverter-Driven Induction Motor, Speed control, Constant Volts/Hz Control, Constant Slip-Speed Control, and Constant-Air Gap-Flux Control.

Unit V : Vector-Controlled Induction Motor Drives: Principle of Vector control, Direct Vector control, Derivation of Indirect Vector-Control Scheme, Indirect Vector-Control Scheme, and Implementation of Indirect Vector-Control Scheme.

Unit VI: PM Brushless DC Motor (PMBDCM): Modeling of PM Brushless DC Motor, PMBDCM Drive Scheme, Phase Advancing, Half-Wave PMBDCM Drives, Sensorless Control of PMBDCM Drive, Design of Current and Speed Controllers.

TEXT BOOK :
R. Krishnan, "Electric Motor Drives: Modeling, Analysis and Control", Pearson Education.

REFERENCE BOOKS:
1. Ned Mohan, Undeland, Robbins, "Power Electronics" ,Wiley.
2. G.K. Dubey, Doradla, Joshi, Sinha, "Thyristorised Power Controllers", Wiley.
3. Rashid M.H., "Power Electronics", Pearson Education.
4. B.K.Bose, "Power Electronics and Motor Drives", Elsevier.

2 EEEME4   ELECTIVE-I
(2) DIGITAL COMMUNICATIONS

Unit I : Digital Modulation Schemes- Representation of Digitally Modulated Signals, Memory-less Modulation Methods, Signaling Schemes with Memory, Power Spectrum of Digitally Modulated Signals.

Unit II : Waveform and Vector Channel Models, Waveform and Vector AWGN channels, Optimal Detection and Error Probability for Band-Limited Signaling, Optimal Detection and Error Probability for Power-Limited Signaling, Optimal Detection in Presence of Uncertainty, Comparison of Digital Signaling Methods.

Unit III : Carrier and Symbol Synchronization- Signal Parameter Estimation, Carrier Phase Estimation, Symbol Timing Estimation, Joint Estimation of Carrier Phase and Symbol Timing, Performance Characteristics of ML Estimators.

Unit IV : Linear Block Codes- Basic Definitions, General Properties of Linear Block Codes, Some Specific Linear Block Codes, Optimum Soft Decision Decoding of Linear Block Codes, Hard Decision Decoding of Linear Block Codes, Comparison of Performance between Hard Decision and Soft Decision Decoding.

Unit V : Trellis Codes- The Structure of Convolutional Codes, Decoding of Convolutional Codes, Distance Properties of Binary Convolutional Codes, Punctured Convolutional Codes, Other Decoding Algorithms for Convolutional Codes, Practical Considerations in the Application of Convolutional Codes.

Unit VI: Digital Communication Through Band-Limited Channels – Characterization of Band Limited Channels, Signal Design for Band Limited Channels, Optimum Receiver for Channels with ISI and AWGN, Linear Equalization.

TEXT BOOK:
John Proakis, Masoud Salehi, "Digital Communications", (5/e), McGraw Hill International.

REFERENCE BOOKS:
1. Bernard Sklar, " Digital Communication" (2/e). Pearson Education.
2. Simon Haykins, "Digital Communication" John Wiley & Sons.
3. K Sam Shanmugam, "Digital Communications", John Wiley & Sons.

2EEEME5 ELECTIVE-II
1) FLEXIBLE AC TRANSMISSION SYSTEMS

UNIT –I : Introduction to Facts Controllers: Reactive power control: Reactive power, uncompensated transmission line, reactive power compensation – Principles of conventional reactive power compensators: Synchronous condensers, saturated reactor, phase angle regulator, and other controllers.

UNIT–II: Thyristor Controlled Shunt Compensator: SVC Objective of shunt compensation – Principle and operating characteristics of Thyristor Controlled Reactor – Thyristor Switched Capacitor – TSC-TCR static Var Compensators –

UNIT-III: SVC control system – SVC voltage regulator model – Transfer function and dynamic performance of SVC – Transient stability enhancement and power oscillation damping, mitigation of sub synchronous resonance.

UNIT–IV: Thyristor Controlled Series Compensator: TCSC Series compensation – Principles of operation of TCSC – Capability characteristics of TCSC – Modeling of TCSC – TCSC control system – enhancement of system damping – mitigation of sub synchronous resonance.

UNIT–V: Voltage Source Converter Based Shunt and Series Compensator: STATCOM: (Static Synchronous Compensator) Principle of operation, VI Characteristics, Harmonic performance – Steady state model. SSSC: (Static Synchronous Series Compensator) Principle of operation and characteristics of SSSC– control scheme for SSSC.

UNIT–VI: Unified Power Flow Controller: Basic operating principles – conventional transmission control capability of UPFC – Independent real and reactive power flow control – control scheme for UPFC – Basic control system for P and Q control – dynamic performance.

TEXT BOOK:

Narani.G.Hingorani and Laszlo Gyugyi, "Understanding FACTS", First Indian Edition, 2001, IEEE Power Engineering Society Sponsor, IEEE Press.

REFERENCE BOOKS :

1. T J E Miller, "Reactive Power Control in Electric Systems", John Wiley.

2. Hingorani N G, "High Power Electronics and Flexible AC Transmission Systems", IEEE High Power Engineering Review, 1998.

3. Padiyar K R "FACTS Controllers in Power Transmission & Distribution", New Age.

4. R. Mohan and R.K.Varma, "Thyristor-Based FACTS Controllers for Electrical Transmission Systems", IEEE Press.

2EEEME5   ELECTIVE-II
(2) DIGITAL IMAGE PROCESSING

UNIT -I : Introduction & Image Transforms: Introduction to Image processing System, Human Visual System, and Elements of an Image Processing System. Image Transforms: Fourier Transform, 2-D discrete Fourier Transform, Hadamard Transform, Discrete Cosine Transform, KL Transform, SVD.

UNIT- II : Image Enhancement: Introduction, Image Enhancement in spatial domain, Enhancement through point operation, Types of point operation, Histogram manipulation, Linear Gray –Level Transform, Non Linear Gray Level Transform, Local or neighborhood operation, Median Filter.

UNIT-III: Image Restoration and Denoising: Introduction, Types of Image Blur, Linear Image-restoration Techniques, Non-linear Image-restoration Techniques, Blind Deconvolution, Classification of Blind-Deconvolution Techniques. Classification of Noise in Image, Median Filtering, Trimmed Average Filter, Performance Metrics in Image Restoration, and Applications of Digital Image Restoration.

UNIT-IV: Image Segmentation: Introduction, Classification of Image segmentation techniques, Region Approach to Image segmentation, Clustering Techniques, Image segmentation based on Thresholding, Edge-based Segmentation, Classification of Edges, Edge detection, Edge Linking, Hough Transform, Active Contour, Watershed Transform, Shape Representation Techniques.

UNIT-V: Image Compression: Need for Image Compression, Redundancy and Classification of redundancy in images, Classification of Image Compression Schemes, Fundamentals of Information Theory, Run-length Coding, Shannon-Fano coding, Huffman Coding, Arithmetic Coding, Dictionary-Based Compression,

Predictive Coding, Transform Based Compression, Image Compression Standard, Scalar Quantization, Vector Quantization.

UNIT VI: Wavelet Based Image Processing: Introduction to Wavelet Transform, Continuous Wavelet Transform, 2D Continuous Wavelet Transform, Multi-resolution analysis, Wavelet based Image Compression, JPEG2000 Compression Standard. Digital Image Watermarking: Classification of watermarking methods, watermarking in spatial domain, watermarking in frequency domain, applications of digital water marking.

TEXT BOOK:

Jayaraman, Esakkairajan, Veerkumar, "Digital Image Processing", TMH Publication.

REFERENCE BOOKS:

1.   R.C Gonzales & Woods, "Digital Image Processing" –Addison Wesley.
2.   A.K.Jain "Fundamental Digital Image Processing "–Prentice Hall Inc.
3.   W.K Pratt, "Digital Image Processing" John Wiley.
4.   B Chanda and D.Mujumdar, "Digital Image Processing and Analysis" PHI.

2EEEME6 SEMINAR

The Seminar shall be based on the recent trends in the field of electrical and electronics engineering preferably related to the subjects 2EEEME1 to 2EEEME5. It should be surveyed from the technical literature published in international /national journals. A report should be prepared following the guidelines of IEEE paper format, submitted and followed by the presentation.

2EEEME7 EMBEDDED SYSTEMS DESIGN LAB

Minimum Eight experiments based on the syllabus of 2EEEME2 Embedded Systems Design using appropriate hardware and software.

SEMESTER-III
3EEEME 1   SEMINAR & DISSERTETION
(As per given Scheme)

SEMESTER-IV

4EEEME 1 SEMINAR & DISSERTETION
(As per given Scheme)

*****

SYLLABUS PRESCRIBED FOR
TWO YEAR P.G. COURSE IN
MASTER OF ENGINEERING (FULL TIME)
M.E. (COMPUTER SCIENCE & INFORMATION TECHNOLOGY)

1RNME1   ADVANCED COMPUTER ARCHITECTURE

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

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

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

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

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

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

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

REFERENCE BOOKS:
1.   Hayes J.P., "Introduction to Computer Architecture", (McGraw Hill)).
2.   Tenanbaum A. S., "Computer Organisation and Architecture", (PHI).
3.   Hwang K., "Advanced Computer Architecture", (McGraw Hill).
4.   Hamacher V.C, "Computer Organization", (McGraw Hill).

1RNME2 DISTRIBUTED OPERATING SYSTEM DESIGN

Unit I: Introduction : Distributed Computing Models, Software Concepts, Issues in Designing Distributed systems, Client Server Model, Case studies, review of n/w communication, protocols for distributed system.

Unit II: Interprocess communication : Message passing, case study, group communication, case study
Remote Communication : Introduction, RPC – Implementation, Communication, Issues, RMIs, Java RMs.

Unit III: Synchronization : Introduction, Clock synchronization, logical clocks, Mutual Exclusion, Election Algorithm, Deadlocks in distributed systems.

Unit IV: Distributed System Management : Introduction, Tash assignment, Load Balancing, Load sharing, Process Management, Process Migration, Threads, Fault tolerance.

Unit V: Distributed Shared Memory : Introduction, Basic Concepts, Design Issues in DSM, Issues in Implementation.

Unit VI: Distributed file management : Introduction, Distributed file system design.
Naming : Introduction, Designing, Human Oriented Names
Security in Distributed Systems : Introduction, Case Studies
Realtime distributed OS : Introduction, Design of RTDOS

TEXT BOOKS :

1) Distributed Systems : "Concepts & Design Coreterous, Dollimore, Kindberge – Addison-Wesley.

REFERENCE BOOKS :

1) Jose Garrido, Schlesiger, Hongson : "Principle of Mdern Operating Systems",
Pub : Jones & Bartlet Learning ((VIVA Books)

2) Tang : "Security Scrategies in Linux Platforms and applications",
Pub : Jones & Bartlet Learning ((VIVA)

3) Soloman : "Security Strategies in Windows Platforms and Applications",
Pub : Jones & Bartlet Learning ((VIVA)

4) Lunch : "Distributed Algorithms", Pub : CBS

1RNME3   DISTRIBUTED DATABASE SYSTEMS

Unit I: **Review of DBMS :** Introduction to Database Processing, ER models, Database Models, Symentic Object Models, Relational Model, Normalization, Database Designs Using ER models, Managing multiusers databases, ODBC, OLE, DB, ADO, Webserver Data Environment, ODBC, JDBC, JSP with reference databases, Relational Data Manipulation with SQL, MySQL & Oracle.

Unit II: **Distributed Databases Management Systems :**
Introduction to DDBMS, Parallel DBMS, DDBMS Architecture, Data storage, Distributed Catalogue Management, Distributed Query Processing, Distributed transactions, Distributed concurrency control, Distributed Databases Recovery, Mobile Databases, Case Study.

Unit III: **Emerging Trends in Distributed Computing :**
Introduction to Grid Computing, SOA, Cloud Computing
Dataware Housing : Need, Benefits, Subject oriented Data, Data granularity, Information flow mechanism.

Unit IV: **Meta Data** : Rele, Classification, Management, DWH architecture, DWH and data marts, DWH Scheme, Keys in DWH schema, OLAP in DWH, OLAP Design considerations, OLAP models, Security Issues.

Unit V: **Data Mining :** Introduction, Fundamentals, Classifications, Major Issues, Mining frequent patterns, association & correlation, clustor analysis, evolution analysis

Unit VI: Market Basket Analysis, Apriori Algorithm, Association Regeneration, constraint based association rules
Classification and Prediction, Bay's Theorem, Rule Based classification.

BOOKS RECOMMENDED :

1) C.J. Date : "Database Processing", Addison Wesley
2) Mahajan : " Distributed Computing"
3) M.H. Danham : "Data mining Introductory & Advance topics", PE
4) Han, Kamber : "Data Mining", Morgan Kaufmah
5) Dataware Housing : OUP
6) Dataware Housing : John Wiley

1RNME4 WIRELESS COMMUNICATION & NETWORK COMPUTING

Unit I: Wireless Communication present scenario, fundamentals, Introduction to source coding and channel coding

Unit II: Radio propagation over wireless channels, Brief overview of channel models.

Unit III: Wireless Communication Systems Standards, MAN, WLAN, WMAN, Introduction to mimo, Brief Overview of simulation.

Unit IV: Spread spectrum technology, multiple access wireless communication, GSM.

Unit V: GPRS, imode, UmTS, Wireless data networks, RFID.

Unit VI: Connecting the last mile, wireless Information Security, convergence-3G, Future Trends, 4G.

TEXT BOOKS :
1) Upen Dalal : Wireless Communication, Offord.
2) Vern A D : Wireless Data Technologies, Wiley

REFERENCE BOOKS:
1. Vern A.D."Wireless Data Technologies" : Wiley
2. Ray ES : "Space/Tererestrial Mobile Network Internet access & QOS, : Wiley
3. Rai Zing : "Multihop Wireless Networks, Wiley
4. Yu Kwang, Ricky Klark, Vincnt K.N.Lau : wireless Internet & Mobile Computing Interoperability & Performance" : Wiley

1RNME5 ELECTIVE I
(1) EXPERT SYSTEM DESIGN & INTELLIGENT SYSTEMS

Unit I: Introduction to ES : Overview of AI, Intelligent systems, knowledge representation, principles & techniques evaluating & comparising ES, TMS, Nonmonotonic justification, maintaining multiple contacts.

Unit II: Rule based systems : Canonical systems, production systems, production systems, associate nets & frame systems, OOAD for ES.
University Issues, knowledge acquisition, ES shells, knowledge acquisition methods, tools for building ES.

Unit III: Fuzzy Systems : introduction, foundation of fuzzy systems, fuzzy relations, arithmetic operations of fuzzy numbers, linguistic

descriptions and their analytical forms, defuzzification methods, fuzzy logic in control and decisionmaking applications, hardware realization of the analog fuzzy controller.

Unit IV: Artificial Neural Networks : introduction, Neuron physiology, artificial neurons, artificial neural networks, features of artificial neural networks, backpropagation training algorithms, functional link neural networks, cascasde correlation neural networks.

Unit V: Genetic Algorithms and Evolutionary Programming : introduction, genetic algorithms, procedures of genetic algorithms, the working of genetic algorithms, the logic behind genetic algorithms, evolutionary programming, the working of evolutionary programming, genetic-algorithmbased machine learning classifier system.

Unit VI: Swarm Intelligent Systems : introduction, background of Ant intelligent systems, importance of the ant colony paradigm, ant colony systems, development of the ant colony systems, application of ant colony intelligence, the working of ant colony systems, particle Swarm intelligent systems, engineering applications of PSIS and future research.

TEXT BOOKS :
1) Peter Jackson "Introduction to Expert System" PE 3rd Ed., 2003
2) N.P.Padhy, "Artificial Intelligence and Intelligent Systems", Oxford.

REFERENCE BOOKS :
1) Hakin, Simon 2003, "Neural Networks : A Comprehensive Foundation", PHI, New Delhi.
2) Kosko B. 1997, "Neural Networks and Fuzzy Systems", PHI, New Delhi.
3) Rajasekaran S. and G.A.Vijayalakshmi Pai, 2003, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, New Delhi.
4) Sriram, Ram D. 1977, "Intelligent Systems for Engineering - AKnowledge-Based Approach", Springer, London.

1RNME5 ELECTIVE I
(2) ALGORITHMICS

Unit I: Introduction: Mathematical Notations, Proof techniques, Elementary algorithmics, Efficiency of algorithms : Examples. Asymptomatic notations: conditional asymptomatic

notations. Notation with several parameters. Operations on asymptomatic notations.

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

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

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

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

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

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

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

1RNME5   **ELECTIVE I**
(3) INFORMATION TECHNLOGY MANAGEMENT

Unit-I : IT and Strategy : Information revolution, Business and strategy. IT Strategy, Strategy and Success, Design Parameters, Strategic

positioning, Evolution of strategy sequences and getting the right, development of a strategy ,types of strategy ,context and strategy.

Unit-II : Managing IT :IT management and its roles, It governance, It governance and strategy, Technology management process, Technology selection, Strategic aspects of technology. IT and business alignment, Risk Management ,Exploiting IT Capabilities, Deploying IT in strategic manner ,Strategic planning for information technology and frameworks , Measuring IT, Performance Measures : Balanced Score Card.

Unit-III : E- strategy : What is e- strategy. E-business and E-strategy, E- business objectives ,E-Commerce and E-Business, Making e- strategy work, E-strategy and the E-economy.
IT strategies for IT companies: Project Vs Product Companies , Strategies aspects for an IT product company, IT Strategic perspective for product company ,IT Strategies for Product company information Technology Strategy development, Product life cycle and project life cycles.

Unit-IV : IT strategies for Knowledge Management
Knowledge Management, Knowledge Management and IT strategies, role of Knowledge Management in IT strategies for IT companies, knowledge industry and knowledge strategy knowledge workers, IT strategic services ,product and consulting .
IT strategies for non –IT companies : Role of IT in non –IT companies , IT Investment decision, measurement of IT,IT strategies for Non-IT companies, IT supply chain management and constraint management, IT enabled supply chain management.

Unit-V : IT Strategies in specific scenario, Enterprise resource planning implementation, mapping IT strategies initiatives to ERP ,supply chain contribution and business strategy, IT strategies for business process outsourcing,
IT strategy implementation : IT strategy implementation, Development and need of it strategic plan ,IT strategy implementation to gain competitive advantage, IT strategy and leadership, IT strategy and differentiation , Execution and IT strategy .

Unit-VI : Global dimension of It Strategy : IT strategies in global environment, Global product cycle, Making It global scenario, globalization and competitive strategy, global project management, Mergers and acquisitions ,IT compatibility in M&A.

TEXT BOOK:

Parag Kulkarni,Pradip K Chande "IT Strategy for Business", OXFORD University Press.

REFERENCE BOOKS :

1. Earl. M, "Management Strategies for Information Technology ",Prentice Hall.
2. Gottschalk , P " Strategic Knowledge Managements Technology " IGP USA
3. Hill , C and G Jones " Strategic management " Houghton Miffen USA
4. Honeycutt J " Knowledge management Strategies" , Microsoft Press USA.

2RNME1   REAL TIME EMBEDDED SYSTEMS

Unit I: Introduction to ES : Application, categories, architecture overview, specialties, Recent Trends.
Architecture : Hardware Architecture, Software Architecture

Unit II: Programming of ES : Memory Management, Timing, Device Drivers, Productivity Tools, Code Optimization, Coding guidelines, C++ & Java for ES.
ES development process & design, Implementation, Integration, testing, Packaging, Configuration management, projects.

Unit III: Hardware Platforms and Communications : Types of hardware platforms, microcontrollers, communication interfaces, RS232, RS422, US, Infrared, IEEE, Ethernet, Bluetooth.

Unit IV: RTOS & ES : Kernel architecture, Tash scheduler, ISRs, Semaphones, Mutex, Mailboxes, Message Censes, Event Registers, Pipes, Signals, Timers, Memory Management, Priority Inversion, Embedded OS, RTOS, Handheld OS, OS S/W, Embedded winXP, Perting RTOS on ES Board.

Unit V: Sample ES : Representative OS, Es programming in Linux, Shell programming, system programming, project overview for navigation system, protocol convertor, Database applications, Mobile Java applications.

Unit VI: Embedded S/W development for Microcontroller : Development Environment, Tools, Application development, RFID System, DSP based system, Future Trends.

TEXT BOOK :

1) Embedded / Real Time Systems : "Concept, Design & Programming", Black Book – Prasad Dreamtech Pub.

REFERENCE BOOKS:

1. Null & Labour : Essentials of Computer Architecture & Organization",
Pub : Jones & Bartlet (VIVA Pub.)
2. Heath :"Embedded System Design", Pub : CBS
3. Shaw : Real Time Systems & Softwares" : Pub : CBS
4. Zurawaski : "Embedded Systems Handbook", Pub : CBS

2RNME2 PERFORMANCE ANALYSIS FOR IMAGING SYSTEMS

Unit I Basic Principles of Imaging, Imerging System, Performance, Imaging System Isues

Unit II Acquisition of Images, Image quality, Signal Processing, Performance evolution

Unit III Signal & Image processing, Image resampling performance issues

Unit IV Super resolution, Image debluzzing, performance analysis

Unit V Image contrast Enhancement, Non uniformity correction, performance issues

Unit VI Time Scale, Image Function, Performance measurement

TEXT BOOK :

"Signal Processing and Performance Analysis of Image Systems" : S. Susan Young, Renald GD, Edlie L.J., Artech House Inc.

REFERENCE BOOKS:

1. Gomes : "Image Processing for Computer Graphics" Pub : CBS
2. Abut : "DSP for in-vehicle and mobile systems" Pub: CBS
3. Adali : "Adaptive Signal Processing : Next Generation Solution" Pub : CBS

2RNME3   INFORMATION TECHNOLOGY & SECURITY

Unit I Introduction, Security, Public key cryptography, Hash function, quantum, cryptography, cryptography protocols.

Unit II PKD, wireless network access, mobile security, Secure software Engineering, ICT Security.

Unit III ICT & forensic, Risk Asessment, IS management, Hacking & cracking, Reconnaissance

Unit IV Scanning tools, sniffers, TCP/IP vulnerability, Password cracking, spooling

Unit V Session Hacking, Hacking N/W devices, Trojan Horses, Dos Attacks, Buffer Overflows.

Unit VI Programming experts, mail vulnerability, Web Application Vulnerability, Windows Vulnerability, Linux Vulnerability, Incident Handling.

TEXT BOOKS :

1) Multidisciplinary Introduction to Information Security Stig FM – CRC Press

2) Computer Seciruty, Concepts, Issues & implementation – Cenage Learning.

REFERENCE BOOKS:

1. Workman, Phelps, Gathegi :"Information Security for Managers" Pub : Jones & Bartlet (VIVA Pub.)

2. Newman: "Computer Security" Pub: Jones & Bartlet (VIVA Pub.)

3. Johnson & Merkov : "Security Policies and Implementation Issues" , Pub: Jones & Bartlet (VIVA Pub.)

4. Gibson : "Managing Risks in Information Systems", Pub: Jones & Bartlet (VIVA Pub.)

5. Basworth : "Computer Security Handbook", Pub : Jones & Bartlet (VIVA Pub.)

2RNME4   SOFTWARE ENGINEERING, TESTING & RELIABILITY

Unit I: Software Engineering Reviews : Software Process models, requirements Engineering, Introduction to UML, Meta Model, Extensibility Mechanism, Introduction to OCL, Behivirol Model, Design Engineering, OOD.

Unit II: Software Testing : Introduction to Testing Methodology, Terminology, Methodology, Verification, Validation.

Unit III: Testing Techniques : Dynamic Testing – Black Box & White Box, Static Testing, Validation Activity, Regression Testing.

Unit IV: Test Management & Quality Management :
1st organization, Test Planning, Software Metrics, Software Quality, Quality Management, Quality factors, Test process maturity models. Testing Tools, OOT Basics, Testing of Web Based systems, Debugging.

Unit V: Reliability Engineering : Introduction, Reliability maths, Life data analysis and Problem plotting,, Monte Carlo in simulation.

Unit VI: Software Reliability : Introduction, Load strength Inferences, Reliability Prediction and modeling, software reliability model, patterns.

BOOKS RECOMENDED:

1) Sommerville : "Software Engineering", 7th Ed., Addison-Wesley 2004

2) Grandy Booch, Ram Bough, Jacobson, "Onified modeling language users guide", 2nd Ed., Addison-Wesley

3) Marsh Chauhan : Software Testing, Principle & Practice", Publishing.

4) Pratric DT " Practical Reliability Engineering" Wiley

REFERENCE BOOK :

1. Richardson & Thies :"Secure Software Design, Pub : Jones & Bartlet (VIVA Pub.)

2RNME5   ELECTIVE II
(1) ADVANCED COMPILING TECHNIQUES

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

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

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

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

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

Unit VI: Data-Flow Analysis: Basic Concepts, Taxonomy of Data-Flow Problems, Solution Methods: Iterative, Lattices of Flow Functions and Control-Tree-Eased. Structural Analysis, Interval Analysis,

Du- Chains, Ud-Chains, Webs, SSA Form. Dealing with Arrays, Structures, and Pointers. Automating Construction of Data-Flow Analyzers.

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

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

2RNME5   **ELECTIVE II**
(2) MOBILE COMPUTING

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

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

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

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

Unit V: Wireless MANs, LANs and PAN's: Wireless metropolitan area networks (WMANs), Wireless Local Area networks (WLANs),

and Wireless Personal Area networks (WPANs), Recent Advances, Introduction, and Ultra –wideband technology.

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

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

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

2RNME5   ELECTIVE - II
(3) DIGITAL MEDIA DEVELOPMENT

Unit I : Introduction to Multimedia Systems design, Elements,Systems architechture & technologies , Objects for multimedia systems , Multimedia data interface standards, Multimedia Databases, Data Compression need, lossy and lossless compression, binary image compression Schemes, color, grey and still video image compression , Full motion video compression , audio compression.

Unit II : Data and file format standards RTF, TIFF,RIFF, MIDI , JPEG ,AVI, MPEG Standards, video and image display systems, image scanners , Digital voice and audio, Digital camera, video images and animation, Full motion video

Unit III : Telecommunications considerations for Multimedia, Specialised processors , ISDN, LAN and WAN for Enterprise Multimedia Applications, Distibuted Object Model, Multimedia communication protocols (UDP , RTP , RTCP , TELNET) Multimedia Applications and Design issues,,Virtual Reality Design,Componects of Multimedia Systems,, Application Workflow & Distributed Application Design Issues

Unit IV : Multimedia Authoring and User Interface, Design Considerations, Hypermedia Applications, Information Access,

Object display, Hypermedia Messaging, Integrated document management

Unit V : Distributed Multimedia Systems, Components, Client-server Operation, Object Server, Network Performance Issues, Distributed Multimedia databases, Managing distributed Objects

Unit VI : System Design: Design issues,requirements, feasibility, Performance Analysis, Design for performance , Multimedia Systems Design , Extensibility and example.

BOOKS RECOMMENDED:
1. Prabhat K Andleigh and Kiran Thakrar "Multimedia Systems Design" (PHI Publications).
2. Fred Halsall," Multimedia Communications by (Pearson Publications).
3. Ze-Nian Li, Mark S.Drew,"Fundamentals of Multimedia" (Pearson Publications).
4. John K.Koegel Buford, "Multimedia Systems" (Pearson Education)

REFERENCE BOOKS:
1. Game Engineering Design & Implementation - Alan Thorn, Pub : Jones & Bartlet (VIVA Pub.)
2. Fundamentals of Game Development : Chandler & Chandler, Pub : Jones & Bartlet (VIVA Pub.)

2RNME 6 CSIT LAB - III: This lab shall be based on 2RNME1 - Real Time Embedded System
AND   **2RNME2** - Performance Analysis for Imaging Systems

2 RNME 7   CSIT LAB - IV : This lab shall be based on 2RNME 3- Informn.Tech.& Security
AND   **2RNME4** - Software Engineering, Testing & Reliability
AND/OR   **2 RNME5 (E-2**) Mobile Computing (if offered)

M.E.(FULL-TIME)/
M.TECH.(FULL-TIME)

Prospectus No.111736

संत गाडगे बाबा अमरावती विद्यापीठ
SANT GADGE BABA AMRAVATI UNIVERSITY

अभ्यासक्रमिका

(FACULTY OF ENGINEERING & TECHNOLOGY)

PROSPECTUS

Prescribed for
Post Graduate Two Year Degree Course
Master of Engineering
(Full-Time)
Credit Grade System
I & II Year Examinations
2010 - 2011 & Onwards

Branches : 1) **M.E. Civil (Structural Engineering)**
2) **M.E. Mechanical (CAD/CAM)**
3) **M.E. Digital Electronics**
4) **M.E.Electrical (Electrical Power System)**
5) **M.Tech. Chemical Technology**
   (Membrane & Separation Tech.)
6) **M.Tech. (Chemical Engg.)**
7) **M.E. (Computer Sc. & Engg.)**
8) **M.E. (Information Tech.)**
9) **M.E. (Electronics & Tele.)**
10) **M.E. (Computer Engg.)**

2010

Visit us at www.sgbau.ac.in

Price Rs. 15/-

SANT GADGE BABA AMRAVATI UNIVERSITY AMRAVATI

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 Ordinances Booklet the various conditions/ provisions pertaining to examination as prescribed in the following Ordinances.

Ordinance No. 1	:	Enrolment of Students.
Ordinance No. 2	:	Admission of Students
Ordinance No. 4	:	National cadet corps
Ordinance No. 6	:	Examinations in General (relevent extracts)
Ordinance No. 18/2001	:	An Ordinance to provide grace marks for passing in a Head of passing and Inprovement of Division (Higher Class) and getting Distinction in the subject and condonation of defficiency of marks in a subject in all the faculties prescribed by the Statute NO.18, Ordinance 2001.
Ordinance No. 9	:	Conduct of Examinations (relevent extracts)
Ordinance No. 10	:	Providing for Exemptions and Compartments
Ordinance No. 19	:	Admission of Candidates to Degrees.
Ordinance No. 109	:	Recording of a change of name of a University student in the records of the University.

Ordinance No. 6/2008	:	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

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

1SFSE1   INTRODUCTION TO EARTHQUAKE ENGINEERING

Interior of earth, Engineering geology of earthquakes, plate tectonics, Seismicity of the world, tectonics features of India, Faults, Propagation of earthquake waves, Quantification of earthquake (magnitude, energy, intensity of earthquake), Measurements of earthquake (accelerograph, accelerogram recording), Determination of magnitude, Epicental distance, focal depth, etc. Ground motion and their characteristics, Factors affecting ground motions

Guidelines for achieving efficient seismic resistant planning, selection of sites, importance of architectural features in earthquake resistant buildings , continuity of construction, projection & suspended parts, special construction features like separation of adjoining structure, crumble section ,stair case etc, twisting of building, seismic effects on structures, inertia forces, horizontal & vertical shaking

Indian seismic codes, Behavior of masonry structure during earthquake, bands & reinforcement in masonry building opening in walls, importance of flexible structures, Behavior of R.C. building in past earthquakes

Concept of earthquake Resistant design, design philosophy, four virtues of EQRD: Stiffness, Strength, ductility and Configurations, Introduction to Capacity design concepts, Introduction to IS: 1893
Introduction to Soil liquefaction. Geotechnical design considerations.

Reference Books:

1.   Dowrick, D. J.; Earthquake Resistant Design for Engineers & Architects; John Willey & Sons; 2nd Edition; 1987
2.   Housner, G.W. & Jennings, P.C.; Earthquake Design Criteria, Earthquake Engineering Research Institute; Oakland; California; USA; 1982
3.   Newmark, N.M. & Hall, W.J.; Earthquake Spectra & Design; Earthquake Design Criteria, Earthquake Engineering Research Institute; Oakland; California; USA; 1982
4.   Wakabayshi, M.; Design of Earthquake Resistant Buildings, McGraw Hill Books Company; 1986
5.   Okamoto, S.; Introduction to Earthquake Engineering; University of Tokyo press; 2nd Edition; 1984

6.   Kramer, S.L.; Geotechnical Earthquake Engineering; Prentice Hall; New Jersey; 1996
7.   Bolt, B.A.; Earthquakes; W. H. Freeman & Company; NY; 1988
8.   Duggal S. K., Earthquake Resistant Design of Structures, Oxford University Press 2007

1SFSE2   THEORY OF PLATES AND SHELLS

Governing differential equations of thin rectangular Plates with various boundary conditions and loadings.

Introduction, Moment of curvature relation in pure bending, metrical bending of circular plates (Lateral loaded, uniformly loaded with clamped)

Laterally loaded rectangular plates, Differential equation of the deflection surface (Lagrange's equation), Boundary conditions, simply supported plates under sinusoidal loading, Navier's solution.

Finite differential method, differential equation to bent surface of anisotropic plate, Application to grid.

General shell geometry, classifications, stress resultants, equilibrium equation, Membrane theory for family of shells (Parabolic, Quaternary, Cycloid, Circular, hyperbolic).

Classical bending theories of cylindrical shells with and without edge beams, Finster Walder Theory, Schorer's Theory
Approximate analysis & design of cylindrical shells.

Reference Books:

1.   Timoshenko, S. P. & Kriegar, W.; Theory of Plates & Shells; McGraw Hill; NY; 1970
2.   Szilard, R.; Theory and Analysis of Plates; Prentice Hall; 1974
3.   Novozhilov, V.V.; Thin Shells; Noordho of Groningen; 1964
4.   Ramaswamy G. S., Design of Concrete Shells; Krieger Publication Co.; 1984
5.   Chandrasekhar K.; Theory of Plates; University Press India Ltd.; Hyderabad; 1st Edition; 2001

1SFSE3   COMPUTER METHODS OF STRUCTURAL ANALYSIS

Objective:
 The objective of this course is to understand the basic of structural analysis using stiffness approach, understand the concept of mathematical model of structure and hand on training on computer to solve problems.

Syllabus:
Memory problems in large structural systems: Incore & outcore techniques, half band storage and solution, sky line storage technique and solution, frontal technique

Flexibility method (structure approach) - flexibility coefficient. , physics meanings, basic determinant or released structure, choice of redundant, geometrical compatibility conditions. Matrix formulations, hand solution of simple problems on truss, beams, frames, with loads

Introduction to stiffness and flexibility approach, Stiffness matrix for spring, Bar, torsion, Beam (including 3D), Frame and Grid elements, Displacement vectors, Local and Global co-ordinate system, Transformation matrices, Global stiffness matrix and load vectors, Assembly of structure stiffness matrix with structural load vector, Analysis of plane truss, plane frame, plane grid and space frames subjected to joint loads.

Analysis for member loading (self, Temperature & Imposed) Inclined supports, Lack of Fit, Initial joint displacements. , Plane frame with effect of shear deformation, Global load vector for rigid jointed plane frame.

Reference Books:

1. Cheng, F.Y.; Matrix Analysis of Structural Dynamics; M. Dekke; NY; 2000
2. Kanchi M. B.; Matrix Methods of Structural Analysis; John Willey & Sons; 2nd Edition; 1999
3. Bathe, K.J.; Finite Element Procedures; Springer; 2nd Edition; 2002
4. Kasmali Aslam; Matrix Analysis of Structures; Brooks/Cole Publishing Co.; 1999
5. Cook R. D. et. al; Concepts and Applications of Finite Element Analysis; John Willey & Sons; NY; 1995
6. Gere W. and Weaver J. M.; Matrix Methods of Structural Analysis, 3rd Edition; Van Nostrand Reinhold; New York; 1990
7. Martin; H.C.; Introduction to Matrix Method of Structural Analysis; McGraw Hill Book Co.; 1966

Pre-requisite:
Knowledge of Matrices, Solution of simultaneous equations by using Gauss-Seidal, Gauss elimination & Crout's Method.

1SFSE4 STRUCTURAL DYNAMICS

Sources of vibration, types of excitations, Spring action and damping; Degrees of freedom; Application of Newton's laws, D'Alembert's principle, Single degree of freedom systems; Mathematical model of physical systems; free vibrations, damped free vibrations, critical damping, and response, periodic loading expressed in harmonics, dynamic load factor.

Single degree freedom system, response to impulsive loading, rectangular, triangular pulses, Duhamel Integral. Response to general dynamic loading, Numerical schemes such as Wilson-Theta, Newmark-Beta, constant linear acceleration & time domain and frequency domain analysis.

Multi-degree freedom system, stiffness and flexibility approaches, Lumped-mass matrix, free vibrations fundamental Frequencies and mode shapes, orthogonality of, response to dynamic loading, Formulations of equations of motion, mode superposition method, modal matrix, numerical scheme of iteration method.

Vibration of Continuous Systems: Free vibrations of Continuous systems- axial and transverse vibration of bars / beams. Response of continuous systems to dynamic loads. Rayleigh-Ritz method.

Structural response to earthquake, Response spectrum design earth quake, IS code provisions for multistory frames.

Reference Books:

1 Chopra, A. K.; Dynamics of Structures; Prentice Hall; 1995
2 Clough, R.W.; & Penzin, J.; Dynamics of Structures; McGraw Hill; 1993
3 Humar J. L.; Dynamics of Structures; Prentice Hall; 1990
4 Mario, Paz; Structural Dynamics; CBS Publ.; N-Delhi; 1995
5 Timoshenko, S.; Advanced Dynamics; McGraw Hill Book Co; NY; 1948
6 Meirovitch L.; Elements of Vibration Analysis; 2nd Edition; McGraw Hill International Edition; Singapore; 1986
7 Biggs, J.M.; Introduction to Structural Dynamics; McGraw Hill; NY; 1964

1SFSE5 EARTHQUAKE RESISTANT DESIGN OF REINFORCED CONCRETE STRUCTURES

Review of Limit State Design of RC members. Confinement of concrete Philosophy of earthquake resistant design, Ductility, Redundancy & Over strength, Damping, Supplemental Damping, Base Isolation, Codal Provisions. Seismic behaviour of concrete,

Beams (Flexural, Shear and torsion)

Uni-axial and biaxial Beam-column (Axial, shear and moments)

Building frames, frame-shear wall buildings, Braced Buildings, Preliminary sizing and Mathematical modeling of buildings with different structural systems with and without diaphragms,

Earthquake, wind and other (i.e. blast, snow) load calculations along with dead load and live loads and their combinations.

Special aspects in Multi storied buildings: Effect of torsion, flexible first story, P-delta effect, effect of soil-structure interaction on building response, drift limitation.

Analysis and Design of multi-storied buildings with masonry infill,

Reference Books:

1. Paulay T. and Prestiley M.J.N.; Seismic design of R C & Masonry Buildings; John Willey & Sons; 2nd Edition; 1999
2. Booth, E.; Concrete Structures in Earthquake Regions; Longman Higher Education; 1994
3. Raynolds C.E.; Reinforced Concrete Design Handbook; 9th Edition; Rupa & Company; Calcutta; 1981
4. Raynolds, C.E.; Basic Reinforced Concrete Design; Vol.-II; Conc. Publications Ltd.; 1962
5. Fintel M.; Handbook of Concrete Engineering; 2nd Edition; CBS Publishers, Delhi; 1986
6. Park and Paulay; Reinforced Concrete Structures, John Wiley and Sons
7. Duggal S. K., Earthquake Resistant Design of Structures, Oxford University Press 2007

1SFSE6   EARTHQUAKE RESISTANT DESIGN OF REINFORCED CONCRETE STRUCTURES: LABORATORY

Complete Design calculations and Drawings to be developed for a multi-storied building based on the above syllabus.

1SFSE7   COMPUTER AIDED ANALYSIS & DESIGN OF STRUCTURES: LABORATORY

- Introduction to Computer systems and facilities. Operating systems, Software, Software development processes.

- Introduction to software packages like STAADPRO, STRUDS, SAP-2000, Etab and ANSYS

****

SEMESTER : SECOND

2SFSE1   FINITE ELEMENT METHOD

Introduction to Finite element method, History, Principles & discretization, Applications

Introduction to Rayleigh Ritz Method, Stress strain relationship, strain displacement relationship, Equilibrium equations (Total potential approach, Virtual work approach)

Shape function, Stiffness matrix, load vector for 2-D elements (Plane stress, Plane strain & Axi-symmetric) using Displacement formulation. Cartesian and Iso-parametric element formulation. Numerical Integration, convergence of Isoperimetric elements.

Formulation of 1-D elements (BAR, TORSION, BEAM) and 3-D solid elements.

Computer Implementation of FEM procedure for plane truss, Plane stress, Plane strain and Axi-symmetric problems.

Constraint Equations (Penalty, Lagrangian Method), Patch test, Mathematical modeling of structures.

Reference Books:
1. Zienkiwicz O. C. & Taylor, R. L.; Finite Element Method; Vol-I, II & III; Elsevier; 2000
2. Hughes, T .R. J.; Finite Element Method; Dover Publication; 2000
3. Bathe, K.J.; Finite Element Procedures; Pringor; 2nd Edition; 2002
4. Reddy, J. N.; Finite Element Method; John Willey & Sons; 1982
5. Buchanan, G.R.; Finite Element Analysis; McGraw Hill Publ.; NY; 1995
6. Belegundu A.D. & Chandrupatla T.R.; Finite Element Method in Engineering; Prentice Hall India; 1991
7. Pilkey W.D. & Wunderlich W.; Mechanics of Structures, Variation and Computational Methods; CRC Press; 2nd Edition
8. Cook, R. D. et. al; Concepts and Applications of Finite Element Analysis; John Willey & Sons; NY; 1995
9. Prathap G.; Finite Element Method; Kluwer Academic Publ.; Dordrecht; 1993
10. Irons, B. & Ahmad, S.; Techniques of Finite Elements; Elliswood, London; 1980

2SFSE2   ADVANCED DESIGN OF STEEL STRUCTURES

Introduction to Allowable Stress Design, Plastic design, Limit state Design

Loadings as per IRC, IRS, IS (IS:800-2007, IS: 875 part 1-V, IS: 1893) applicable to various steel structures.

Design of Beams, Beam-column, Plate Girders, Open web structures and Space structures by limit state method.

Bridges, Industrial Buildings including crane girders by using Limit State method

Welded and riveted connections.

Composite structures.

Reference Books:
1. Owens, G.W. & Knowles, P.R.; Steel Designers Manual; Blackwell; 1994

2. Gaylords E.H. & Gaylords, C. N.; Design of Steel Structures; McGraw Hill Publ.;1998
3. Steel Design Manual; ELBS and Granada Publishers; London
4. Johnson, R.P.; Composite Structures of Steel and Concrete; Volume-I; Granado Publishing Ltd.; London; 1975
5. Salmon and Johnson; Steel Structures – Design and Behaviour, Harper and Collins Publishers.
6. Subramanian N., Design of Steel Structures, Oxford University Press 2008
7. IS 800-2007, BIS

2SFSE3   REPAIRS & RETROFITTING OF STRUCTURES

Principles of Repair and Retrofitting, Terminology in Repair, Restoration, Strengthening and Rehabilitation, Criteria for Repair, Restoration and Retrofitting; Repair Materials; In-situ testing methods for RC and masonry structures; Seismic Hazard Evaluation; Techniques of repair and retrofitting of masonry buildings; Seismic evaluation of RC building-Demand capacity method, pushover analysis and performance based approach; Techniques of Repair and Retrofitting in RC buildings; Retrofitting of buildings by seismic base isolation and supplemental damping; Retrofitting of heritage structures; Retrofitting of bridges; Case studies in retrofitting.

Reference Books:
1. Pankaj Agrawal & Manish Shrikhande, Earthquake Resistant Design of Structures, Prentice Hall India.
2. Duggal S. K., Earthquake Resistant Design of Structures, Oxford University Press 2007

2SFSE4   DESIGN OF PRESTRESSED CONCRETE STRUCTURES

1. Introduction to pre-stressing, Analysis for pre-stress, Load balancing.
2. Partial pre-stressing, Grouting of beams, fire resistance of beams, special problems like stress corrosion, fatigue under dynamic loading etc.
3. Basic design for flexure (Type I structures), Introduction to Limit state method.
4. Limit state of collapse: Shear, Bond, deflection & cracking in pre-stressed concrete member
5. Comprehensive design of a rectangular and/or a T-section by limit state method.
6. Design of Poles, Piles and Sleepers.
7. Design and analysis of pre-stressed concrete pipes and circular tank.

8. Analysis and design of end block.
9. Comprehensive design of post-tensioned girders.
10. Analysis and design of continuous beams up to two spans linear transformation, concordant cable.
11. Analysis and design of portal frame, single storey and limited to two bays.

Reference Books:
1. Krishna Raju, N.; Prestressed Concrete Structures; TMH; Delhi; 1981
2. Lin, T.Y. and Burns, N.H.; Design of Prestressed Concrete Structures; 3rd Edition; John Wiley & Sons; NY; 1981
3. Ashok Jain, R. C. C. Design
4. P. Dayaratnam, Prestressed Concrete Structures, Oxford & IBH
5. Latest relevant BIS codes

2SFSE5   Elective
(1) SUBSTRUCTURES AND FOUNDATION DESIGN

Analysis and design of Piers, Abutments and Retaining walls.

Shallow foundations: Individual and combined footings for axial and bending loads (Uniaxial and biaxial), Loss of contacts.

Rafts, Annular Footings, Rigid and flexible foundations, Beams and slabs on elastic foundations.

Deep Foundations: Piles and Wells foundations.

Design of Machine Foundations.

Reference Books:

1. Hetenyi M.; Beam on Elastic foundation; University of Michigan Press; 1946
2. Bowles, J. E.; Foundation Analysis & Design; McGraw Hill; 5th Edition; 1996
3. Swami Saran; Soil Dynamics and Machine Foundations, Galgotia Publications (P) Ltd, New Delhi, 1999
4. Srinivasulu P, Vaidyanathan C V ; Handbook of Machine Foundation
5. Kurian N P; Modern Foundations – Introduction to advanced Techniques

2SFSE5   **Elective**
(2) EARTHQUAKE RESISTANT DESIGN OF BRIDGES AND DAMS

Bridges:

Performance in past earthquakes, Types of bridge superstructure and introduction to their design, sub-structure, bearings, IRC / IRS Bridge loadings and other codal recommendations, Performance of Bridges in past earthquakes.

Seismic design philosophy for Bridges, State of art Modeling of bridges, Seismic Design of Substructures, Capacity design of substructures and ductile detailing,

Seismic design of well and pile foundations

Dams:
Performance of concrete and masonry gravity dams, seismic design considerations, dynamic analysis of dams. Dam-foundation-reservoir interaction, bending, shear and finite element method of analysis.

Reference Books:

1   Chen W.F. and Duan L., Bridge engineering Handbook; CRC Press; 1999

2   Fintel, M.; Handbook of Concrete Engineering; 2nd Edition; CBS Publishers Delhi; 1986

2SFSE5   **Elective**
(3) THEORY OF ELASTICITY AND STABILITY

Stress at a point, relationship between stresses and strains, Elastic modulii, Basic equations of theory of Elasticity. Plane stress-strain, Airy's stress function, strain-displacement relationship, Principal Planes and Principal stresses in three dimensions, equilibrium and compatibility in rectangular coordinates and other coordinate systems,

Simple applications in tension, bending and torsion.

Concept of Stability, Axial buckling of columns by Energy Criteria of Stability & approximate methods, lateral torsional buckling of beams and beam columns, Coupled axial torsion and flexural buckling.

Buckling of rectangular thin plates.

Reference Books:

1.   Timoshenko, S. P.; Theory of Elasticity; McGraw Hill; 3rd Edition; NY; 1970

2.   Timoshenko, S. P.; Theory of Elastic Stability; McGraw Hill; 2nd Edition; NY; 1961

3.   Trahair N.S.; Flexural Torsional Buckling of Structures, E&FM SPON; London

4.   Chen, W.F.; theory of Beam-Column-Space Behaviour and Design; 2nd Vol.; McGraw Hill;

2SFSE5   **Elective**
(4) DESIGN OF ENVIRONMENTAL STRUCTURE

1.   Analysis and design of cylindrical shaped E.S.R, supported peripherally & internally making the tank floor a solid continuous slab system, Analysis and design of staging.

2.   Design of underground water tanks, swimming pools, Jacks well

3.   Design of Water Treatment Plant units, aeration tank, Clari-floculator, flash mixers.

4.   Design of water sumps, filters, Design of digestion tank.

Reference Books:

1.   Paulay T. & Park R.; Reinforced Concrete structures; John Willey & Sons

2.   Krishna Raju N., Advanced R.C.C. Design, TataMcGraw Hill, New Delhi Reynolds C.E.; Reinforced Concrete Design Handbook; 9th Edition; Rupa & Company; Calcutta; 1981

3.   Punmia B. C., R. C. C. Design, Laxmi publications

4.   Datta N. P., Waste Water Treatment, Oxford & IBH Publication

2SFSE6   **ADVANCED DESIGN OF STEEL STRUCTURES:**
                                  LABORATORY
Complete Design calculations and Drawings to be developed for the following structures based on syllabus For the relevant theory subject (2SFSE2)
    1.   Design of a steel bridge
    2.   Design of an Industrial shed

2SFSE7 DESIGN OF PRESTRESSED CONCRETE STRUCTURES:
                                  LABORATORY
Complete Design calculations and Drawings to be developed for the following structures based on syllabus For the relevant theory subject (2SFSE4)
    1.   Comprehensive design of a pre-tensioned Pole
    2.   Comprehensive design of a post-tensioned Girder
    3.   Field visit report
3SFSE1 & 4SFSE1   **SEMINAR AND DISSERTATION**
A Dissertation on Recent Trends in Structural Engineering to be submitted. Marks shall be based on Seminar, dissertation. and Viva-Voce on dissertation.

****

SYLLABUS PRESCRIBED FOR
TWO YEAR P.G. COURSE IN
MASTER OF ENGINEERING
(FULL TIME)
MECHANICAL- CAD/CAM
SEMESTER-I

1MCC1   COMPUTER AIDED DESIGN
Section-A

Introduction to computer technology, Introduction to CAD systems, Computer Aided Design workstation and peripherals, Graphics input/output devices

Design process and CAD models: Computers for design, benefits of CAD

ICG: Configuration of graphic workstations, Vector and Raster displays, Geometric modeling and transformations.

Section-B

CAD software: Graphics system and functions of a graphics package, Graphics databases structure and handling, Operating features, wireframe, solid and surface modeling, approaches to solid modeling.

Computer aided drafting and documentation: Principles and concepts of automated drafting, drafting packages, Introduction to CADD packages like AutoCAD, SOLIDWORKS, CATIA. Graphics standards like GKS, PHIGS, IGES etc

Practical : Five practical based on above syllabus

References:
1) CAD/CAM by Groover and Zimmers
2) Computer Aided Design in Mechanical Engineering by V. Ramamurti
3) CAD by Krishnamoorthy and Rajiv
4) CAD Principles and Applications by Barr, Krimger and Lazaer
5) CAD/CAM Handbook by Teicholz

1MCC2   COMPUTER AIDED MANUFACTURING
Section-A

Numerical control (NC): Fundamentals of NC, merits and demerits of NC, classification of NC systems, basic components of NC systems, instructions, NC tape and coding, control units, features of machine tools and system devices.

Computer Numerical Control CNC: Problems in conventional NC, NC controller technology, computer numerical control, designing CNC systems. NC/CNC machine tools: Types and features, DDA

integrator, DDA hardware interpolator, software interpolators, reference word interpolator, point to point, straight line and contouring control loops

Section-B

NC/CNC part programming: Introduction, computer-aided part programming (APT), CNC part programming

Ddirect numerical control (DNC), Types of DNC Systems. combined DNC/CNC systems,

Adaptive control: ACC and ACO systems, optimization of AC

Practical: Five practical based on above syllabus

References:
1) Yoram Koren- Computer control of manufacturing, McGraw Hill.
2) Mikell P. Groover- CAD/CAM-Prentice-Hall of India pvt. Ltd.
3) Kundar T.K., Rao P.N., Tewari N.K.-Numerical control and computer aided manufacturing; Tata McGraw Hill.
4) D. Kochan- CAM Development in computer integrated manufacturing-Springer Verlag, Berlin

1MCC3   COMPUTER ASSISTED PRODUCTION MANAGEMENT
Section-A

Computer aided process planning: Approaches to CAPP, basic part representation methods, shape producing capabilities, Process economics

Computer assisted QC: co-ordinate measuring machines-construction and types, automated dimensional gauging and in-process gauging

Capacity planning: Roll of capacity planning in manufacturing, planning and control systems, hierarchy of capacity planning decisions links to other system modules, capacity planning and control techniques.

Section-B

Just in time: JIT in manufacturing planning and control, leveling the production, pull system introduction, product and process design, JIT applications

Computer aided inventory control: Computer aided purchasing procedure, simulation of inventory problems

Computer aided materials management: Material requirement planning, computer integrated materials management.

References:
1) Groover M.P.- Automation, Production Systems and CIM.
2) David Bedworth, M.R. Handerson & Philip Wilze- Computer Integrated Design and manufacturing

1MCC4   MECHATRONICS
Section-A

Introduction : Scope, sensors, transducers, selection, contact & non contact optical types, performance, examples. **Actuators :** Principal, types-hydraulic, pneumatic, electrical, contact speed, multispeed, step and continuous variable, actuators with stepping motors.

Computer process controls : Computer process interface, interface hardware, direct digital control, supervisory computer control.

Design of mechatronics elements: Measuring system, control software and user interface, gauging, tool monitoring system, spindle drives, feed drives, servo principles, configuration CNC systems, interfacing, monitoring, diagnostics.

Section-B

Automatic loading and unloading devices, magazines, bunkers, orientors, feeders, separators, etc.

Pneumatic systems: different control components of pneumatic systems and there conversion valves, auxiliary devices, synchronizing, clamping, declamping, application to robotics.

Hydraulic systems: different control components of hydraulic systems, valves and auxiliary devices, design and analysis of hydraulic circuits sequencing, synchronizing, pneumo-hydraulic, CNC lubrication, machine tool applications.

References:
1) Mechatronics by HMT
2) Introduction to Mechatronics and Measurment Systems by Michal B. Histand & David G. Aiciatore.
3) Industrial Automation by Turgam, Mir Publication.
4) Pneumalics and Hydraulics by Stewart.

1MCC5   ELECTIVE-I
1. CONCURRENT ENGINEERING
Section-A

Introduction : Principles, traditional versus concurrent approach, schemes and tools of concurrent engineering, Applications of computers in practice of CE

Basic process issues : Process models, types, importance, relation between models, specifications, technology, automation and process improvement.

Concurrent engineering approach in manufacturing systems: System design procedure, features, assembly resource alternatives, tasks assignments.

Section-B

Concurrent automated fabrication systems : Introduction, methodology, preliminary and details work content analysis, human resource considerations, 'Technical Economic' performance evaluation.

Assembly work stations: Strategic issues, technical issues, economic analysis.

Case studies of concurrent engineering practice.

References:
1) David Bedwarth, M.R. Handerson & Philip Wilze- Computer integrated Design and manufacturing.
2) J.L. Nevines and D.E. Whitney-Concurrent Design of Products and Processes.
3) Procedding of the "Summer school on Application of Concurrent Engineering to Product Development" at P.S.G. College of Technology.

1MCC5   ELECTIVE-I
2. ENGINEERING EXPERIMENTAL TECHNIQUES
Section-A

Generalized measuring systems, different transducers for measurement of different mechanical parameters such as thickness (length), temperature, pressure, force, torque, etc., their design consideration, characteristics, limitation and uses.

Intermediate stage instrumentation, Impedance matching, selection of intermediate instrumentation equipments.

Terminating stage devices- characteristics, limitations

Section-B

Dynamic response of instruments, Effect of different instruments used in the measuring system on the accuracy, sensitivity and performance of the instrument designed to measure a particular mechanical parameter.

Experimental planning, parliamentary, intermediate and final stages, a experimental investigations, selection of instruments based on static, dynamic characteristics and allowable errors, analysis of experimental data, curve fitting, report writing.

References:
1) Experimental methods for engineering by J.P. Holman
2) Measurement System, Application and Design by E.D. Doeblein

1MCC5 **ELECTIVE-I**
3. MANAGEMENT INFORMATION SYSTEMS
Section-A
Objectives and cost benefits of Management Information Systems (MIS). Decision and MIS. A decision environment model, Decision strategies. Characteristics of information: Measurement and amount of Information, Information search, storage and retrieval, Information feed back systems. Planning techniques: Project proposals, reporting and controlling, Determination for information needs and sources, development of conceptual design, development of detailed design, selection of final design, design report, organization for implementation, training of operational personnel, forms and files for data collection, evaluation control and maintenance of information system.

Section-B
Computer Based Information System, MIS and CBIS family, MIS in total CBIS environment, an MIS model and dimensions of MIS model, an overview of tele-processing system(TPS):Techniques for TPS processing models, MIS and TPS, decision support system : definition : characteristics of DSS difference in DSS and development of DSS and its applications, production of sub-systems : Marketing sub-systems, finance sub-systems, personnel sub-system, office automation system : definition, importance, planning and implementation of Automated computer based office communication system.

References:

1) Essentials of MIS by K.C. Laudon, J.P. Laudon; PH
2) Strategic Management and MIS: An Integrated Approach by W. Robson; Pitman Pub.
3) Information systems for Managers by G.W.Reynolds; West Pub.
4) IT for Management by Turban E and McLean E; John Wiley Pub.
5) Foundations of Information systems by Zwass V; Irwin/ McGraw Hill

1MCC 5 **ELECTIVE-I**
4. OPTIMIZATION TECHNIQUES
Section-A
Classical Optimization Techniques: Single-variable and Multi-variable Optimization, Hessian Matrix, Saddle Point, Lagrange Multipliers Method, Kuhn-Tucker Condition

Single-variable Optimization Techniques: Unrestricted Search, Exhaustive Search, Dichotomous Search, Interval-halving Method, Fibonacci Method, Golden-section Method, Quadratic Interpolation Method, Newton Method, Quasi-Newton Method, Secant Method

Multi-variable Optimization Techniques: Evolutionary Optimization Method, Simplex Search Method, Pattern Search Method, Conjugate Direction Method, Steepest Descent Method, Newton's Method, Conjugate Gradient Method, Davidon- Fletcher-Powell Method

Section-B
Constrained Optimization Techniques: Interior Penalty Function Method, Exterior Penalty function Method.

Genetic Algorithm, Simulated Annealing, Artificial Neural Networks.

Theory of Constraints: Introduction to TOC, Optimized Production Technology (OPT), Nine principles of OPT, Five Focusing Steps (The 5FS) of TOC, Capacity Constrained Resources and the Time Buffer, Modeling the Time Buffer, Modeling Return-On-Investment (ROI) in TOC, Comparison of TOC and Local Optimization Approaches

References:
1. Deb K (2004). Optimization for Engineering Design: Algorithms and Examples, Prentice Hall of India.
2. Dennis J Jr, Schnabel R (1996). Numerical Methods for Unconstrained Optimization and Nonlinear Equations, Society for Industrial and Applied Mathematics.
3. Rao S (1996). Engineering optimization, Theory and Practice, New Age International Publishers
4. Ravindran A, Ragsdell K and Reklaitis G (2006). Engineering Optimization: Methods and Applications, 2nd edition, John Wiley and Sons Inc.
5. Goldratt, E. M. and Cox, J. (2004). The Goal: A Process of Ongoing Improvement. 3rd Edition, North River Press. ISBN-10: 0884271781, ISBN-13: 978-0884271789
6. Dettmer, H. William (1997). Goldratt's Theory of Constraints: A Systems Approach to Continuous Improvement, American Society for Quality. ISBN 0873893700, 9780873893701

1MCC 5 **ELECTIVE-I**

5. DESIGN FOR MANUFACTURE, ASSEMBLY AND ENVIRONMENT

Section-A

Introduction: General design principles for manufacturability, Strength and mechanical factors, Mechanism selection, Evaluation method, Process capability, Feature tolerances, Geometric tolerances, Assembly limits - Datum features, Tolerance stacks.

Factors influencing form design: Working principle, Material, Manufacture, Design, Possible solutions, Materials choice, Influence of materials on form design , Form design of welded members, Forgings and castings.

Component design-machining consideration : Design features to facilitate machining, Drills, Milling cutters, keyways, Doweling procedures, Counter sunk screws, Reduction of machined area, Simplification by separation, Simplification by amalgamation, Design for machineability, Design for economy, Design for clampability, Design for accessibility, Design for assembly.

Section-B

Component design - casting consideration: Redesign of castings based on parting line considerations, Minimizing core requirements, machined holes, Redesign of cast members to obviate cores. Identification of uneconomical design, Modifying the design, Group technology, Computer Applications for DFMA.

Design for the environment: Introduction, Environmental objectives, Global issues, Regional and local issues, Basic DFE methods, Design guide lines, Applications, Lifecycle assessment: Basic method, AT&T's environmentally responsible product assessment, Weighted sum assessment method, Lifecycle assessment method, Techniques to reduce environmental impact, Design to minimize material usage, Design for disassembly: Design for recyclability, Design for remanufacture, Design for energy efficiency, Design to regulations and standards.

BOOKS RECOMMENDED:
1. Bralla, "Design for Manufacture handbook ", McGraw hill, 1999.
2. Boothroyd, G, Heartz and Nike, "Product Design for Manufacture", Marcel Dekker, 1994.
3. Dixon, John. R, and Corroda Poli, "Engineering Design and Design for Manufacture and Structural Approach", Field Stone Publisher, USA, 1995.
4. Fixel, J. "Design for the Environment", McGraw Hill., 1996.
5. Kevien Otto and Kristin Wood, "Product Design", Pearson Publication, 2004.

SEMESTER-II
2MCC1 FINITE ELEMENT ANALYSIS
Section-A

Introduction: Discretization, going from part to whole approach, Conventional Numerical methods- finite difference method , method of least squares Ritz method, boundary value problems, displacement method, the equilibrium method, the mix method of solid mechanics, Finite element formulation, variational methods.

Finite Elements- types: triangular, rectangular, quadrilateral, sector curved, isoparametric elements

General procedure of FEM: Discretization, element shapes, interpolation functions, shape functions, element stiffness matrix, global stiffness matrix, application of boundary conditions, solutions.

Section-B

FEA of 2-D single variable problems, application of Heat transfer, fulid mechanics, solid mechanisms, plane elasticity, analysis of structural vibrations

Applications: Free vibration of thin plates, cylindrical shells, transient heat conduction, torsion of prismatic shafts, motion of fluid in flexible container, flow of ideal fluids, viscous fluids, sheep structures.

Softwares in FEM: Introduction and study of FEM packages like ASKA, SAP, NASTRAN, ANSYS, COSMOS, NISA, ANIDA

Practical: Five practical based on above syllabus

References:
1) Introduction to Finite Element Methods by C.S. Desai & J.F. Abel.
2) Concept and application of Finite element analysis by Robert Cook.
3) Finite element analysis by C.S. Krishnamoorthy.
4) Finite element methods by J.N. Reddy.

2MCC2 SIMULATION THEORY AND APPLICATIONS
Section-A

System models and studies: Concepts of a system, system environment, stochastic activities, continuous and discrete systems, system modeling, types of models, principles used in modeling, sub-systems, types of system studies.

System simulation: The techniques of simulation, Monte Carlo method, comparison of simulation and analytical methods, Analog computers and methods, hybrid computer, simulators, continuous system simulation languages, system dynamics, growth models, logistic curves, multi-segment models, probability concepts in simulation, system simulation, events, representation of time, arrival pattern.

Section-B

Analysis of simulation output : Estimation method, simulation run statistics, replications of runs, elimination of initial bias, batch means, regenerative techniques, time series analysis, spectral analysis, auto regression.

Applications of simulation in manufacturing

Practical : Five practical based on above syllabus

References:
1) Geoffrey Gordon- System Simulation
2) Narsingh Deo- System Simulation with Digital Computers.
3) Naylor T.H. et. Al.- Computer Simulation Techniques.
4) Gottfried B.S- Elements of Stochastic Process Simulation

2MCC3 ROBOTICS AND ROBOT APPLICATIONS

Section-A

Introduction: Definition, need, robot classification, terminology and systems, benefits and limitations.

Robot system: Robot physical configuration, basic robot motions, end effectors work cell control and interlocks.

Robot sensors: Vision tactile and proximity, voice, robot control, kinetics and necessary control systems.

Section-B

Robot applications: General considerations and problems, material transfer, machine loading, welding, spray coating, processing operations, assembly, inspection, robo in FMS and automation.

Robot arm kinematics: Homogenous transformation matrix.

References:

1) Handbook of Industrial robotics.
2) Aures R.U. & Miller S.M.- Robotics applications and social implications.
3) Tanner W.R. – Industrial Robots Vol.-1 & Vol.-2.
4) Groover M.P. and Zimmer E.W.- Computer Aided Design and Manufacturing

2MCC4 INDUSTRIAL PRODUCT DESIGN

Section-A

An approach to industrial design, Technical requirements, Ergonomic requirements, Aesthetic requirements.

Ergonomic and industrial design Man- Machine relationship, Anthrometric data, Ergonomical design aspects of M/c tools testing M/cs, Instruments, automobile process equipment, etc.

Aesthetic concepts: Concepts of unity, concept of order with variety, concept of purpose, style and environment, Aesthetic continuity, proportions, rhythm, radiance.

Section-B

Design for Producibility, design for Assembly & Disassembly, Design for Maintenance

Computer aided Product Design

Industrial Design in Graphics: general design situations, Specifying design requirements, rating the importance of Industrial Design.

Design & development for Generative Manufacturing Processes.

Product Patenting.

References:

1) Industrial Design for Engineers by W.H. Mayali.
2) Design Engineering by John Diwan .
3) Problems of Product Design development by C.Hearn Bucle Pergaman Press.

4) Product Design & Manufacture by John Lindbeck , Prentice Hall International.
5) Integrated Product & Process Design by Edward Magrab, RC Press.

2MCC5 ELECTIVE-II
1. FLEXIBLE MANUFACTURING SYSTEMS

Section-A

FMS an overview: types and configuration, concept, types of flexibility and performance measures, functions of FMS, FMS host and area controller function distribution.

Development and implementation of FMS: Planning phases, integration, system configuration, FMS layout, FMS project development steps.

Section-B

Automated material handling and storage: Functions- types- analysis of material handling equipments design on conveyors and AGV systems.

Automated Storages: Storage system performance- AS/RS- carausal storage system- WIP storage system- interfacing handling, storage with manufacturing.

Modeling and Analysis of FMS: Analytical, heuristic, queuing, simulation and petrinet modeling techniques- scope, applicability and limitations

References:

1) Groover M.P.- Automation, Production Systems and CIM.
2) Ranky P.G.- The Design and Operation of FMS.
3) Parrish D.J.- Flexible Manufacturing.

2MCC5 ELECTIVE-II
2. VIRTUAL MANUFACTURING

Section-A

Virtual reality in engineering, rapid prototyping and near net shape manufacturing, visualization, environment construction technologies, modeling technologies, metamodeling, integrated infrastructure and architecture, simulation, integration of ligacy data, manufacturing characterization, verification, validation and measurement, work flow, cross functional treads.

Section-B

Design centered and production centered VM, CAD data translation, manufacturing resource models for distributed manufacturing, design of production systems, Virtual manufacturing over INTERNET, IMACS (interactive manufacturability analysis and critiquing system), optimal selection of partner in Agile Manufacturing, Virtual reality modeling languages.

References:

1) Considine D.M. and Considine G.D. – Standard Handbook of Industrial Automation.
2) Kusiak A.- Intelligent Manufacturing Systems.
3) Fundamentals of Industrial Automation by Turgan.

2MCC 5
ELECTIVE-II
3. INDUSTRIAL AUTOMATION
Section-A

Introduction to Industrial Automation: Automation in production systems, Opportunities of automation and computerization in a production system, Automated manufacturing systems, Computerized manufacturing support systems, reasons for automating, automation principles and strategies, basic elements of an automated system, advanced automation functions, levels of automation.

Industrial Control Systems**:** Process industries, discrete manufacturing industries, continuous and discrete control, computer process control and the forms of computer process control, sensors, actuators and other control system components.

Automated Manufacturing Systems**:** Fundamentals of automated production lines, applications of automated production lines, transfer lines, automated assembly systems.

Section-B

Modelling and Simulation for Plant Automation: Need of system modeling, uses of system simulation, mathematical modeling of a plant, model evaluation and improvement, modern tools for modeling and simulation of systems, applications.

Industrial Control Applications: Introduction, cement plant, thermal power plant, water treatment plant, irrigation canal management, steel plant, etc.

Intelligent Controllers: Introduction, model based controllers, predictive control, artificial intelligence based systems, expert controller, fuzzy logic system, fuzzy controller, fuzzy logic tools, artificial neural networks, neural controllers, VLSI implementation of neural networks, neuro-fuzzy control systems.

Books :

1. Automation, Production Systems and Computer-Integrated Manufacturing, by M. P. Groover, Pearson Education Pub.
2. Computer-Based Industrial Control, by Krishna Kant, Prentice Hall of India.

2MCC 5
ELECTIVE-II
4. RAPID PROTOTYPING AND TOOLING
Section-A

Introduction: Need for time compression in product development, Product development conceptual design, Development, Detail design, Prototype, Tooling, Applications of RP.

Stereolithography systems: Principle, Process parameters, Process details, Machine details, Applications.

Laser sintering systems: Principle, Process parameters, Process details, Machine details, Applications.

Fusion deposition modeling: Principle, Process parameters, Process details, Machine details, Applications.

Section-B

Laminated object manufacturing: Principle, Process parameters, process details, Machine details, Applications.

Laser engineering net shaping (lens): Ballistic Particle Manufacturing (BPM), 3D printing.

Principle, Introduction to rapid tooling, Direct and indirect method, Commercial softwares for RP, STL file generation.

Rapid tooling techniques- vacuum casting, DMLS, etc.

Introduction to reverse engineering.

BOOKS RECOMMENDED:

1. Pham, D.T. & Dimov.S.S., "Rapid manufacturing", Springer -Verlag, London, 2001.
2. Terry wohlers, "Wohlers Report 2007", Wohlers Associates, USA, 2007.
3. Ghosh A., "Rapid Protopyping: A Brief Introduction", Affiliated East West,
4. Kenneth G. Cooper, "Rapid Prototyping Technology: Selection and Application", CRC Press, 2001.
5. Chua Chee Kai, Leong Kah Fai, Lim Chu -Sing, "Rapid Prototyping: Principles and Applications", World Scientific, 2003.

****

SEMESTER-III
3MCCS
Seminar
Project

SEMESTER-IV
4MCCP
Project (Dissertation and viva-voce)

*****

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

1UMEF1/1UMEP1   DIGITAL INSTRUMENTATION
SECTION A

Unit-I   Digital time measurement techniques:
Vernier technique for small time interval measurement, Measurement of periodic time, Measurement of phase, capacitance, quality factor, time constant & decibel .
Digital frequency measurement techniques:
Measurement of ratio, product & difference between two frequencies, High frequency measurement, Maxima & Minima frequency measurement , Peak Frequency measurement, Fast low frequency measurement.

Unit-II: Electronic instrument for signal analysis:
Signal Analyzer: Spectrum analyzer, Network analyzer, Wave analyzer, Distortion analyzer, Logic Analyzer, Protocol analyzer.
Automated Measurement Systems:
Need & requirement of Automatic test equipment (ATE), Computer based & computer controlled ATE, ATE for PCB, Component testing. IEEE-488 electronic instrument Bus standard, Field Bus application. Instrumentation in Hazardous area.

SECTION B

Unit-III: Microcontroller & PC based Data acquisition system:
Data acquisition system: Introduction to smart sensors, digital sensors, Case studies of real time PC based instrumentation system, Virtual instruments, Intelligent instrument & Role of software.
Computer control: Hierarchy of computer control for industry, Direct digital control, Distributed computer control: System architecture & implementation concepts, buses & communication networks of DCCS, SCADA system.

Unit-IV: Advanced medical instrumentation systems:
Microprocessor interfacing & computer based Medical instrumentation System, Real time digital conditioning of monitored bio-medical signals such as EEG, ECG, EMG, & VEP .
Intelligent controllers:
Discrete State Process control, Relay Sequencer & Ladder Diagram Programmable logic controllers, PLC programming

techniques, Introduction to fuzzy logic & Neural network controllers.

Text Books:
1.   Digital Measurement Techniques, 1996 by T.S.Rathore, Narosa publishers,New Delhi Second Edi.
2.   Instrumentation & Process, Critis Johnson (PHI Publication)

Reference Books :
1.   Electronic Instruments Handbook (3/e), 1997 by Clyde E. Coombs, McGraw Hill International
2.   Applied Electronics Instrumentation & Measurement, 1992 by McLachlan & Buchala, Prentice Hall International
3.   Khandpur R.S., Handbook of Bio-medical Instrumentation (3/e)
4.   Computer Based Industrial Control by Krishnkant , PHI , 5TH Edition.
5.   Digital Signal Processing by Cavicchi (John Willey Publication)

1UMEF2/1UMEP2 ADVANCED DIGITAL SIGNAL PROCESSING

SECTION - A

Unit I :   Introduction : Overview of Discrete time signals and systems: Convolution, correlation, Time Bandwidth Relationships, Introduction to Random signal Processing and Statistical Signal Processing. Different transforms, use of DFT in linear filtering, filtering of long data sequences, Algorithm for convolution and DFT. FFT algorithms.

Unit II :   Digital filter Design: FIR and IIR Filter Design techniques, Introduction to Multirate Digital Signal , Implementation of Sampling Rate Converter, Filter Bank Implementation, Sub-band Coding.

SECTION - B

Unit III :   Adaptive Digital Signal Processing: Spectral Estimation using Least Square(LS), Least Mean Square (LMS), Recursive Least Square (RLS) Algorithms. Applications to Speech and Audio Signal Processing

Unit IV :   Issues involved in DSP processor design, Architecture and programming of TMS 320 C67XX, Applications of DSP to Biomedical Signal Processing.

Text Books :
1)   Digital Signal Processing: Principles , Algorithms and Applications by J G Proakis, D.G. Monalikis PHI (3rd Edition)
2)   Discrete Time Signal Processing, A.V. Oppenheim and Schafer, PHI.

Reference Books :

1)   Discrete Time Signal Processing A practical Approach, E.C. Ifeacher & B.W. Jarvis Pearson Education 3rd Edition.

2) A Course in Digital Signal Processing, Porat ,Boaz John Willey and Sons
3) Digital Signal Processing, S.K. Mitra, TMH(2nd Edition)
4) Digital Signal Processing, T. J. Cavicchi, John Willey and Sons
5) DSP Handbook Vijay Medisetti & D.B. Williams CRC Press
6) Adaptive Filter Theory, Simon Haylein Jhon Wiley
7) Fundamentals of Statistical signal Processing by Steven Key, Pearson Education.

1UMEF3/1UMEP3   ELECTIVE–I
1) Modern Electronics Design Technique

Unit – I : **Amplifiers & Regulators System Design :** Digital isolation techniques, high speed clamping amplifiers, programmable gain amplifiers, auto – zero amplifiers, lock – in amplifiers, switch mode regulator topologies like buck, boost, buck boost their control techniques and selection of passive, active (IGBT, GTO, MOSFET, Diode) and magnetic components for these regulators, simulation of these systems using PSIM and related software.

Unit – II : **Communication and control system design :** Electronic navigation systems, underwater sound systems, phase lock loop design, direct digital synthesis, radio systems and auto pilot systems in aircraft, digital engine control and motion control systems for automobiles, simulation of these systems using related software's.

Unit – III :Portable Electronics system design : Types and characteristics of modern batteries, smart battery management systems, portable devices like mobile TV, VolP phones, glucose meter, pulse oximetry, cardio pulmonary resuscitation systems , ultrasound systems, Barcode readers, payment terminals.

Unit–IV : **Electronic system design for production :** Layout and grounding for analog & digital systems, safety, testablility, reliability and thermal management in electronic systems, quality, reliability, testing and environmental aspects in printed circuit board design, design of enclosures for electronic products, EMC of electronic products.

Text Books :

1. Linear Circuit Design Handbook by Zumbahlen Elsevier, Analog Devices Corp.
2. Circuit Design, Knowit All by Ashby, Baker Elsevier

Reference Books :

1. Demystifying switching power supplies by Mach., Elsevier 2.Standard handbook of Electronic Engg. (5th Ed) by Chritiansen & Alexander MGH
3. Digital Frequency synthesis Demystified by Goldberg LLH Pub.
4. Aircraft Digital Electronic & Comp. System by Tooley Elsevier
5. Aircraft Electricity and Electronics by Bent.
6. Battery operated devices and systems by Pitoia, Elsevier
7. Understanding Automotive electronics (6th Ed) by Ribbens Elesevier
8. Grounding & Shielding Ckt & interfacing (5th Ed) by Morrison Wiley
9. Printed Ckt. Boards by Khandpur MGH

1UMEF3/1UMEP3   ELECTIVE –I
2) RF SYSTEM DESIGN

UNIT-I   **ACTIVE RF COMPONENTS AND THEIR MODELING**
Active RF Components: Semiconductor Basics: Physical properties of semiconductors, PN-Junction, Schottky contact. **Bipolar-Junction Transistors:** Construction, Functionality, Temperature behavior, Limiting values. **RF Field Effect Transistors:** Construction, Functionality, Frequency response, Limiting values. **High Electron Mobility Transistors:** Construction, Functionality, Frequency response. **Active RF Component Modeling:** Transistor Models: Large-signal BJT Models, Small-signal BJT Models, Large-signal FET Models, Small-signal FET Models.

UNIT-II   **FILTER and AMPLIFIER DESIGN**
RF filter Design methods: Image Parameter Method, Insertion Loss Method, Microstrip Filter Design **Filter Implementation:** Unit Elements, Richard's Transformation, Kuroda's Identities and Examples of Microstrip. **High frequency amplifier design:** Bandwidth enhancement, neutralization and unilateralisation, cascaded amplifiers. **RF power amplifier design:** Class A to Class F amplifiers and modulation characteristics.

UNIT-III   **LNA, Mixers and oscillators design**
LNA topologies and their design, linearity and large signal performances, multipliers and sub sampling mixers, High Frequency Oscillator Configuration: Fixed Frequency Oscillator, Voltage Controller Oscillator and Dielectric Resonator Oscillator

UNIT-IV   **PLL design**
Linearized PLL models, Noise properties of PLLs, Phase detectors, Sequential phase detectors, Loop filters and charge pumps, design examples

Text Books :
1. Microwave Transistor Amplifiers, Analysis and Design by G. Gonzalez; Prentice Hall
2. RF Circuit Design-Theory and Applications by Reinhold Ludwig and Pavel Bretchko; Pearson Education

Reference Books :
1. Thomas Lee, " The Design of CMOS RF ICs", Cambridge second edition
2. Microwave Engineering by David M. Pozar; Wiley & Sons (ASIA) Pvt. Ltd.
3. Radio Frequency and Microwave Electronics by Matthew M Radmanesh
4. Microwave Circuit analysis and Amplifier Design by S. Y. Liao; Prentice Hall

1UMEF3 /1UMEP3   ELECTIVE–I
3) COMPUTER COMMUNICATION NETWORKS
Section - A
Unit I **Review of computer networking concepts:** *(Introductory portion removed)* OSI/ISO Reference Model, TCP/IP reference models, Point to point protocols.
ARQ: Retransmission strategies.
Functional elements : Multiplexing, Switching , Networks Management & traffic controls. Delay models in Data Networks Switching techniques: Performance measures & architectural issues.

Unit II **Internetworking :** TCP/IP Internet architecture, IPV4, IPV6, IP addressing & related issues, IP address resolution techniques (ARP). IP datagram & forwarding, *Queuing Models, Routers,* routing algorithms.

Section - B
Unit III **Multiple access techniques:** CSMA/CD, CSMA/CA, CDMA, OFDM, Delay throughput characteristics, WLAN-Protocols**, multiple access Protocols**, Ad-hoc networks, WAP, Bluetooth Specifications, *3G Evolution and Architecture.*

Unit IV **Network security issues :** Ciphers, DES, Public key cryptography, RAS algorithm, Digital Watermarking, Attacks and Counter Measures , Service Authentication Proforma.

Text Books :
1. Communication Networks – Leon Garcia & Wadeja, Tata McGraw Hill Publication.
2. "Computer Networks and Internetworking"D.E.Comer, Pearson Education

Reference Books :
1) "Data Networks" Dimitri Bertisekas & Robert Gallager, PHI
2) "Local Area Networks", Gerd E Kieser – Mc-Graw-Hill
3) "Cryptography and Network Security: Principles and Practice", William Stallings, Pearson Education
4) "GSM, CDMA and 3G Systems" , Steele,, Wiely Students Edition

1UMEF4 /2UMEP1 DIGITAL COMMUNICATION TECHNIQUES
Section : - A
Unit - I Characterization of communication signal and optimum receiver for AWGN Channel :
Signal space representation, Memory less modulation methods, Linear Modulation with memory, Non linear modulation methods with memory,-CPFSK & CPM, Power spectral of linear modulated signal, CPFSK & CPM Signals, Correlation demodulator, Match filter demodulator, Optimum detector, Probability of error for binary & M-array signals.

Unit – II Source & channel coding: Discrete stationary sources, Lampel Ziv algorithm, Coding of analog sources, Rate distortion functions, Scalar quantization & vector quantization, Temporal & spectral waveform coding, BCH codes, Reed – Solomon codes, Reed Muller codes, convolution codes, transfer function of convolution codes, Viterbi decoding algorithm, stack algorithm (no problems expected) trellis coded modulation.

Section : B
Unit – III Signal Design for band limited channel & equalization.: Design of banc limited signal for zero ISI, Nyquist criterion, design of band limited signal for controlled ISI, partial response signal. Data detection for controlled ISI, Linear Equalization – peak distortion criteria, mean square error (MSE) criteria, decision feedback equalization, coefficient optimization, adaptive linear equalization, zero forcing algorithm

Unit - IV Spread Spectrum techniques : Generation of PN sequence, direct sequence spread spectrum system , processing gain, jamming margin, application of direct sequence spread spectrum signal, frequency hopped spread spectrum signal, time hopping spread spectrum signal, synchronization of spread spectrum signal - acquisition & tracking.

Text Books :
1. J G Proakis, " Digital Communication" Fourth Edi. MGH
2. Shu Lin & Costell , " Error Control Coding – Fundamentals & applications," Addison Wessley Pub.

Reference Books :
1. Bernard Sklar, " Digital Communication" Fundamental & application, Second Edi. Pearson education, Asia.

2. Simon Haykins ; Digital Communication" John Wiley & Sons.
3. J P Proakis, M Salehi, " Communication System Engineering" Second Edi. Pearson Edition (LPE)
4. Salvatore Gravano, " Introduction to Error Control Codes", 1st Edition, Oxford Press.
5. Stephen Wicker, " Theory of Error Correcting Codes", PHI
6. K S Shanmugan; " Digital & Analog Communication System" John Wiley & Sons.

1UMEF5/2UMEP2   EMBEDDED SYSTEM DESIGN
Section - A

Unit I : **Embedded System hardware :** Embedded systems overview, Hardware components like microcontroller, GPP,ASSP,AISP, SOC, Details of 32 bit ARM SoC architecture, Organisation, analog, digital & high speed I/O for embedded systems, interfacing SRAM, DRAM, flash memories with microcontroller, memory management, allocation of memory to program segments and blocks, memory maps.

Unit II : **Embedded System Software :** Techniques of writing efficient C code for microcontroller C data types for ARM, Signed & unsigned data types, limitation of char & char & data types, storage class – static & extern, volatile keyword, operation on bits, functions, ARM / Thumb procedural call standard, pointers & arrays, conditional statements – of-else, switch, structure, conditional loops – for & while, preprocessing, compiling, cross compiling, compiler driver, startup code and board support packages, program segments calling assembly routines in C, interrupt handling in C, interrupt latency.

Section - B

Unit III : **Uniprocessor Real Time Scheduling:** Real time systems, tasks and its states, task assignment & scheduling, scheduling algorithms – rate monotonic and earliest deadline first, inter-task communication, semaphore, priority inheritance protocol, priority ceiling protocol, real time operating system features, features of micro C OS – II RTOS.

Unit IV : **Embedded System Architecture & Design :** Embedded system implementation aspects & estimation modeling, embedded system architecture, validation and debugging of embedded systems, hardware – software co-design in an embedded system, ARM Philips NXP LPC 2148 programming on – chip components like ADC and interfacing external peripherals like keyboard, LCD, Stepper motor.

Text Books :

01) Embedded Systems (2nd Edi) by Rajkamal (Tata McGraw Hill)
02) Embedded Real-time Systems Programming by Lyer & Gupta (Tata McGraw Hill

Reference Books :

01) ARM System on chip architecture (2nd Ed) by Furber (Pearson India)
02) Intro. To Embedded systems by K.V. Shibu (MGH)
03) Philips NXP LPC 2148 user manual
04) Scheduling in Real time systems by Cottet, Delacroix & Mammeri (John Wiley & Sons)

1UMEF6 /2UMEP3
DIGITAL COMMUNICATION TECHNIQUES-LAB.

1UMEF7/2UMEP4
EMBEDDED SYSTEM DESIGN-LAB.
******

SECOND SEMESTER
2UMEF1/3UMEP1 DIGITAL IMAGE PROCESSING

Section A

UNIT I   Image processing fundamental: Basic image processing Steps, Digital image representation,Image acquisition for grey scale and color, ,Human visual system Image types . Image Transforms: 2D DFT, Walsh transform ,Hadamard transform,Slant transform, Discrete transform ,KL transform, Radon transform and Multiresolution wavelet transform.

UNIT II   Image Enhancement: Image enhancement in spatial domain ,Enhancement through point operation,Types of point operation, Histrogram Manipulation, linear/nonlinear grey-level transformation,Local or neighbourhood operation, median filter,spatial domain high-pass filtering,bit-plane slicing,Image enhancement in the frequency domain,homomorphic filter,zooming operation ,image arithmetic.

Section B

UNIT III   Image Restoration and Denoising : Image degradation models, Types of image blur, image restoration model, linear image restoration,nonlinear image restoration techniques, blind deconvolution and classification technique ,image denoising, noise in image, median filtering, trimmed metrices in image restoration, Application of biomedical imaging

UNIT IV   Image segmentation: , region approach to image segmentation, clustering technique, image segmentation based on thresholding, edge-based segmentation , edge detection ,edge linking, Hough transform ,active contour, watershed transformation, shape representation and classification. Morphological techniques, Object & pattern recognition & interpretation method.

Image Compression : Lossy block truncation & vector quantization , lossless Huffmon coding, runlength coding & block coding , transform coding.

Text Books :

1) "Digital Image Processing By R.C Gonzales & Woods –Addison Wesley IIIrd Ed
2) "Digital Image Processing" by S Jayaraman, S Esakkirajan,T Veerakumar- Tata Mc Graw Hill.

Reference Books :

1) "Fundamental Digital Image Processing "by A.K.Jain –Prentics Hall Inc.
2) "Digital Image Processing" By W.K Pratt IIIrd ed John Wiley
3) "Digital Image Processing and Analysis" by B Chanda and D. Mujumdar-PHI new Delhi

2UMEF2/3UMEP2   CMOS VLSI DESIGN

Unit I: CMOS design methods, CMOS Testing, CMOS subsystem design, CMOS system case studies. Fault tolerant VLSI architectures.

Unit II: ASIC Construction: Physical design, CAD tools, system partitioning, ASIC size estimation, Power dissipation issues, FPGA partitioning methods

Unit III: Floor planning, Placement, physical design flow, information formats, global routing, detailed routing, special routing, circuit extraction and DRC

Unit IV: CMOS Analog and RF Integrated Circuits: High speed comparators, Switch capacitor filters, RF power amplifier, Mixer, PLL.

Text Books :

1) "Application Specific IC" Michael John Sebastin, Smith Addison – Wesley Publication
2) "The Design of CMOS Radio-Frequency Integrated Circuits" Thomas H. Lee – Cambridge University press

Reference Books :

1) "Principles of CMOS VLSI Design" Neil Weste and Eshraghian – Person Education
2) "CMOS Analog Circuit Design" Phillip F. Allen, Douglas R. Holberg – Oxford University Press
3) "VLSI Design" M. Michael Vai – CRC press

2UMEF3/4UMEP1   PARALLEL COMPUTING

Section A

Unit I : **Introduction**
Parallel Computer Models, Flynn's classification, system attributes, multiprocessors and multicomputers, condition of parallelism, program partitioning and scheduling, program flow mechanism, performance metrics and measures, parallel processing applications, speed up performance laws.

Unit II : **Pipelining and superscalar Techniques**
Linear and non linear pipeline processors, reservation and latency analysis, collision free scheduling, instruction pipeline design, arithmetic pipeline design, superscalar and superpipeline design.

Section B

Unit III : **Parallel and scalable architectures**
Multiprocessor, Multicomputers, multivector and SIMD computers, scalable, multithread and dataflow architecture.

Unit IV : **Parallel Program Development and Environment**
Programming Parallel Computers, Parallel Programming environments, Synchronization and multiprocessing modes, multitasking,. Microtasking, autotasking, shared variable program structure, semaphores and applications, message passing program development, control decomposition techniques, heterogeneous processing.

Text Books :

1) "Advanced Computer Architecture", Kai Hwang, Parallelism, Scalability, Programmability", McGraw Hill Inc. Ed. 1993.
2) "Computer Architecture and Parallel Processing", Kai Hwang, F. A. Briggs, McGraw Hill, 1985

Reference Books :

1) "Elements of Parallel Computing", V. Rajaraman, PHI, 1990
2) "Computer organization & Architecture", William Stallings, PHI, New Delhi, 6th edition.
3) "Kalsuk'Advanced computer Architectures", Dezso'Sima, Terence Fountain & Peter Pearson's Edation. (2nd Edition)
4) "Parallel Processing for Supercomputers and AI", Hwang and Degroot (Eds) McGraw Hill.

2UMEF4/4UMEP2   ARTIFICIAL INTELLIGENT SYSTEM

Unit I : Fuzzy set Theory, Introduction to Fuzzy sets, Fuzzy relation,Membership functions, fuzzification, defuzzification, fuzzy logic, fuzzy rule based system, fuzzy inference system.

Unit II : Fuzzy Decision Making, Fuzzy modeling, Adaptive neuro fuzzy inferencesystem, cognitive neurofuzzy modelling, Neuro fuzzy control, Application of neuro fuzzy control.

Unit III : Artificial neuron model, single and multilayer perceptron neural network (MLP), Learning process: training by backpropagation, swarm particle optimization, genetic algorithm, simulated annealing, basic concept of bidirectional associative memory (BAM), self organization feature map, optical neural network.

Unit IV: Recurrent networks, Hamming network, support vector machine**,** counter propagation networks, cluster discovery network (ART), Applications of neural network in characters recognition, forecasting, robot kinematics, biomedical signals.

Text Books :
1) "Neural Networks", S. Hykin ,Pearson Education.
2) "Fuzzy sets and Fuzzy logic Theory and Applications", George J. Klir, Bo Yuan, PHI

Reference Books :

1) "Artificial Neural Networks", Zurada
2) "Neuro Fuzzy and Soft computing", Jang, Sun, Mezutani
3) "Introduction to Neural networks using MATLAB 6.0", S.N.Sivanandan, S. Sumathi, S.N. Deepa, McGraw Hill.
4) "Neural networks, Fuzzy logic and genetic algorithms synthesis and applications", S. Rajasekaran, G.A. Vijayalakshmi Pai, PHI
5) Intelligent Systems & controls , Laxmidhar Behera, Indrani kar (Oxford)

2UMEF5/4UMEP3   ELECTIVE - II
1) BIOINFORMATICS

Unit I : Intro. To bioinformatics, databases in bioinformatics, characterization in bioinformatics databases, categories of bioinformatics databases & navigating databases.

Unit II : **Biological sequence database :** Nucleotide database, literature database, protein database, Gene expressing database.

Unit III : **Tools :** Data submission tools, PDB, MMDB, CATH, FSSP, DALI & SCOp.

Unit IV : **Data Analysis Algorithms :** Sequence comparison algorithms, substitution matrics, sequence alignment algorithms.
Prediction Algorithms : Gene prediction algorithms, phyrogenetic prediction algorithms, protein structure prediction.

Text Books :
1. Bioinformatics databases, tools and algorithm by Orpita Bosu & Simminder Kaur Thukral, Oxford Uni. Press

2. Bioinformatics principles & application by Zhumur Ghosh & Bikekanand Mallick, Oxford Uni. Press.

Reference Book:

1. Intro. To Bioinformatics by Artur M. Lesk, Oxford Uni. Press.

2UMEF5/4UMEP3   ELECTIVE - II
2) Micro Electro Mechanical Systems

UnitI : Development of MEMS technology, present and future, challenges, Starting Materials-substrates, etching processes & patterning, material doping, bulk micromachining processes-SCREAM, PennSOIL, integration of Electronics and MEMS technology, technology characterization.

Unit II: Scaling issues of MEMS, Scaling of physical systems, computational & fabrication issues of scale. Design realization tools for MEMS : SUMMiT technology layout, design rules.

Unit III: Electro Mechanics: structural mechanics, damping, electrical system dynamics.

Unit IV: MEMS sensors: Capacitive, piezo-resistive, sensor noise. Actuators : Electrostatic, thermal, Lorentz force actuation, MEMS reliability theory & terminology.

Text Book :
1) "Micro Electro Mechanical System Design" James J. Allen - CRC Press

Reference Books:
1) "MEMS and nanotechnology based sensors and devices for communications medical and Aerospace applications", Jha A. R. - CRC Publications.
2) "MEMS Design and fabrication" Mohamed Gad-El-Hak – CRC Press
3) "MEMS : A Practical Guide to Design, Analysis and Applications" Jan G Korvink, Oliver Paul – Springer-Verlag

2UMEF5/4UMEP3   ELECTIVE–II
3) HIGH SPEED DIGITAL SYSTEM DESIGN

Unit I: The Importance of Interconnect Design, Ideal Transmission Line Fundamentals, Crosstalk

Unit II: Non ideal Interconnect Issues, Connectors, Packages, and Vias, Nonideal Return Paths, Simultaneous Switching Noise, Power Delivery

Unit III: Buffer Modeling, Digital Timing Analysis, Design Methodologies

Unit IV: Radiated Emissions Compliance and System Noise Minimization, High-Speed Measurement Techniques

Text Books :

1) "High-Speed Digital System Design: A Handbook of Interconnect Theory and Design Practices" Stephen H. Hall Garrett W. Hall, James A. McCall - John Wiley & Sons, Inc.

2) "High-Speed Digital Design: A Handbook of Black Magic" Howard Johnson – Prentice Hall publication

Reference Books:

1) "High Speed Signal Propagation: Advanced Black Magic" Howard W. Johnson

2) " Signal Integrity Issues and Printed Circuit Board Design" Douglas Brooks – Prentice Hall

3) "Signal Integrity – Simplified" Eric Bogatin – Prentice Hall

4) " Noise Reduction Techniques in Electronic Systems" Henry Ott - John Wiley & Sons.

2UMEF6/3UMEP3   DIGITAL IMAGE PROCESSING-LAB.

2UMEF7/3UMEP4   CMOS VLSI DESIGN-LAB.

******

3UMEF1/5UMEP1   THIRD SEMESTER
SEMINAR AND DISSERTATION
AND TECHNICAL PAPER WRITING

4UMEF1/6UMEP1   FOURTH SEMESTER
SEMINAR AND DISSERTATION
AND TECHNICAL PAPER WRITING

****

SYLLABUS PRESCRIBED FOR
TWO YEAR P.G. COURSE IN
MASTER OF ENGINEERING
(FULL TIME)
ELECTRICAL ENGINEERING
(ELECTRICAL POWER SYSTEM) EXAMINATION
SEMESTER : FIRST

1 SEPS 1   POWER SYSTEM OPTIMIZATION
SECTION-A

1) Introduction to optimization and classical optimization techniques

2) Linear Programming : Standard form, geometry of LPP, Simplex Method pf solving LPP, revised simplex method, duality, decomposition principle, and transportation problem.

3) Non-Linear Problem (NLP) : One dimensional methods, Elimination methods, Interpolation methods

4) Non-Linear Programming(NLP): Unconstrained optimization techniques-Direct search and Descent methods, constrained optimization techniques, direct and indirect methods

SECTION-B

5) Dynamic Programming: Multistage decision processes, concept of sub-optimization and principle of optimality, conversion of final value problem into an initial value problem.

6) CPM and PERT

7) Genetic Algorithm: Introduction to genetic Algorithm, working principle, coding of variables, fitness function. GA operators; Similarities and differences between Gas and traditional methods; Unconstrained and constrained optimization using Genetic Algorithm, real coded gas, Advanced Gas, global optimization using GA.

8) Applications to Power system: Economic Load Dispatch in thermal and Hudro-thermal system using GA and classical optimization techniques, Unit commitment problem, reactive power optimization. optimal power flow, LPP and NLP techniques to Optimal flow problems.

References:

1. "Optimization - Theory and Applications", S.S.Rao, Wiley-Eastern Limited

2. "Introduction of Linear and Non-Linear Programming ", David G. Luenberger, Wesley Publishing Company

3. "Computational methods in Optimization ", Polak, Academic Press

4. "Optimization Theory with Applications" Pierre D.A., Wiley Publications

5. "Optimization for Engineering Design: Algorithms and Examples", Kalyanmoy deb, PHI Publication
6. "Genetic Algorithm in Search Optimization and Machine Learning ", D.E. Goldberg, Addision-Wesley Publication, 1989
7. "Advanced Power System Analysis and Dynamics " L.P. Singh, Wiley Eastern Limited.
8. "Power System Analysis ", Hadi Saadat, TMH Publication.
9. " Electrical Energy System : An Introduction ". Olle I.Elewgerd, TMH Publication, New Delhi.

1 SEPS 2 GENERATION PLANNING AND LOAD DISPATCH

SECTION - A

Generation- Fossil fules, Hydropower and Nuclear power generation systems. Chronological Load Curves, Power duration curve, Integrated duration curve, Hydrography, Flow duration curve, Mass curve for Hydro Power generations. Co-ordination of steam, Hydro and Nuclear power stations. Optimum Generation allocation-Line losses neglected and including the effect of transmission losses for thermal power generations. Long range and short range Hydro generation scheduling. The short term and long term Hydro-thermal scheduling of generation.

Load Forecasting & Generation Planning - Classification of loads -Load forecasting methodology-Energy forecastingpeak demand forecasting-Weather sensitive and Non-weather sensitive forecasting - Total forcast - Annual and Monthly peak demand forecast.

SECTION-B

Generation system cost analysis:
Cost analysis -capacity cost, production cost. Production analysis-production costing, production analysis involving nuclear unit, production analysis involving hydro unit. Fuel inventories-energy transaction and off-peak energy utilization.

Generation System Reliability Analysis – probabilistic generating Unit-Model and Load model, effective load- Reliability analysis for isolated system-Interconnected system-Reliability analysis of interconnected system.

Load dispatch & System Communication – Consideration for centralized control of system operations. Requirements of the central load dispatch centre.
Telementry-Remote control and data transmission, etc. Power system reforms, deregulation of electric utilities, energy management & conservation.

REFERENCES :
1) Power System Planning - R.L. Sullivan, McGraw Hill.
2) Economic Control of Interconnected System -Kirchmayers, L.K.,John Wiley and Sons, New York.
3) Generation of Electrical Energy - B.R. Gupta, Euresia Publishing House Pvt., Ltd., New Delhi.
4) Power System Restructing and Deregulation - by Loi Lei Lai
5) Restructed Electrical Power Systems - by Mohammad Shahidehopur, Muwaffaq Alomoush.
6) Privatization, Restructing, and Regulation of Network Utilities (Walras-Pareto Lectures) : by David M. Newbery.
7) Power to the People : Electric Power Deregulation : An Expose : Jack Duckworth
8) Understanding Electric Utilities and De-Regulation, Power Engineering : Lorrin Philipson, et al
9) Power Generation, Opearion and Control : A.J. Wood and B.F. Wollenberg:, John Wiley 1996
10) Understanding Electric Utilities and De-Regulation (Power Engineering) : by Lorrin Philipson, H. Lee Willis, Lorrion Philipson
11) The End of a Natural Monopoly : Deregulation and Competition in the Electric Power Industry : by P.Z.Grossman, D.H. Cole, P.Z. Grossman, D.H. Cole

1SEPS 3 MICROPROCESSOR AND MICROCONTROLLER

SECTION – A

Overview of Intel 8085 microprocessor. 8086 : Architecture, instruction including I/O instructions, bus timing diagram, interrupt structure, ISR minimum and maximum mode, Assembly Language Programming. Hardware and Software debugging aids: 1 Pass and 2 Pass assemblers, cross assemplers, circuit emulators, simulators, linkers, loaders, compiler, cross compiler, logic analyzers.
Types of interfacing devices

SECTION B

8051 Architecture : 8051 Microcontroller Hardware, Input/Output. Pins, ports, and circuits, External Memory, Counter and Timers, Serial Data input/output, Interrupts
Assembly language programming concepts : The mechanics of programming, The assembly language programming process, PAL instructions, Programming tools and techniques, Programming the 8051
Moving Data : Addressing modes, external data moves, code memory read only data moves, push and pop -op codes, data exchanges

Logical Operations : Byte level logical operations, bit level logical operations, rorate and swap operations

Arithmetic Opearions : Flags, incrementing and decrementing, addition, subtraction, multiplication and division, decimal arithmetic

Jumps and Call Instructions : The jump and call program range, jumps, calls and subroutines, interrupts and returns

8051 Microcontroller Design : Microcontroller specification, microcontroller design, testing the design, timing subroutines, look up tables for the 8051, serial data transmission

Applications : Keyboard, displays, pulse measurement, D/A and A/D conversion, multiple interrupts

Serial Data Communication : Network Configuration, 8051 Data Communication.

Books Recommended :

1. Kenneth J.Ayala, The 8051 Micro Controller : Architecture, Programming, Penram International, Mumbai.
2. Intel Embeded Micro Controller Data Book, Intel Corporation.
3. D.V.Hall, Microprocessor and Digital Systems, ELBS Publication, London.
4. B.P.Singh, Advance Microprocessors and Micro Controllers, New Age International, New Delhi.
5. D.V.Hall, Microprocessors and Interfacing, Tata McGraw Hill Publication, New Delhi.
6. Y.C.Liu, Gibson, Microcomputer Systems: the 8086/8088 Family, Architecture, Programming and Design, Prentice Hall of India Publications, New Delhi.
7. Lance A. Leventhal, Introduction to Microprocessor, Software, Hardware and Programming.
8. Ramesh S.Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085, Penram International, Mumbai.

****

1SEPS 4   POWER SYSTEM DYNAMICS
SECTION-A
INTRODUCTION

Reliable electrical power service, Stability of Synchronous machines, Tie-line oscillations, Method of simulation. Synchronous Machines: Review od synchronous machine equations, parameters, Equations in a-b-c phase co-ordinates and Park's co-ordinates, Representation of external system, Low and High orderstate models, Choice of state variables. Initial state equivalent circuit, Phasor diagram p.u. reactances. System Response to Large Disturbances: System of one machine against infinite bus, Classical Model, Mechanical and electrical torques, Critical clearing angle and time, Automatic reclosing, Precalculated Swing curves and their use.

SECTION-B

System Response to Small Disturbances: Two machine system with negligibe losses, Clarke diagram for two machine series reactance system, Extention of Clarke diagram to cover any reactance network, Equation for steady State Stability limit, Two- Machinesystem with losses, Effect of inertia. Effect of governor, action, Conservative criterion for stability, Effect of sallency, saturation and short circuit ratio on steady state power limits.

Regulated Synchronous Machines: Demagnetising effect of armature reaction and effect of small speed changes, Modes of oscillations of unregulated multimachine system. Voltage regulator and governor coach with delay Distribution of power impacts.

Effect of Excitation on Stability: Effect of excitation on generator power limits, transients and dynamic stability, Examination of dynamic stability by Routh's criterian, Root locus analysis of a regulated machine connected to an infinite bus. Approximate System representation, Supplementary Stabilising Signals, Linear analysis of stabillised generator.

REFERENCES:

1. Synchronous Machines by C.Concordia, John Wiley & Sons.
2. Power System Stability by E.W.Kimbark, Dover Publication, Vol.-3
3. Power System Control & Stability by Anderson, Galgotia Publ.
4. Power System Stability by S.B. Crary, John Wiley & Sons.

1SEPS 5   DIGITAL SIGNAL PROCESSING
SECTION-A

Digital Signal Processing

Characterization & Classification of Digital Signals. Digital Signal Processing of continuous signals. Discrete time signals - sequences, representation of signals on orthogonal basis, sampling, aliasing, quantization & reconstruction of signals.

Discrete systems-attributes, z-transform, analysis of LTI system.

Frequency analysis, inverse systems, Discrete Fourier transform, Fast Fourier implementation of discrete time system.

Digital filters - structures, sampling, recursive, non-recursive A to D & D to A conversion. FIR, IIR & lattice filter structures, Design of FIR digital filters. Window method, Park-McCellan's method. Design of IIR digital filters. Butterworth, Chebyshev.

SECTION-B

Elliptic approximations, low-pass, band-pass, band-stop & high-pass filters. Effect of finite register length in FIR filter design. Multirate signal processing-motivation-application, decimation & interpolation, sample rate

conversion, polyphase implementation of sampling rate conversion, Filter bank theory-DFT filter banks, Adaptive filtering theory.

DSP Processors and Applications - DSP Microprocessor architectures, fixed point, floating point precision, algorithm design, mathematical, structural and numerical constraints, DSP programming, filtering, data conversion; communication applications. Real time processing considerations including interrupts.

Refernce Books :
1. J.G.Proakis and D.G.Manolakis 'Digital Signal Processing Principles, Algorithm and Applications' Prentice Hall 1997
2. A.V.Oppenheim, R.W.Schafer, 'Discrete Time Signal Processing' John Wiley.
3. J.R. Johnson, ' Introduction to Digital Signal Processing Prentice Hall 1992
4. D.J.Defatta, J.G.Dulas. Hodgekiss, 'Digital Signal Processing' J. Wiley and Sons Singapore, 1988
5. L.R.Rabiner & B. Gold - 'Theory & Applications of Digital Signal Processing', Prentice Hall, 1992

1 SEPS 6   POWER SYSTEM LAB.-I

Indentify and perform minimum 16 (sixteen) experiments based on syllabus of subjects form Semester-I

****

SECOND SEMESTER
2SEPS1   ADVANCED POWER SYSTEM PROTECTION
SECTION-A

Review of principles of power system equipments protection, configuration of various solid state protection scheme, evaluation of digital relays from electromechanical relays, performance & operational characteristics of digital protection, Basic elements of digital filtering, analog multiplexers, conversions of system: the sampling theorem, signal aliasing error, sample & hold circuit, multiplexers, analog to digital conversion, digital filtering concepts, A digital relay. Hardware & Software.

SECTION – B

Mathematical background to protectional algorithm, first derivative (Mann & Morrison) algorithm, Fourier algorithm- full cycle window algorithm, fractional cycle window algorithm, Walsh function based algorithm, least square based algorithm, differential equation based algorithm, travelling wave based technique. Digital differential protection of transformer, digital line differential protection, recent advances in digital protection of power system.

Books Recommended :
1) Digital Protection for Power System : A.T.Johns and S.K.Salman, Peter, Published by Peter Peregrinus Ltd. on behalf of the IEE, London, U.K.
2) Power System Protection and Switchgear : Badri Ram and D.N.Vishvakarma, Tata McGraw Hill, New Delhi.
3) Transmission Network Protection : Theory and Practice, Y.G.Paithankar, Marcel Dekker, New York, U.S.A.
4) Fundamentals of Power System Protection : Y.G.Paithankar and S.R. Bhide, Prentice Hall of India, New Delhi.

2 SEPS 2   HIGH VOLTAGE TRANSMISSION
SECTION-A

Introduction of EHV-AC transmission, Tower configuration, Thermal ratings of lines & cables, circuit breakers, insulators for A.C. transmission, Voltage gradients of conductors, Cuona effects, power loss & audible noise, radio interferences, electrostatic field of transmission lines, Insulation characteristics of ling air gaps. Design of EHV lines based upon steady state limits, transient overvoltages & voltage stability, series shunt compensation, active & reactive power flow control, basics of static VAR compensators

SECTION-B

H.V.D.C. Transmission:
General aspects of comparison between HVDC & HVDC transmission schemes and terminal station layout. Operation of converters as rectifier and as an inverter. Equivalent circuit and operating chart of converter. Control of the converters (ccc & cca) Harmonics and its control, faults protection of line and terminal equipment.
Parallel operation of HVDC and AC, Multiterminal HVDC Systems

REFERENCE BOOKS :
1. Weedy, B.M. : Electric Power Systems, John Wiley & Sons.
2. EHV Transmission Line Refernce Book : Edison Electric Inst.
3. Adamson, C & Hingorani N.G. . HVDC Power Transmission, Garraway Publications.
4. Kimbark, E.W. : Direct Current Transmission, Vol.I, John Wiley & Sons.
5. Uhlman, E. : Transmission by D.C.
6. Rakosh Das Beganudre : Extra High Voltage AC Transmission Engineering.

2 SEPS 3 POWER SYSTEM MODELLING & CONTROL
SECTION-A

Transient response and concept of stability in Electrical Power System. Modelling of Power System. Control of voltage, frequency and tie-line power flows, Q-v and P-f control loops, mechanism of real and reactive power control. Mathematical model of speed governing system. Turbine governor contrate as affecting the power system dynamics. Transion and steady state response in the interconnected power systems. (multimedia systems). Excitation systems. Transformation model of exciter system. Analysis using block diagrams. Power systems stabilizers. Dynamic stability (small disturbances), effect of excitation control and turbine dynamics, characteristic equation, method of analysis of the stability of power system. Multi machine systems, Flux decay effects. Multi machine systems with constant impedance loads, matrix representation of a passive network in the transient state, converting to a common reference frame. Converting machine co-ordinates to system reference, relation between machine current and voltages, system order, machine represented by classical methods, multi machines systems study.

SECTION-B

Net interchange tie-line bias control. Optimal, sub-optimal and decentralised controllers. Discrete mode AGC. Time - error and inadvertent interchange correction techniques. On-line computer control. Distributed digital control. Data acquisition systems. Emergency control, preventive control, system, system wide optimization, SCADA.

Self excited electro-mechanical oscillations in power system and the means for control.

REFERENCES :-
1) V.Venlkov : Transient Processes in Electrical Power System, Mir Publication, Moscow.
2) Olle I.Elgard : Electric Energy Systems Theory, Tata McGraw Hill Pub. Co., New Delhi.
3) Anderson P.M. & Foaud A.A. : Power System Control and Stability, Galgotia Pub.
4) Nagrath I.J., Kothari D.P. : Modern Power System Analysis, Tata McGraw Hill Pub. Co., New Delhi.

2SEPS 4 COMPUTER METHODS IN POWER SYSTEM ANALYSIS
SECTION - A

1. Representation of power systems for computerised analysis: Mathematical models of synchronous generator for steady state and transient analysis, Transformer with tap changer, transmission line, phase shifter and loads.

2. Topology of Electric Power System-Network Graphs, Incidence matrices, fundamental loop and cutest matrices, primitive impedance and admittance matrices, equilibrium equations of networks. Singular and nonsingular transformation of network matrices.

3. Formation of bus impedance and admittance 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 network. Algorithm for formulation of 3 - phase bus impedance matrix.

SECTION-B

4. Short Circuit Studies : Three phase network, Symmetrical components. Thevenin's theorem and short circuit analysis of multi node power systems using bus impedance matrix. Short circuit calculations for balanced and unbalanced short circuits bus impedance and look impedance matrices.

5. Load flow studies : Sleek bus, loop buses, voltage control buses, Load flow equations, Power flow model using bus admittance matrix, Power flow solution through Gauss-Seidal and N-R methods - sensitivity analysis, Second order N-R method, fast mecouple load flow method - Sparsity of matrix. Multi area power flow analysis with the line control.

6. Stability studies of Power System - Development of mathematical model for multi machine system stability analysis-Formation of equations and method of solution. Transient stability analysis including synchronous machines, system network and loads. Solution of state equation by modified Eular method and solution of network equations by Gauss-Seidal interactive method.

REFERNCE BOOKS :
1) Computer Methods in Power System Analysis : G.W.Stage A.H.Elabiad, McGraw Hill Book Co.
2) Computer Techniques in Power System Analysis : M.A. Pai, Tata McGraw Hill Publication.
3) Electric Energy System Theory : O.I.Elgard, Tata McGraw Hill Publication.
4) Computer Aided Power System Operation and Analysis: R.N.Dhar, Tata McGraw Hill Publication.
5) Modern Power System Analysis : I.J.Nagrath, D.E.Kothar, Tata McGraw Hill, New Delhi.

2SEPS 5 FACTS AND POWER QUALITY
SECTION-A

Steady state and dynamic problems in AC systems, Flexible AC transmission systems (FACTS), principles of series shunt compensation, description of

static var compensation (SAC), thyristor controlled series compensation (TCSC) static phase shitters (SPS), static condenser (STATCON), static synchronous series compensator (SSSC) and unified power flow controller (UPFC), modelling and analysis of FACTS controllers, control strategies to improve system stability.

SECTION-B

Power quality problems in distribution systems, Harmonics, Harmonics creating loads, modelling, harmonic propagation, series and parallel resonance, harmonic power flow, mitigation of harmonics, filters, passive filters, active filters, shunt and series hybrid filters, voltage sag ans swells, voltage flicker, mitigation of power quality problems using power electronics conditioners, IEEE standards.

Books Recommended :
1) G.T.Heydt : Power Quality, Stars in a Circle Publication, Indiana, 1991.
2) E.J.E.Miller : Static Reactive Power Compensation, John Wiley & Sons, New York, 1982.
3) Recent Publications on Power Systems and Power Delivery.

2 SEPS 6   POWER SYSTEM LAB.-II

Identify and perform minimum 16 (sixteen) experiments based on syllabus of subjects form Semester-II.

******

THIRD SEMESTER

3SEPS1   SEMINAR AND DISSERTATION
(as per given scheme)

FOURTH SEMESTER

4SEPS1   SEMINAR AND DISSERTATION
(as per given scheme)

******

SYLLABUS PRESCRIBED FOR
TWO YEAR P.G. COURSE IN
MASTER OF TECHNOLOGY (FULL TIME)
CHEMICAL TECHNOLOGY
(MEMBRANE & SEPARATION TECHNOLOGY)

FIRST SEMESTER

1 MST 1   ADVANCES IN ABSORPTION AND
ADSORPTION SEPARATION TECHNOLOGIES

Absorption, fundamentals, applications, multicomponent absorption, Non-isothermal absorption, mass transfer in packed towers for gas absorption, capacity, height of tower, plate towers, absorption equipments & recent developments.

Adsorption isotherm models, break through curve, steady state & unsteady state adsorption, adsorption equipments, structure of adsorbents, kinetic effects, equilibrium, non-equilibrium isothermal and non isothermal operation, regeneration of adsorbent.

BOOKS :

1) Chemical Engineering, Vol.I & II : Coulson & Richardson.
2) Handbook of Separation Techniques for Chemical Engineers : P.A.Schweitzer.
3) Mass Transfer Operations : R.E.Treybal.
4) Absorption, Fundamentals and Applications : Zarzycki R.,Chacuk A.
5) Gas Separation by Adsorption Process : R.T.Yang.

1 MST 2   MEMBRANE SEPARATION PROCESS

Membrane transport and separation mechanism, Basic transport equations, solute transport parameters, surface force-pore flow model, prediction of membrane performance, physico-chemical criteria of membrane process, material science of RO/UF membranes, aqueous & non-aqueous solution systems, module design and analysis, membrane process design and systems, membrane process in water, waste water, biotechnology process, food industries etc., membrane bioreactor, pervaporation techniques in alcohol concentration, gas separation application, by permeation under pressure through membrane, membrane fouling and compaction, liquid membranes, pollution control by membrane process. RO treatment of non-aqueous solutions in liquid phase.

BOOKS :

1) RO/UF Principles and Applications : S.Sourirajan, R.Matsscera, Canada.

2) UF Applications Handbook : Munir Cheryon.

3) Membrane Separation Process : Stratumann, Germany.

4) Filtration and Separation : J.Wakeman, Elsevier.

5) Handbook of Separation Process Technology : Koros W.J., Rousseau R.W., Wiley, New York.

1 MST 3   CHEMICAL ENGINEERING ANALYSIS

Chromatographic techniques for chemical analysis for measuring thermodynamic, kinetic & physico-chemical properties, process chromatography, production chromatography, laboratory or preparative chromatography, gas chromatography, liquid chromatography, Elution chromatography, Gas-Liquid chromatography, chromatographic equipments, process design & optimization, counter current techniques, HPLC, ion exchange chromatography, electrophorasis, electrodialysis, lypholisation, equipment, recent advances. Basic principles of mass spectrometry, its application for molecular structure determination, magnetic rosonance spectroscopy, NMR chemical shift, Fourier transfer IR, Coulometric analysis, basic of electronic circuitvy for chemical instruments, computer applications and programming in chemical analysis and instrumentation.

BOOKS :

1) Chromatographic Methods : Braithwaite A., Smith F.J., Chapman & Hall.

2) New Developments in Gas Chromatogrphy : Purnell J.H., Wiley Production Scale GC.

3) Preparative Liquid Chromatography : Bidlingmeyer R.A., Elsevier.

4) High Performance Liquid Chromatography : Brown P.R., Hartwick R.A., Wiley.

5) Chemical Engineering, Vol. I to IV : Coulsion V. Richardsons.

6) Separation Techniques : Schoew H.M., New Chemical Engg., Intersciences Pub.

7) Separation Processes : C.J.King, Tata McGraw Hill.

8) Instrumental Methods of Chemical Analysis : Willard H.N., East West Press.

9) Instrumental Methods of Chemical Analysis : Ewing G.W., McGraw Hill.

1 MST 4   ADVANCED ENERGY TECHNOLOGIES

Energy intensive chemical process, energy balances, energy consumption & audit, recovery of energy, energy recovery units related to gas-gas, gas-liquid, liquid-liquid systems, waste heat recovery units, Energy planning, energy conservation.

Energy resources - conventional, non-conventional, renewable / alternate sources of energy, using water, wind, tide, solar, biomass, geothermal, etc. and their applications, energy related pollution control technologies, combustion process, removal of Nitrogen, Sulphur containing gases, acid gas removal.

BOOKS :

1) Chemical Technology, I to IV : Venkateshwaralu D.

2) Energy Conservation in Petrochemical Industries : S.B.Pandya, Tata McGraw Hill.

3) Conventional Energy Technology : S.B.Pandya, Tata McGraw Hill.

4) Practical Techniques of Saving Energy in Chemical Industry : Sitting M., Noyes Data Corp, USA.

5) Fuels & Fuel Technology : Francis W., M.C.Peter, Pergamon Press.

6) Fuel Combustion Energy Technology : S.N.Saha, Dhanpat Rai Pub. Co, New Delhi.

1 MST 5   ADVANCES IN ABSORPTION AND ADSORPTION SEPARATION TECHNOLOGIES-LAB.

PRACTICALS : based on above syllabus.

1 MST 6   MEMBRANE SEPARATION PROCESS-LAB.

PRACTICALS : based on above syllabus.

1 MST 7   SEMINAR-I

Presentation of critical apprisal of literature survey on the topic related to recent development, advances, reserach work in the field of membrane and separation technologies.

*****

SECOND SEMESTER

2 MST 1 ADVANCED DOWNSTREAM TECHNOLOGY FOR CHEMICAL RECOVERY AND WASTE UTILIZATION

Centrifugal separation - theory, application, equipments, power requirement, chemical separation for Gas-Liquid system, Gas-Solid system. Super critical fluids extraction in food, pharmaceutical, environmental and petroleum applications, water treatment, desalination, Bio separation, dialysis, industrial dialysis.

Cryogenic distillation for refinery, petrochemical off gases, natural gases, gas recovery-Olefin, Helium, Nitrogen, Desulfurization - coal,

flue gases, Azeotropic & extractive distillation - residue curve maps, homogeneous azeotropic distillation, pressure swing distillation, Column sequences, hetro geneous azeotropic distillation.

Energy conservation in separation processes - energy balance, molecular sieves - zeolights, adsorption, catalytic properties, manufacturing processes, hydrogel process, application, New trends.

Separations process synthesis for nonazeotropic mixtures, non ideal liquid mixtures, separation synthesis algorithm, Ion exchange - manufacture of resins, physical & chemical properties, capacity, selectivity, application, regeneration, equipment, catalysis use.

BOOKS :

1) Perry's Chemical Engg. Handbook : McGraw Hill Pub.

2) Conceptual Design of Chemical Processes : Douglus J.M., McGraw Hill

3) Recent Developments in Chemical Process & Plant Design : Liu Y.A., John Wiley & Sons Inc.

4) Cryogenic Process Engg. : Timmerhaus K.D., Plenum Press.

5) Encyclopedia of Separation Technology, Vol I & II : Kirk Othmer, Wiley Interscience.

2 MST 2   INDUSTRIAL BIOTECHNOLOGY

Advanced termentation process for industrial production, Fermentation products, Biochemistry and bio chemical engineering aspects, kinetics of growth & model of fermentation process, industrial microbiology, fermentation types and mechanism, recent development in fermentation design, measu rement and control devices, instrumentation in fermentar, liquid media and air sterilization techniques, heat load of fermentation, enzyme engineering, industrial production and applications of enzymes, immobilization of enzymes of whole cells, bioenergy utilization, bioconvertion of renewable resources to organic chemicals, application of bio technology in petroleum, oil, paper, food & chemical industries, production of high value products using biotechnology, production of antibiotics, vaccine, vitamins, surfactants, polysaccharides by microbial fermentation, their isolation, purification.

BOOKS :

1) A Comprehensive Practise in Biotechnology : Rehrn H.J. & Reed S., Vevlacs Chemie, Weinheim.

2) Biochemical Engineering & Biotechnology Handbook : Atkinson B., Mavituna F., The Nature Press, New York.

3) Pollution Control in Process Industries : Mahajan S.P., Tata McGraw Hill.

2 MST 3   ELECTIVE

1) ADVANCED MATERIAL TECHNOLOGY

Packings in crystals, ceramic structure, silicate materials, refractory material, structure sensitive materials, polymeric materials, structure, rheology, mechanical properties, instruments used for determination of structure, detects, advances in polymeric materials, metals like carbon, steel, alloy steel, effect of cooling & heating on structure of metal structure, strengthening mechanism, rubber and composite materials.

Stress characteristics, reinforced material, plastics in packaging, containers for pharmaceutical, beverage, food, oil, detergent, etc. industries, BOPP film in food packaging, laminated, heat seable, flame proof polyester fibers, flame retardant polyolefin fibers, polymer alloys and their applications, nylon, pc, pvc, polysulphur etc., alloys, materials of construction for handling specific chemicals, Lining of equipment, inspection & testing, corrosion, fatigue, protection & testing, nanomaterials.

BOOKS :

1) Process Design of Equipments, Vol. I & II : Dawande S.D., Central Techno Pub., Nagpur.

2) Hydrocarbon Processing- Journal

3) Corrosion Engineering : Fontana M.G., McGraw Hill.

4) Chemical Engg. - World Journal.

5) Chemical Age of India.

2) ADVANCE SURFACE COATING TECHNOLOGY

Synthesis of surface coating binders like acrylics, silicones, epoxies etc., formulations of binders for different applications, inorganic binders, development in pigments in typical functional applications. Concept of eco-friendly pigments in surface coatings, different testing methods.

Books Recommended :-

1) Hydrocarbon Processing : Journal

2) Process Design of Equipments, Vol I & II : Dawande D.S., Central Techno Pub., Nagpur.

3) Corrosion Engineering : Fontana, M.G., McGraw Hill

4) Chemical Engg. : World Journal

5) Chemical Age of India.

3)   Speciality Plastics

Polymer synthesis and characterization for high temp. application, engineering polymers, photo resist polymers in solar energy utiliza-tion, biodegradable polymers, hydrolysis and other new types of polymers.

Books Recommended :-

1) Chemical Engg. : World Journal
2) Process Design of Equipments, Vol I & II : Dawande D.S., Central Techno Pub., Nagpur.
3) Hydrocarbon Processing : Journal
4) Corrosion Engineering : Fontana, M.G., McGraw Hill
5) Chemical Age of India.

4) Insulation Coatings

Fundamentals of electrical insulations, classification of electrical insulation from polymeric materials, properties and structural requirements of polymeric electrical insulation, different types of polymers for electrical insulation, ingredients in formulation, formulation principles, other insulations :- thermal, aquatic and vibrational. Testing of electrical insulation and application methods of electrical insulation.

Books Recommended :-

1) Corrosion Engineering : Fontana, M.G., McGraw Hill
2) Process Design of Equipments, Vol I & II : Dawande D.S., Central Techno Pub., Nagpur.
3) Hydrocarbon Processing : Journal
4) Chemical Engg. : World Journal
5) Chemical Age of India.

2 MST 4   ADVANCED REACTOR DESIGN

Basic concept of design of reactors, types, optimisation techniques, multiphase reactors, multiphase reactions, hetrogeneous catalytic reactions, isothermal, non isothermal, adiabatic, non adiabatic, fluidised catalytic reactor, slurry reactor, characterisation of catalysis, chemical kinetics & rate equation for homogeneous and hetrogeneous reactions, chemical reaction kinetics for reactions with heat and mass transfer simulteneously, non ideal flow, fixed bed reactor - adiabatic, non isothermal, non adiabatic fixed bed, comparision of fixed, moving & fluid beds, optimization - formulation of reactor problems, use of linear programming, differential calculus, non linear programming in reactor optimization, instrumentation & control devices in chemical reactor.

BOOKS :

1) Chemical Reaction Engg. : Levenspiel O., John Wiley.
2) Chemical & Catalytic Reaction Engg. : James J. Carberry, McGraw Hill.
3) Chemical Engg. Kinetics : Smith J.M., McGraw Hill.
4) Chemical Reactor Design & Analysis : Bischott K.B. & Forment G.F.
5) Optimization of Process : Edgar T.F., Himmelbloan D.M., McGraw Hill.
6) Elements of Chemical Reaction Engg. : Scot Fogler H.C., Prentice Hall.

2 MST 5   ADVANCED DOWNSTREAM TECHNOLOGY FOR CHEMICAL RECOVERY AND WASTE UTILIZATION-LAB.

PRACTICALS : based on above syllabus.

2 MST 6   INDUSTRIAL BIOTECHNOLOGY

PRACTICALS : based on above syllabus.

2 MST 7   SEMINAR-II

A collection of literature on a topic related to recent developments in process technology, etc., critical apprisal of literature collected, preparation of report and presentation of Seminar.

*****

THIRD SEMESTER

3 MST 1   SEMINAR-III

Preparation of detail report based on collection of data, experimental work, published reviews, etc. on a topic related to Project / Dissertation and presentation as Seminar.

3 MST 2   PROJECT / DISSERTATION

Literature survey on Project / Dissertation topic, planning of work, finalising materials and methodology, etc.

*****

FOURTH SEMESTER

4 MST 1   PROJECT / DISSERTATION

Review of Project / Dissertation data generated, experimentation, conclusion drawn, recommendations given, preparation of report, calculation, designing, etc.

*****

SYLLABUS PRESCRIBED FOR
TWO YEAR P.G. COURSE IN
MASTER OF TECHNOLOGY
(FULL TIME)
(CHEMICAL ENGINEERING)

FIRST SEMESTER

1CE 1 TRANSPORT PHENOMENA

Viscosity and Mechanisms of Momentum Transport, Shell momentum balances and velocity distribution in Laminar flow., Equation of continuity, Mechanical energy, and equation of motion, velocity distribution in Turbulent flow, Polymeric liquids, Non Newtonian Viscosity and Models, Molecular theory of Polymeric Liquids. Boundary layer flow and hydrodynamic boundary layer.

Thermal conductivity and the mechanism of Energy transport, Shell energy balance and temperature distributions in laminar and turbulent flow, convective transport of energy, Thermal boundary layer theory, Heat transfer coefficients for different situations.

Diffusivity and the mechanisms of Mass Transport. Mass transport by convection, concentration distributions in laminar and turbulent flow. concentration boundary layer, Mass transfer with chemical reaction.

Simultaneous heat, mass and momentum transfer, analogy, dimensional analysis, Scale up.

Recent Developments in the fields and future challanges.

Books and References :
1. Transport Phenomena, R.B.Bird, W.E. Stewart and E.W. Lightfoot. John Wiley, 2nd Ed
2. Fundamentals of Momentum, Heat and Mass Transfer, J.R. Wilty, et. Al. John Wiley, 4th Ed.
3. Transport Processes and Separation process Principles, Christie J. Geankopolis 4th Ed. Prantice Hall.

1 CE 2 ADVANCED BIOCHEMICAL ENGINEERING

Kinetics of Microbial Growth And Product Formation

Phases of cell growth in batch cultures; simple unstructured kinetic models for microbial growth; growth associated product formation kinetics; Monod and Leudeking-Piret models; etc.,

Introduction to structured models for growth and product formation.

Stoichiometry of cell growth and product formation-elemental balances, available electron balances, degrees of reduction; yield coefficients of biomass and product formation; maintenance coefficients; oxygen consumption and heat evolution in aerobic cultures.

Techniques in Fermentation :-

Sterilization

Sterilization methods; Thermal death kinetics; Design criterion; Batch and continuous Heat- Sterilization of liquid media; Membrane Filter Sterilization of liquid media and Air.

(Death kinetics and design criteria to be elaborated)

Transport Phenomena In Bioreactors

Mass Transfer in heterogeneous biochemical reaction systems; oxygen transfer in submerged fermentation processes; oxygen uptake transfer coefficients (k1.a); relation OUR and OTR, role of aeration and agitation in oxygen transfer. Heat transfer processes in biological systems.

Process Design and Construction Of Bioreactors

Materials of construction, vessel geometry, Bearing assemblies, motor drives; Aseptic Seals; Flow measuring Devices, valves; Agitator and Sparger Design ; sensors and its ancillaries. Operational modes of reactors-Batch, continuous, Fed batch, repetitive batch, recycles and continuous cultivation; novel bioreactors; stirred tank, air lift & loop reactors, packed-bed and hollow-Fiber membrane Bio-reactors; reactors for waste-treatment processes; scale up criteria for bioreactors.

Books and References:
1. Bailey J.E and Ollis, D.F.Biochemical Engineering fundamentals, McGraw Hill(1986).
2. James M.Lee, Biochemical Engineering, Prentice Hall, Englewood Cliffs, New Jersey
3. Michael L. Shuler and Fikret Kargi, Bioprocess Engineering: Basic Concepts, Second Edition, Prentice Hall.
4. S. Aiba et al, Biochemical Engineering, Academic Press, London, 1965.

1 CE 3 PROCESS CONTROL

Dynamic modeling of complex processes by applying fundamental laws, Empirical modeling

Graphical methods for first order plus dead time and second order (over & under) damped Processes. Computer based process parameter estimation techniques.

Introduction to non linear , open loop unstable, dead time, integrating processes and their control.

Advanced control strategies, controller design for cascade control, feed forward control and interfacial Control.

Adaptive control, MRAC and STR, control configuration, Analysis and Applications

Model based control: Internal model control, Dynamic matrix control, model predictive control.

Multivariable control, Transfer function Matrix, Stability and interaction analysis.

Digital control : Hardware & Software requirement, Introduction of DDC, DCS, supervisory (optimizing) and hierarchical, z-and modified z-transformation and their inverse. Controller design and implementation.

Case studies.

Recent Developments in the fields and future challanges.

Books & References :

1. George Stephanopoules, "Chemical Process Control, An Introduction to Theory and Practical", Prentice Hall, New Delhi, 1998
2. Smith C A and Corripio A B "Principles and Practice of Automotive Process Control", John Wiley, New York, 1976.
3. Coughnowr D R, "Process System Analysis and Control" 2nd edn., McGraw Hill, New York, 1991.
4. Luyben" Process Modelling, Simulation and Control for Chemical Engineers", 2nd edn, McGraw Hill, 1990.

1 CE 4   MATHEMATICAL MODELING AND OPTIMIZATION

Introduction to process engineering and optimization, formulation of various process optimization problems and their classification, basic concept of optimization, convex and concave function, necessary and sufficient conditions for stationary points, optimization of one dimensional problems

Unconstrained multi variable optimization, direct search methods, indirect first and second order methods, linear Programming and its application : Simplex and Big M & two phase methods.Constrained multi level optimization, necessary and sufficient conditions for optimum, quadratic programming, Dynamic programming, integer and mixed integer programming.

Neural Network : Fundamentals, basic propagation network, use of neural networking in industries, fundamentals of genetic algorithm, genetic modeling.

Books & References:
1. T.F.Edgar and D.M Himmelblau "Optimization of Chemical Processes" McGraw Hill Edition.
2. Rao S.S "Engineering Optimization" New Age
3. Sharma J.K. "Operations Research"
4. Rajasekaran R, & Vijayalakshmi G.A. " Neural Network, Fussy Systems and Genetic Algorithm.

1 CE 5   ELECTIVE-I (Any one of the following topics)

1) ADVANCED CHEMICAL ANALYSIS

Introduction to Spectroscopical Methods Of Analysis

Molecular Spectroscopy, Atomic Spectroscopy, Polarimetry And Refractometry, Electrometric Methods Of Analysis, XRD Analysis

Thermal Methods, Chromatographic Methods

QUANTITATIVE SPECTROSCOPY: Beer-Lambert's Law, Limitations, Deviations (Real, Chemical, Instrumental). Nesslerimetry, Duboscq colourimetry, Estimation of inorganic ions such as Fe, Ni and estimation of Nitrite using Beer-Lambert's Law. Various electronic transitions in organic and inorganic compounds effected by UV, Visible and infra red radiations, Various energy level diagrams of saturated, unsaturated and carbonyl compounds, excitation by UV and Visible radiations, Woodward-Fischer rules for the calculation of absorption maxima (dienes and carbonyl compounds), Effects of auxochromes and effects of conjugation on the absorption maxima, Instrumentation for UV, VISIBLE and IR spectroscopies (Source, Optical parts and Detectors), Multicomponent analysis,

Classification of chromatographic methods, Column, Thin layer, Paper, Gas, High Performance Liquid Chromatographical methods (Principle, mode of separation and Technique). Separation of organic compounds by column and Thin layer, mixure of Cu, Co and Ni by Paper, separation of amino acids by paper, estimation of organic compounds by GC and HPLC.

Books & References:
1. Parikh V.M., " Absorption Spectroscopy of Organic Molecules ", Addison - Wesley Publishing Company, 1974.
2. Willard, H.H., Merritt. I.I., Dean J.A., and Settle, F.A., " Instrumental Methods of Analysis", Sixth edition, CBS publishers, 1986.
3. Skoog D.A. and West D.M., " Fundamentals of Analytical Chemistry", Saunders-College Publishing, 1982.
4. Banwell, G.C., " Fundamentals of Molecular Spectroscopy", TMH, 1992.

1 CE 5   ELECTIVE-I
2) MATERAL SCIENCE

Packings in crystals, ceramic structure, silicate materials, refractory material, structure sensitive materials, polymeric materials, structure, rheology, mechanical properties, instruments used for determination of structure, detects, advances in polymeric materials, metals like carbon, steel, alloy steel, effect of cooling & heating on structure of metal structure, strengthening mechanism, rubber and composite materials.

Stress characteristics, reinforced material, plastics in packaging, containers for pharmaceutical, beverage, food, oil, detergent, etc. industries,

BOPP film in food packaging, laminated, heat seable, flame proof polyester fibers, flame retardant polyolefin fibers, polymer alloys and their applications, nylon, pc, pvc, polysulphur etc., alloys, materials of construction for handling specific chemicals, Lining of equipment, inspection & testing, corrosion, fatigue, protection & testing, nanomaterials.

Books & References:

1) Process Design of Equipments, Vol. I & II : Dawande S.D., Central Techno Pub., Nagpur.
2) Hydrocarbon Processing- Journal
3) Corrosion Engineering : Fontana M.G., McGraw Hill.
4) Chemical Engg. - World Journal.
5) Chemical Age of India.

1 CE 5   **ELECTIVE-I**

3) PULP & PAPER TECHNOLOGY

Raw materials for making pulp & Paper. Different pulping processes, pulp washing, recovery of spent chemicals, pulp bleaching, stock preparation: beating, refining, internal sizing filling & loading, coloring, wet end additives.

Fourdrinier and cylinder mold paper making machines, sheet formation, Pressing, sheet drying, external sizing, winding, Hand made paper production.

Environmental aspect of Pulp & Paper Industry.

Recent Development of subject.

Books & References:

1. Pulp & Paper, Chemistry & Chemical Technology Casey, J.P.Wiley Interscience, New York
2. Pulp & Paper Manufacture , MacDonald R.G, McGraw Hill
3. Pulping Processes, Rydhlom S.A Interscience, New York
4. Pulp & Paper, Science and Technology, Libby, C.E McGraw Hill
5. Handbook of Pulp & Paper Technology, Britt, K.W. Reinhold Publishing Corporation, NY.

1CE 6   **TRANSPORT PHENOMENA-LAB.**

Practical based on above syllabus.

1 CE 7   **ADVANCED BIOCHEMICAL ENGINEERING**

Practical based on above syllabus.

****

SECOND SEMESTER

2 CE 1   **CHEMICAL REACTION ENGINEERING**

Basic concept of design of reactors, types, optimisation techniques, multiphase reactors, multiphase reactions, hetrogeneous catalytic reactions,

isothermal, non isothermal, adiabatic, non adiabatic, fluidised catalytic reactor, slurry reactor, characterisation of catalysis, chemical kinetics & rate equation for homogeneous and hetrogeneous reactions, chemical reaction kinetics for reactions with heat and mass transfer simulteneously, non ideal flow, fixed bed reactor - adiabatic, non isothermal, non adiabatic fixed bed, comparision of fixed, moving & fluid beds, optimization - formulation of reactor problems, use of linear programming, differential calculus, non linear programming in reactor optimization, instrumentation & control devices in chemical reactor.

Books & References:

1) Chemical Reaction Engg. : Levenspiel O., John Wiley.
2) Chemical & Catalytic Reaction Engg. : James J. Carberry, McGraw Hill.
3) Chemical Engg. Kinetics : Smith J.M., McGraw Hill.
4) Chemical Reactor Design & Analysis : Bischott K.B. & Forment G.F.
5) Optimization of Process : Edgar T.F., Himmelbloan D.M., McGraw Hill.
6) Elements of Chemical Reaction Engg. : Scot Fogler H.C., Prentice Hall.

2CE2   **ADVANCED SEPARATION PROCESS**

Membrane transport and separation mechanism, basic transport Equations solute transport parameters, surface force-pore model, prediction of membrane performance, physico-chemical criteria of membrane process, material science of RO/UF membranes, aqueous & non aqueous solution systems, module design and analysis, membrane process design and systems, membrane process in water, waste water, biotechnology process, food industries etc., membrane bio reactor, pervaporation techniques in alcohol concentration, gas separation application, permeation under pressure through membrane, membrane fouling and compaction, liquid membranes, pollution control by membrane process RO treatment of non-aqueous solutions in liquid phase.

Books and References:

1. RO/UF Principles and Applications; S.Sourirajan, R. Matsscera, Canada
2. UF Applications Hand book; Munir Cheryon
3. Membrane Separation Process : Stratumann, Germany
4. Handbook of Separation Process Technology: Koros W.J, Rousseau R.W., Wiley, New York.

2 CE 3   **PROCESS DESIGN AND PLANT UTILITIES**

Process Design and development. General design considerations, Hierarchy of chemical process design.

Nature of process synthesis and analysis. Developing a conceptual design and flow sheet synthesis.

Synthesis of reaction-separation systems, Distillation sequencing, Energy targets, heat integration of

Reactors, distillation columns, evaporators and driers. Process change for improved heat integration.

Heat and mass exchange networks and network design. CHEM CAD/CAM ASPHEN Essential utilities of chemical process plants such as Water sources, steam, compressors & vacuum pumps, refrigeration systems, inert gases etc.

Recent Developments in the fields and future challanges.

Books & References:

1. Jack Broughton; Process Utility Systems; Institution of Chem. Engineers U.K.
2. Reid, Prausnitz poling; The Properties of Gases & Liquids, IV ed. McGraw Hill International ed.
3. S.C.Arora & S.Domkumdwar; A Course in Refrigeration and Air Conditioning; Dhanpat Rai & Co.(P) ltd.

2CE4   ENERGY TECHNOLOGY AND CONSERVATION

Sources of energy, different forms and conversion , solid, liquid and gaseous fuels, composition Analysis, heating values, combustion of fuels, furnaces and furnace streams, material and energy Balance, consumption and heat transfer efficiency, furnace design, oxidation of sulfur and sulfur compounds, alternate sources of energy, energy auditing, case studies, principle of renewable energy, technical and social implications.

Solar radiation, measurement and estimation, solar heating devices, solar water heaters, sheltered and unsheltered heaters, systems with separate storage, selective surfaces, solar ponds, solar concentrators and other devices, Bio fuels: classification, combustion and pyrolysis, production of alcohol and bio gas. Bio diesel, fundamentals, transesterification of vegetable oils for bio diesel production, characterization of bio diesel, economics, current trends, future prospects.

Hydrogen energy,: system and analysis, hydrogen infrastructure, safety, codes and standards.

Hydrogen production: Electrolysis, thermochemical, hydrogen from fossil fuels, biomass a renewable sources of energy. Hydrogen storage, carbon storage materials, metal and chemical hydrides, cryogenic hydrogen storage, hydrogen fuel cells.

Recent Developments in the fields and future challanges.

Books & References:

1. Fuels & Fuel Technology : Francis W; Peter M.C Pergmon Press
2. Fuel Combustion Energy Technology : S.N.Saha, Dhanpat Rai Pub. Co. New Delhi
3. Conventional Energy Technology : S.B.Pandya, Tata McGraw Hill

4. Practical Techniques of Saving Energy in Chemical Industries : Sitting M, Noyes Data Corp. USA.
5. Brame J. S. S. and King J. G. Edward Arnold, " Fuel, Solid, Liquid and Gases"
6. Sukhatme S.P., "Solar Energy"

2CE5   ELECTIVE-II   (Any one of the following)

1) ENVIRONMENTAL ENGINEERING & WASTE MANAGEMENT

Ecology and environment, sources of air waster, solid wastes, Air pollution, Micrometeorology and dispersion of pollutants in environment, Fate of pollutants, Air pollution control techniques, centrifugal collectors,electrostatics, precipitator, bag filter, wet scrubbers, Design & efficiencies, Combustion generated pollution, vehicle emission control, case studies, Water pollution, water quality modeling of streams, Characterization of effluents, effluent standards, treatment methods, Primary, secondary and tertiary methods, solid waste collection, treatment and disposals, waste recovery systems.

Books & References:

1. Environmental Impact Assessment L.Canter, McGraw Hill
2. Fundamentals of Ecology, E.P.Odum, V.B.Sounders & CO
3. Physici-Chemical Process for water quality control, Wiley International
4. Water & Water Pollution Handbook, L.L.Gaccio, Marcel Dekkar, New York.

2CE5   ELECTIVE-II
2) NANOTECHNOLOGY

Introduction to Nanotechnology – History of nano-revolution, nano scale materials and their applications, Carbon nano tubes, organic and inorganic nano structures.

Future of the nanotechnology.

Materials used in Nanotechnology – An overview of the physical (mechanical, electrical) and chemical properties of different classes of solid materials such as metals, semiconductors, insulators and polymers.

Examples of size effects of properties observed in thin films, colloids and nanocrystals.

Conventional Fabrication Techniques – Topdown and bottom up process, techniques used in conventional microfabrication including thin film deposition (e.g. CVD, PVD(, lithography, chemical etching and electrodeposition.

Analytical Techniques – Analytical techniques such as Scanning Electron Microscopy (SEM), Electron and X-ray Diffraction, Ellipsometry,

Photoelectron, Optical and Ion spectroscopy and Probe Microscopy. Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM)

Applications – Examples of applications in Micro and Nano technology including, Micro fluidics, Micro Electron Mechanical Systems (MEMS) membrane technology, and catyalyst and coatings

Books & References :
1. M. Wilson, K. K. G. Smith, M. Simmons and B, Raguse; Nanotechnology, Chapman & Hall/CRC press 2002
2. M. Meyyappan; Carbon Nanotubes, Science and application; CRC Press, 2005
3. Alexei Nabok; Organic and Inorganic Nanostructures; Publisher Artech House, London, 2005
4. H. Watarai, N. Teramae and T Sawada; Interfacial Nanochemistry; Kluwer Academic/Plenum Press, 2005

2CE5   **ELECTIVE-II**
3) CHEMOINFORMATICS

Definition; in-vivo, in-vitro, in-silico synthesis of molecules

Representation of molecules in computers; WLN, SMILES, InChi etc.; Graph theory; Property Calculations; QSAR, QSPR

Molecular surfaces; data mining, data modeling; 2D and 3D structural databases; Database search tools (ANN, GA, Fuzzy etc.)

Virtual reactions, reaction prediction; bond energies; reaction databases; drug design; CML

Introduction to packages such as ACDLABS, Chemsk8, Chemaxon, JME, Molchem

Books & References:
1. J. Gasteiger, T. Engel, "Cheminformatics," Wiley-VCH, Weinheim, Germany, 2003 A. Leach, V. Gillet, "An Introduction to Cheminformatics," Springer, 2003.
2. J. Bajorath, "Chemoinformatics: Concepts, Methods, and Tools for Drug Discovery (Methods in Molecular Biology)," Humana Press, 2004
3. Gasteiger, Johann J., ed. Handbook of Chemoinformatics: From Data to Knowledge. 4 v. Wiley-VCH, 2003.

2 CE 6   **CHEMICAL REACTION ENGINEERING-LAB.**
          Practical based on above syllabus.

2 CE 7   **ADVANCED SEPARATION PROCESS**
          Practical based on above syllabus.
          *****

THIRD SEMESTER
3CE1 DISSERTATION / **SEMINAR** : Preparation of detailed report based on collection of data, experimental work, published review, etc, on a topic related to the Project / Dissertation and presentation as seminar.

Literature survey on Project / Dissertation topic, planning of work, finalising materials and methodology, etc.

*****
FOURTH SEMESTER

4CE1 DISSERTATION / **SEMINAR** : Review of Project / Dissertation data generated, experimentation, conclusion drawn, recommendations given, preparation of report, calculation, designing, etc.

*****

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

1RMEF1/1RME1 ADVANCED COMPUTER ARCHITECTURE

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

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

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

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

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

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

Text Book:

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

Reference Books:

1. Hayes J.P., “Introduction to Computer Architecture”, (McGraw Hill)).
2. Tenanbaum A. S., “Computer Organisation and Architecture”, (PHI).
3. Hwang K., “Advanced Computer Architecture”, (McGraw Hill).
4. Hamacher V.C, “Computer Organization”, (McGraw Hill).

1RMEF2/1RME2   ALGORITHMICS

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

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

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

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

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

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

Text Book:
G. Brassard, P.Bratley, “Fundamentals of Algorithmics”, (PHI).

Reference Books:

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

1RMEF3 /1RME3   OPERATING SYSTEM DESIGN

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

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

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

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

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

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

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

Reference Books:
i.   Daniel Bovet, "Understanding the Linux Kernel" O'Reilly Publications 2/e.

ii.   Rubini and J. Corbet . "Linux Device Drivers." O'Reilly and Associates, 2001.

iii.   Mosberger & Eranian. "IA-64 Linux Kernel: Design & Implementation" PHI.

iv.   McKusick & Neil . "The FreeBSD Operating System" Addison-Wesley, 2004.

1RMEF4/3RME1   EXPERT SYSTEM DESIGN

Unit I: Introduction to Expert Systems, An Overview of Artificial Intelligence, Knowledge Representation: Principles and techniques, STRIPS planner, Subgoaling in MYCIN, Evaluating and comparing expert Systems.

Unit II: Rule Based Systems: Canonical systems, Production systems for problem solving, Conflict resolution. Associative Nets and Frame Systems: Graphs, trees and networks, The rise of associative networks, Representing typical objects and situations. Object-oriented analysis and design for expert systems.

Unit III: Representing Uncertainty: Sources of uncertainty, Expert systems and probability theory, Vagueness and possibility, The uncertain state of uncertainty. Knowledge Acquisition: Theoretical analyses of knowledge acquisition, Expert system shells, Knowledge acquisition methods, Knowledge-based knowledge acquisition.

Unit IV: Heuristic Classification (I): Classifications of expert system tasks, Classification problem solving, Classification versus construction. Heuristic Classification (II): Mapping tools to tasks, Heuristic classification in MUD and MORE, Making strategy more explicit.

Unit V: Hierarchical Hypothesize and Test: Managing complexity, Structured objects in CENTAUR, Model-based reasoning in INTERNIST, TDE as knowledge engineering workbench. Constructive Problem Solving (I): Motivation and overview, A case study: R1/XCON, Elicitation, evaluation and extensibility.

Unit VI: Tools for Building Expert Systems: Overview of expert systems tools, Expert System Shells, High-level programming languages, potential implementation problems, More maxims on expert system development. Truth Maintenance Systems: Keeping track of dependencies, Revising propositional theories, Nonmonotonic justifications, Maintaining multiple contexts.

Text Book:
Peter Jackson, "Introduction to Expert systems", Pearson Education, 3rd Edition, 2003.

Reference Books:
1.   J. L. Ermine, "Expert Systems: Theory and Practice", Prentice Hall, 2003.
2.   Hayes Roth, "Handbook of Expert System Design" (Addison-Wesley).

3. D. W. Patterson, "Artificial Intelligence & Expert Systems" (PHI).
4. Donal A. Waterman, "A Guide to Expert systems", Pearson Education, 2001.
5. E. Turban, "Expert Systems and Applied Artificial Intelligence", Macmillan, 2004.

1RMEF5/3RME2 DATABASE PROCESSING

Unit I: Introduction to Database Processing, File Processing Systems, Definition of Database. The Entity-Relationship (E-R) Model: Element of the E-R Model, E-R Diagrams, Examples, Database as Models of Models. The Semantic Object Model: Semantic Objects, Creating Data Models with Semantic Objects, Types of Objects, Comparison of the Semantic Object and the E-R Model.

Unit II: The Relational Model and Normalization: The Relational Model, normalization, First through Fifth Normal Forms, Domain Key Normal Forms, The Synthesis of Relations, Multi-Value Dependencies, Iteration, Optimization.

Unit III: Database Design using Entity-Relationship Models: Transformation of Entity Relationship Models into Relational Database Designs, Example Design. Trees, Networks. Database Design with Semantic Object Models: Transformation of Semantic Objects into Relational Database Design, Sample Objects.

Unit IV: Defining Relational Data, Relational Data manipulation, Relational Algebra. SQL: Querying a Single Table, Querying Multiple Tables, Exist and Not Exists, Changing Data. Database Application Design: Creating, Reading, Updating and Deleting View Instances, Form Design, Report Design, Enforcing Constraints, Security and Control, Application Logic.

Unit V: Managing Multi-User Databases: Database Administration, Concurrency Control, Database Security, and Database Recovery. Managing Database with Oracle: Creating an Oracle Database, Application Logic, Data Dictionary, Concurrency Control, Oracle Security, Backup and Recovery.

Unit VI: Networks, Multi-Tier Architecture, and XML: Network Environments, Multi-Tier Architecture, XML-Extensible Markup Language. ODBC, OLE DB, ADO. The Web Server Data Environment, Open Database Connectivity (ODBC) Standard, JDBC, JSP with reference to databases.

Text Book:
David M. Kroenke: Database Processing- Fundamentals, Design and Implementation, 8th Edition (PHI).

Reference Books:
1. C.J. Date: Database Processing, (Addison Wesley).
2. R. Ramakrishnan: Database Management Systems, (McGraw Hill).
3. R Elmasri and S B. Navathe: Fundamentals of Database Systems, 2nd Edition.(Wiley)
4. Korth and Silberschatz " Database Processing Concepts" (McGraw Hill).

1RMEF6/3RME3 EXPERT SYSTEM DESIGN-LAB.

At least eight experiments must be performed which will include at least one experiments on each Unit.

1RMEF7/3RME4 DATABASE PROCESSING-LAB.

At least eight experiments must be performed which will include at least one experiments on each Unit.

SECOND SEMESTER

2RMEF1/2RME1 COMPUTER COMMUNICATION NETWORKS

Unit I: The need for speed and quality of service. Advanced TCP/IP and ATM Networks. The need for a protocol architecture. The TCP/IP protocol architecture. The OSI model. Internetworking, TCP, UDP, Ipv6.

Unit II: Pacekt-switching networks. Frame relay networks. ATM protocol architecture. ATM logical connections. ATM cells. ATM service categories. ATM Adaptation Layer (AAL). The emergence of high-speed LANs. Ethernet. Fibre channel. Wireless LANs.

Unit III: Overview of probability and Stochastic processes. Probability. Random variables. Stochastic processes. Queuing analysis. Why queuing analysis. Queuing models. Single-server queus. Multiserver queues. Queues with priorities. Networks of queues. Other queuing models. Estimating model parameters. Self-similarity. Self-similar data traffic. Examples of self-similar data traffic. Performance implications of self-similarity.

Unit IV: Congestion control in data networks and internets. Effects of congestion. Congestion and control. Traffic management. Congestion control in Packet-Switching networks. Frame relay congestion control. The need for flow and error control. Link control mechanisms. ARQ performance. TCP flow control. TCP congestion control performance of TCP over ATM.

Unit V: Overview of graph theory and least-cost paths. Elementary concepts of graph theory. Shortest path length determination. Internet routing principles. Distance-Vector protocol. RIP. Link-State protocol. OSPF. Path-Vector protocols. BGP and IDRP. Multicasting.

Unit VI: Integrated Services Architecture (ISA). Queuing discipline. Random early detection. Differentiated services. Real-Time traffic. Resource Reservation : RSVP. Multiprotocol label switching. Real-Time Transport Protocol (RTP).

Text Books:

Willam Stallings - High Speed Networks and Internets - Performance and Quality of Service, 2nd Ed., (Pearson Education).

Reference Books:

1. Andrew S. Tanenbaum - Computer Networks, 4th Ed., Pearson Education.
2. James F. Kurose, Keith W. Ross - Computer Networking: A Top-Down Approach Featuring the Internet.
3. William Stallings - Data and Computer Communications, 7th Ed., Pearson Education.
4. Andrew S. Tanenbaum - Computer Networks, 4th Ed., Pearson Education.

2 RMEF2/2 RME2 ADVANCED COMPILING TECHNIQUES

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

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

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

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

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

Unit VI: Data-Flow Analysis: Basic Concepts, Taxonomy of Data-Flow Problems, Solution Methods: Iterative, Lattices of Flow Functions

and Control-Tree-Eased. Structural Analysis, Interval Analysis, Du-Chains, Ud-Chains, Webs, SSA Form. Dealing with Arrays, Structures, and Pointers. Automating Construction of Data-Flow Analyzers.

Text Book:

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

Reference Books:

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

2RMEF3/4RME1 REAL-TIME SYSTEMS

Unit-I: Typical Real-time applications, Hard versus Soft Real-time systems: Jobs and Processors, Release Times, Deadlines and Timing Constraints, Hard and Soft Timing Constraints, Hard Real-time systems, Soft Real-time systems. A Reference Model of Real-time system: Processors and Resources, Temporal Parameters of Real-time Workload, Periodic Task Model, Precedence Constraints and Data Dependency, Other types of Dependencies, Functional Parameters, Resource Parameters of Jobs and Parameters of Resources, Scheduling Hierarchy.

Unit II: Commonly used approaches to Real-time Scheduling: Clock driven Approach, Weighted Round-Robin Approach, Priority Driven Approach, Dynamic versus Static Systems, Effective Release Times and Deadlines, Optimality of the EDF and LST Algorithms, Non optimality of the EDF and LST Algorithms, Challenging in Validating Timing Constraints in Priority-Driven Systems, Off-Line versus On-Line Scheduling.

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

Unit IV: Priority-Driven Scheduling of Periodic Tasks: Static Assumption, Fixed-Priority versus Dynamic-Priority Algorithms, Maximum Schedulable Utilization, Optimality of the RM and DM Algorithms, A Schedulability Test for Fixed-Priority Tasks with Short Response Times, Schedulability Test for Fixed-Priority

Tasks with Arbitrary Response Times, Sufficient Schedulability Conditions for the RM and DM Algorithms.

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

Unit VI: Resources and Resource Access Control: Effects of Resource Contention and Resource Access Control, Nonpreemptive Critical Sections, Basic Priority-Inheritance Protocol, Basic Priority-Ceiling Protocol, Stack-Based Priority-Ceiling (Ceiling-Priority) Protocol, Use of Priority-Ceiling Protocol in Dynamic-Priority Systems, Preemption-Ceiling Protocol, Controlling Accesses to Multiple-Unit Resources.

Text Book:

Jane W.S. Liu: Real-Time Systems, (Pearson Education).

Reference Books:

1. R Buhr and D Bailey "Introduction to Real-Time Systems" (Addison Wesley).
2. C. M. Krishna and K. G. Shin: Real-Time Systems, (McGraw-Hill), 1997.
3. Phillip A. Laplante: "Real-Time Systems Design and Analysis" (Wiley India).
4. K.V.K. Prasad "Embedded Real –Time Systems" (Wiley- India/ Dreamtech).

2RMEF4/4RME2   ELECTIVE
(1) MOBILE COMPUTING

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

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

allocation (HCA), Allocation in specialized system structure, System Modeling.

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

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

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

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

Text Book:

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

Reference Books:

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

2RMEF4/4RME2   ELECTIVE
(2) NETWORK SECURITY

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

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

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

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

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

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

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

Reference Books:

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

2RMEF4/4RME2   ELECTIVE
(3) COMPUTER VISION & IMAGE PROCESSING

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

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

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

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

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

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

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

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

2RMEF5/4 RME 3   TECHNICA PAPER WRITING

2RMEF6/2RME3   SEMINAR

2RMEF7/2RME4   ADVANCED COMPILING TECHNIQUES-LAB.

At least eight experiments must be performed which will include at least one experiments on each Unit.

2RMEF8/4 RME 4   REAL TIME SYSTEMS- LAB.

At least eight experiments must be performed which will include at least one experiments on each Unit.

*****

THIRD SEMESTER

3RMEF1   SEMINAR AND DISSERTATION

FOURTH SEMESTER

4RMEF1   SEMINAR AND DISSERTATION

*****

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

1NMEF1   OPERATING SYSTEM CONFIGURATION

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

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

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

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

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

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

Text book :

Robert Love, "Linux Kernel Development" Pearson Education, 2/e.

Reference Books:

i.   Daniel Bovet, "Understanding the Linux Kernel" O'Reilly Publications 2/e.

ii.   Rubini and J. Corbet . Linux Device Drivers. O'Reilly and Associates, 2001.

iii.   D. Mosberger and S. Eranian. IA-64 Linux Kernel: Design & Implementation. Prentice Hall, 2002.

iv.   M. McKusick and G. Neville-Neil . The Design and Implementation of the FreeBSD Operating System. Addison-Wesley, 2004.

1NMEF2   DATABASE SYSTEM DESIGN

Unit I: Introduction to Database Processing, File Processing Systems, Definition of Database. The Entity-Relationship(E-R) Model: Element of the E-R Model, E-R Diagrams, Examples, Database as Models of Models. The Semantic Object Model: Semantic Objects, Creating Data Models with Semantic Objects, Types of Objects, Comparison of the Semantic Object and the E-R Model.

Unit II: The Relational Model and Normalization: The Relational Model, normalization, First through Fifth Normal Forms, Domain Key Normal Forms, The Synthesis of Relations, Multi-Value Dependencies, Iteration, Optimization.

Unit III: Database Design using Entity-Relationship Models: Transformation of Entity Relationship Models into Relational Database Designs, Example Design. Trees, Networks. Database Design with Semantic Object Models: Transformation of Semantic Objects into Relational Database Design, Sample Objects.

Unit IV: Foundation of Relational Implementation: Defining Relational Data, Relational Data manipulation, Relational Algebra. SQL: Querying a Single Table, Querying Multiple Tables, Exist and Not Exists, Changing Data. Database Application Design: Creating, Reading, Updating and Deleting View Instances, Form Design, Report Design, Enforcing Constraints, Security and Control, Application Logic.

Unit V: Managing Multi-User Databases: Database Administration, Concurrency Control, Database Security, and Database Recovery. Managing Database with Oracle: Creating an Oracle Database, Application Logic, Data Dictionary, Concurrency Control, Oracle Security, Oracle Backup and Recovery.

Unit VI: Networks, Multi-Tier Architecture, and XML: Network Environments, Multi-Tier Architecture, Markup Languages HTML and DHTML, XML-Extensible Markup Language. ODBC, OLE DB, ADO and ASP: The Web Server Data Environment, Open Database Connectivity (ODBC) Standard, JDBC, Java Server Pages, MySQL.

Text Book:

David M. Kroenke: Database Processing- Fundamentals, Design and Implementation, 8th Edition (PHI).

References:

1.   C.J. Date: Database Processing, (Addison Wesley).

2.   R. Ramakrishnan: Database Management Systems, (McGraw Hill).

3.   Ramez Elmasri and Shamkant B. Navathe: Fundamentals of Database Systems, 2nd Edition.

1 NMEF 3   NET - CENTRIC COMPUTING

Unit I :   Overview of Computer Communications and Networking, Types of Computer Networks, Network Addressing, Routing, Reliability, Interoperability, and Security, Network Standards, Network Applications and Application Protocols, Computer Communications and Networking Models, Communication Service Methods and Data Transmission Modes, Analog and Digital Communications, Speed and Capacity of a Communications Channel, Multiplexing and Switching, Network Architecture and the OSI Reference Model.

Unit II :   Physical Layer Concepts, Copper Media, Fiber-Optic Media, Wireless Communications, Satellite Communications, structured cabling Systems, Data Link Layer Concepts, LLC Sublayer, MAC Sublayer, Data Prioritization and Quality of Service.

Unit III :   Internetworking Concepts, The Network Layer and Routing Concepts, Routing Protocols, RIP, OSPF, Router and Switches, VPNs, Internet Administration, TCP/IP, TCP/IP Transport and Network Layer Protocols, IP Addresses, IPv6, TCP/IP Application Level Protocol.

Unit IV :   Ethernet and 802.3 Networks, 10-MBPS Ethernet/802.3 LANS, Switched Ethernet, Full-Duplex Ethernet, and Virtual LANs, Fast Ethernet, Gigabit Ethernet, Token Ring, Frame Formats, Priority and Reservation, Monitor Stations, Second-Generation token Ring, Token Ring versus Token Bus.

Unit V :   Fiber Distributed Data Interface, Physical Layer Specifications, Frame Formats and Medium Access Specifications, Configuration and Design Issues, Integrated services Digital Network, Components, Channel types, BRI, PRI, ISDN Protocols, Frame Relay Circuits, Data link Layer Issues & Information.

Unit VI :   Switched Multimegabit Data Services, Technical Overview, SIP, SMDS Addressing, SMDS versus Other LAN-to-LAN Technologies, ATM, Concepts and Operation, ATM interface Standards, ATM Cells, Virtual Connections, And Addressing,

AAL, ATM and Convergence Technology, ATM versus Other Technologies and Services, Dialup Networking, DSL Services.

TEXT BOOK :

Michael A. Gallo, William M. Hancock : Computer Communications and Networking Technologies. Cengage Learning

REFERENCE BOOKS :

1) Stallings W., "High Speed Networks and Internets : Performance and Quality of Service", Prentice Hall, 2002.

2) Kershenbaum A., "Telecommunications Network Design Algorithms", Tata McGraw Hill.

3) Douglas E. Comer, "Computer Networks and Internet", Pearson Edu. Asia.

4) Andrew Tanenbaum, "Computer Network", PHI.

1 NMEF 4   REAL TIME EMBEDDED SYSTEM DESIGN

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

UNIT II Detailed study of PIC18 Family Microcontroller Architecture, Pin Description, File Structure, Status Register, PIC data formats, Directives, RISC Architecture in PIC, SFR, PIC18 Hardware Connections, PIC 18 Timers, PIC 18 Serial Port, PIC 18 Interrupts. Features of ATMEL, ARM, AVR Microcontrollers.

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

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

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

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

TEXT BOOKS:

1. Dr. K.V. K. K. Prasad "Embedded / Real Time System : Concepts, Design, & Programming -Black Book" Dreamtech Press Publication

2. Mohammad Ali Mazidi, Rolin D. Mckinly,Danny Causey: PIC Microcontroller and Embedded system using Assembly and C for PIC18, Pearson Education

3. Jane W.S. Liu : Real Time System, Pearson Education

REFERENCE BOOKS:

1. Raj Kamal, "Embedded Systems Architecture, Programming and Design", Tata McGraw-Hill

2. John B. Beatman, Design with PIC Microntroller, Prentice Hall

3. Barry B. Brey, Appling PIC18 Microntroller, Architecture, Programming and Interfacing using C and Assembly, Prentice Hall.

4. Phillip A. Laplante: Real-Time Systems Design and Analysis, (Wiley InterScience)

1NMEF5   Elective-I

i) Software Engineering Methodologies

Unit I: Software Process Models : Software Process Framework, Process Patterns, Personal and Team Process Models, Process Models: Waterfall Model, Incremental Models, Evolutionary Models, Iterative Development, The Unified Process, Agile process, Process Assessment, CMMI, Impact of Processes and Outcomes, Process Selection and applicability.

Unit II: Requirements Engineering : Requirements Engineering Tasks, Requirement Elicitation Techniques, Software Requirements: Functional, Non-Functional, Domain, Requirements Characteristics and Characterization, Requirement qualities, Requirement Specification, Requirement Traceability, System Analysis Model Generation, Requirement Prioritization.

Unit III: UML Concepts : Programming In Small Versus Programming In Large, UML 2.0 History/ New Features MDA/ MOF/ XMI/ CORBA, Introduction to UML Metamodel, Extensibility Mechanisms and its usage, Introduction to OCL, Specification techniques of diagrams in UML.

Unit IV: Behavioral Model : Use Cases, Use Case Diagram Components, Use Case Diagram, Actor Generalization, Include and Extend, Template for Use Case Narrative, Using Use Cases Data Dictionary : Finding the Objects, Responsibilities, Collaborators, and Attributes, CRC Cards, Dynamic Behavior : Sequence diagrams, object lifelines and message types, Activity Diagrams : Decisions and Merges, Synchronization.

Unit V: Design Engineering : Design quality, Design Concepts, The Design Model, Introduction to Pattern-Based Software Design, Architecture styles : Main program with sub program style, Abstract data type style, Repository, Layered. Architectural Design: Software Architecture, Data Design and Architectural Design.

Unit VI: Object Oriented Design : Design of Objects, Design and Factoring, Design of Software Objects, Features and Methods, Cohesion of Objects , Coupling between Objects , Coupling and Visibility, Inheritance, Establishing The Object Model, Refining classes and associations, Analysis model vs. design model classes, Categorizing classes: entity, boundary and control, Modeling associations and collections, Achieving reusability, Reuse through delegation, Identifying and using service packages.

REFERENCE BOOKS:
1.   Ian Sommerville, "Software Engineering", 7th Edition, Addison-Wesley, 2004
2.   Grady Booch, James Rambaugh, Ivar Jacobson, "Unified Modeling Language Users Guide", 2nd Edition, Addison-Wesley,.
3.   Jim Arlow, Ila Neustadt, "UML 2 and Unified Process: Practical Object Oriented Analysis and Design. ", 2nd Edition, Addison-Wesley,
4.   Tom Pender, "UML Bible", John Wiley & Sons,.
5.   Stephen H. Kan, "Metrics and Models in Software Quality Engineering", Pearson Education,

1NMEF5   **Elective-I**
ii) INTELLIGENT SYSTEM

Unit I :   Artificial Intelligence : Intelligence, Artificial intelligence, intelligent systems. Knowledge representation : Reasoning, issue and acquisition : propositional calculus, predicate calculus, Rule-based knowledge representation, Truth Maintenance system.

Unit II: Expert Systems : introduction, expert systems, stages in the development of expert system, expert system tools, difficulties in developing expert systems, applications of expert systems.

Unit III: Fuzzy Systems : introduction, foundation of fuzzy systems, fuzzy relations, arithmetic operations of fuzzy numbers, linguistic descriptions and their analytical forms, defuzzification methods, fuzzy logic in control and decision-making applications

Unit IV :   Artificial Neural Networks : introduction, Neuron physiology, artificial neurons, artificial neural networks, features of artificial neural networks, backpropagation training algorithms, functional link neural networks, cascasde correlation neural networks.

Unit V :   Genetic Algorithms and Evolutionary Programming : introduction, genetic algorithms, procedures of genetic algorithms, the working of genetic algorithms,   evolutionary programming, genetic-algorithm-based machine learning classifier system.

Unit VI :   Swarm Intelligent Systems : introduction, importance of the ant colony paradigm, ant colony systems, development of the ant colony systems, application of ant colony intelligence, the working of ant colony systems : Probabilistic Transition rule,PheromoneUpdating ,Types of ant colony models. particle Swarm intelligent systems .

TEXT BOOK :

N.P.Padhy, "Artificial Intelligence and Intelligent Systems", Oxford.

REFERENCE BOOKS :
1.   Hakin, Simon 2003, "Neural Networks : A Comprehensive Foundation", PHI, New Delhi.
2.   Kosko B. 1997, "Neural Networks and Fuzzy Systems", PHI, New Delhi.
3.   Rajasekaran S. and G.A.Vijayalakshmi Pai, 2003, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, New Delhi.
4.   Sriram, Ram D. 1977, "Intelligent Systems for Engineering - A Knowledge-Based Approach", Springer, London.

******

iii) Legal and Professional Ethics

Unit-I   Technical communication: Oral presentations Technical writing, System documentation, Technical requirements Team Work Culture: Collaboration, Group dynamics, Leadership styles, Personality types, Collaboration tools.

Unit-II   Social informatics, Social impact of IT on society, Online communities & social implications, Philosophical context,

Diversity issues, Gender-related issues, Cultural issues, Accessibility issues, Globalization issues, Economic issues in computing, Digital divide.

Unit-III   Foundations of intellectual property, Ownership of information, Plagiarism, Software piracy, Fair use, Digital Millennium Copyright Act (DMCA), Copyrights, patents, trademarks and trade secrets, NDAs, International differences.

Unit-IV   Legal Issues: Compliance to Cyber laws, Hackers/crackers, Computer crime, Viruses, System use policies & monitoring, Risks and liabilities of computer-based systems, Accountability, responsibility, liability.

Unit-V   Organizational context: Business processes, IT environment, Organizational culture, Professionalism, Relationships with professional societies., Codes of professional conduct, such as IEEE, ACM, BCS, ITAA, AITP. Ethics and history of ethics, Whistle-blowing, Workplace issues (harassment, discrimination), Identify theft, Ethical hacking,

Unit-VI   Implications of: History of computer hardware, software, History of the Internet History of Telecommunications, The IT profession, IT education. Privacy and civil liberties.

BOOKS RECOMMENDED:

1.   Meenakshi Raman, Sangeeta Sharma,"Technical Communication – English Skills for Engineers" Oxford Higher Education

2.   George Reynolds, "Ethics in Information Technology", Thomson Course Technology, 2003

3.   Sara Baase,"A Gift of Fire: Social, Legal and Ethical Issues for Computing and the Internet ", PHI publications

4.   Richard A.Spinello, " Case Studies in Information Technology Ethics", Second Edition, PHI

1NMEF6   **LAB-I**
(Based On 1NMEF1 & 1NMEF2)

1NMEF7   **LAB-II**
(Based On 1NMEF3 & 1NMEF4)

*****

SECOND SEMESTER
2NMEF1   INTEGRATIVE PROGRAMMING

Unit I :   Object Oriented Programming : Methodology, features, design patterns and frameworks, Java classes and objects: constructors, finalizers, garbage collector, cloning objects, nested classes and interfaces, inner classes, Java I/O : Byte-oriented streams, File I/O, Character streams, Object serialization.

Unit II :   Multithreaded Programming : Threads and life cycle of a thread, Creating and running the threads. Thread class and Runnable interface. Service threads, JVM and task scheduling, thread synchronization, synchronizing methods of inner classes. Thread communication, Grouping the threads.

Unit III :   Databases Programming : Model-View-Persistence design pattern, Mapping between Java objects and Data elements, JDBC and drives for RDBMS, SQL to Java type mapping, Java and Javax SQL APIs and their uses in database programming, Transaction coding, Connection pooling.

Unit IV :   XML : Introduction, XML structure, XML DTD creation and Schema creation, well formed and valid XML documents, XML parsers like SAX & DOM, Parsing XML documents with DOM, JDOM and SAX parsers, XML transformation using XSLT and X Path.

Unit V :   Network Programming : Java approach for URLs, Sockets – TCP/IP and Datagram sockets, Programming using sockets, Remote method invocation (RMI) : server and client development for RMI, RMI registry, JNDI service and its packages, Security : Cryptography, Secure Socket Layer, Security policy definition, Java AAS.

Unit VI :   Web application development : Technology of the web, Servlet and Servlet API, building web application. Java Server Pages, JSP tags and API, JSP processing, Java coding in JSP, Web application frameworks. Robust web application development.

TEXT BOOK :

Wigglesworth J & McMillan P : Java Programming : Advanced Topics, 3/e, Thomson Course Technology.

REFERENCES :

1.   Schildt H and Naughton P : Java : The Complete Reference, Osborne, McGraw Hill

2.   Dustin R Callaway : Inside Servlet, Pearson Education, LPE

3.   Larne Pekowasky : Java Server Pages, Pearson Education, LPE

4.   Dietel & Dietel : WWW : How to Program, Pearson Education, LPE.

2NMEF2   DIGITAL MEDIA DEVELOPMENT

Unit I   Introduction to Multimedia Systems design, Elements,Systems architechture & technologies , Objects for multimedia systems , Multimedia data interface standards, Multimedia Databases, Data Compression need, lossy and lossless compression, binary image compression Schemes, color, grey and still video image compression , Full motion video compression , audio compression

Unit II   Data and file format standards RTF, TIFF,RIFF, MIDI , JPEG ,AVI, MPEG Standards, video and image display systems, image scanners , Digital voice and audio, Digital camera, video images and animation, Full motion video

Unit III   Telecommunications considerations for Multimedia, Specialised processors , ISDN, LAN and WAN for Enterprise Multimedia Applications, Distibuted Object Model, Multimedia communication protocols (UDP , RTP , RTCP , TELNET) Multimedia Applications and Design issues,,Virtual Reality Design,Componects of Multimedia Systems,, Application Workflow & Distributed Application Design Issues

Unit IV   Multimedia Authoring and User Interface, Design Considerations, Hypermedia Applications, Information Access, Object display, Hypermedia Messaging, Integrated document management

Unit V   Distributed Multimedia Systems, Components, Client-server Operation, Object Server, Network Performance Issues, Distributed Multimedia databases, Managing distributed Objects

Unit VI   System Design: Design issues,requirements, feasibility, Performance Analysis, Design for performance , Multimedia Systems Design , Extensibility and example.

References

1.   Prabhat K Andleigh and Kiran Thakrar "Multimedia Systems Design" (PHI Publications).

2.   Fred Halsall," Multimedia Communications by (Pearson Publications).

3.   Ze-Nian Li, Mark S.Drew,"Fundamentals of Multimedia" (Pearson Publications).

4.   John K.Koegel Buford, "Multimedia Systems" (Pearson Education)

2NMEF3   INFORMATION TECHNLOGY MANAGEMENT

Unit-I   IT and Strategy : Information revolution, Business and strategy. IT Strategy, Strategy and Success, Design Parameters, Strategic positioning, Evolution of strategy sequences and getting the right, development of a strategy ,types of strategy ,context and strategy.

Unit-II   Managing IT :IT management and its roles, It governance, It governance and strategy, Technology management process, Technology selection, Strategic aspects of technology. IT and business alignment, Risk Management ,Exploiting IT Capabilities, Deploying IT in strategic manner ,Strategic planning for information technology and frameworks , Measuring IT, Performance Measures : Balanced Score Card.

Unit-III   E- strategy : What is e- strategy. E-business and E-strategy, E-business objectives ,E-Commerce and E-Business, Making e-strategy work, E-strategy and the E-economy.

IT strategies for IT companies: Project Vs Product Companies , Strategies aspects for an IT product company, IT Strategic perspective for product company ,IT Strategies for Product company information Technology Strategy development, Product life cycle and project life cycles.

Unit-IV   IT strategies for Knowledge Management

Knowledge Management, Knowledge Management and IT strategies, role of Knowledge Management in IT strategies for IT companies, knowledge industry and knowledge strategy knowledge workers, IT strategic services ,product and consulting .

IT strategies for non –IT companies : Role of IT in non –IT companies , IT Investment decision, measurement of IT,IT strategies for Non-IT companies, IT supply chain management and constraint management, IT enabled supply chain management.

Unit-V   IT Strategies in specific scenario, Enterprise resource planning implementation, mapping IT strategies initiatives to ERP ,supply chain contribution and business strategy, IT strategies for business process outsourcing,

IT strategy implementation : IT strategy implementation, Development and need of it strategic plan ,IT strategy implementation to gain competitive advantage, IT strategy and leadership, IT strategy and differentiation , Execution and IT strategy .

Unit-VI   Global dimension of It Strategy : IT strategies in global environment, Global product cycle, Making It global scenario, globalization and competitive strategy, global project management, Mergers and acquisitions ,IT compatibility in M&A.

TEXT BOOK:

Parag Kulkarni,Pradip K Chande "IT Strategy for Business", OXFORD University Press.

Reference Books :

1. Earl. M, "Management Strategies for Information Technology ",Prentice Hall.

2. Gottschalk , P " Strategic Knowledge Managements Technology " IGP USA

3. Hill , C and G Jones " Strategic management " Houghton Miffen USA

4. Honeycutt J " Knowledge management Strategies" , Microsoft Press USA.

2NMEF 4   SYSTEM SECURITY

UNIT-I   Introduction: Security, Attacks, Computer criminals, Method of Defense

Cryptography: Substitution ciphers, Transpositions , Symmetric and asymmetric systems , cryptanalysis ,data encryption standard (DES) AES Encryption algorithms Public Key Cryptography, RSA Algorithms , Uses of Encryptions.

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

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

Authentication basics, Password, Biometrics,

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

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

UNIT-VI   Networks Security: Threats in networks, Network security controls, Firewalls Intrusion detection systems, Secure E-mail.

Administrating Security : Planning , Risk Analysis , Organization security policies , Physical security.

Text Book:

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

References :

1. Stallings, "Cryptography and Network Security:" Pearson Education (LPE)

2. Matt Bishop, "Computer Security: Art and Science", Pearson Education

3. Kaufman, Perlman, Speciner, "Network Security" PHI.

4. Eric Malwald, "Network Security: A Beginner's Guide", TMH

2NMEF5   Elective-II
(1) SOFTWARE TESTING

Unit I :   Introduction of testing : Goals for testing, phases in a tester's mental lilfe, test design, testing versus debugging, designer versus tester, model for testing : project overvirew, environment, the program, bugs test, testing & levels, the role of models.

Unit II :   Software testing process : verification & validation, testing team & development team, characteristics of test engineers, level of testing, testing approaches, test plan, manual testing & its limitations / drawbacks.

Unit III :   Flow graphs and path testing : path testing basics, predicates, path predicates and achievable paths, path senstizing, implementation and application of path testing, transaction - flow testing techniques.

Unit IV :   Testing of object oriented systems : peimer on object oriented software, differences in OO testing, software test automation : what to automate, steps of automation, design and architecture for automation, process model for automation, selecting a test tool.

Unit V :   Software testing tools overview : WinRunner, testing and application using WinRunner, test script language, data driven testing, silk test, load runner, test director.

Unit VI :   Source code testing utilities in UNIX/LINUX environment : GNU tools, timing of programs, profiler, code optimization, productivity tools, portability testing tool, testing application using QTP.

TEXT BOOKS :

1) Boris Beizer : Software Testing Techniques, Dreamtech Press, 2nd edition.

2) Srinivasan Desikan, Gopalaswamy Ramesh : Software Testing Principle and Practices, Pearson Education.

3) Dr. K.V.K.K. Prasad : Software Testing Tools, Dreamtech Press, 2006 edition.

2 NMEF 5   **ELECTIVE-II**
(2) WIRELESS COMMUNICATION AND NETWORKS

Unit I : Introduction to Wireless Telecommunication Systems and Networks, evolution of modern telecommunications infrastructure, OSI model, FDMA, TDMA, CDMA, Future Wireless Networks, Future Wireless Networks, 1 G to 4 G cellular systems, Wireless Standards Organizations.

Unit II : Cellular network hardware components, cellular network databases; SS7 signaling, cellular cluster, backhaul networks, mobility management, concepts of power management and network security, GSM network and System architecture, DECT architecture.

Unit III : CDPD, GPRS and EDGE data networks, network layout, packet data transfer, GPRS protocol reference model, data rates, evolution of GSM and NA-TDMA to 3 G..

Unit IV : Wireless modulation techniques and hardware : spread spectrum modulation, ultra
wideband radio technology, BSC and RBS hardware, digital modulation techniques : OFDM, subscriber devices.

Unit V : Wireless LANs / IEEE 802.1x : evolution, architecture, Wi-Fi system, WLAN FHSS and DSSS physical layer, wireless LAN hardware and system deployment strategies.

Unit VI : PANs and WLANs, IEEE 802.15.1 standard, Bluetooth protocol stack, Bluetooth link controller, Broadband wireless MANs/ IEEE 802.16x, IEEE 802.16 physical layer, WiMax System, Broadband satellite applications, emerging wireless technologies, wireless sensor networks.

TEXT BOOK :

1. Gary Mullett, Wireless Telecommunications Systems and Networks, Thomson Delmar Learning, 2006.

REFERENCE BOOKS :

1. Jochen Schiller, Mobile Communications.

2. William Stallings, Wireless Communications and Networks.

3. T.S.Rappaport, Wireless Communications.

2 NMEF 5   **ELECTIVE-II**
(3) DATA WARE HOUSING & DATA MINING

Unit I : Need for Data Warehousing : Operational Vs. Decisional support system, data warehouse defined, data warehouse users, benefits of data warehousing : tangible benefits, intangible benefits. Features of a data warehouse. Subject oriented data. Integrated data, data cleansing, data transformation, non volatile data, time varient data, data granularity, benefits of data granularity, data granularity - pros and cons, dual levels of data granularity, the information flow mechanism.

Unit II : Metadata. Role of metadata, classification of metadata, metadata management. Direct access mode, indirect access mode. Data warehouse architecture, the two tier architecture, three tier architecture, four tier architecture, data warehouse and data marts, reasons for creating data marts, pushing and pulling data, data warehouse schema, the star schema, the snowflake schema, characteristics of a dimension table, characteristics of a fact table.

Unit III : Keys in the data warehouse schema : primary keys, surrogate keys, foreign keys. Data clustering, OLAP in the data warehouse, OLAP functions, multi dimensional analysis, OLAP and multidimensional analysis, OLAP design considerations, OLAP models, data warehouse design stage, security issues in a data warehouse.

Data Mining

Unit IV : Introduction : fundamentals of data mining, data mining functionalities, classification of data mining systems, major issues in data mining, mining frequent patterns, associations and correlations, classification and prediction, cluster analysis, outlier analysis, evolution analysis.

Unit V : Market basket analysis, frequent itemsets, closed itemsets and association rules, frequent pattern mapping, the Apriori Algorithm, generating association rules from frequent itemsets, mining multilevel association rules, mining multidimensional association rules, constrained based association rules.

Unit VI : Classification and prediction : preparing data for classification and prediction, comparing classification and prediction methods, decision tree induction, Baye's theorem, rule based classification using IF-THEN rules, classification by backpropagation, rule extraction from decision tree.

TEXT BOOKS :

1) Reema Thareja : Data Warehousing, Oxford Unviersity Press.

2) Paulraj Ponniah : Data Warehousing Fundamentals, John Wiley.

3) Vikram Pudi and P. Radha Krishna, Oxford University Press.

REFERENCE BOOKS :

1) M.H.Dunham : Data Mining Introductory and Advanced Topics, Pearson Education, 2.

2) Han, Kamber : Data Mining Concepts and Techniques, Morgan Kaufmann, Pieter Adriaans, Dolf Zantinge.

2 NMEF 6   **Lab.-III**
                         (based on 2NMEF1)

2 NMEF 7   **Lab.-IV**
                 (based on 2NMEF2 & 2NMEF4)

*****

THIRD SEMESTER

3NMEF1   **Seminar and Dissertation**

FOURTH SEMESTER

4NMEF1   **Seminar and Dissertation**
                 As per given in the Scheme
                         *****

SYLLABUS
PRESCRIBED FOR
TWO YEAR P.G. DEGREE COURSE IN
MASTER OF ENGINEERING (FULL TIME)
ELECTRONICS & TELECOMMUNICATION ENGG.

SEMESTER : FIRST

1 ENTC1 ADVANCED OPTICAL COMMUNICATION

Unit – I: Introduction to guided optical communication. Optical Fibers, types of fibers & optical Cables, Study of losses during transmission through viz. Attenuation by Absorption & Scattering, Consideration of losses in designing of High Speed / High bandwidth optical communication systems, Selection of fiber for such systems.

Unit – II: Optical Sources: Types of LEDs used in optical communication, their construction & operating principle, Types of Lasers. Principle of working of Lasers, solid state & injection Lasers, Optical amplifiers, EDFA, Soliton Systems & design of system required in LAN & WAN type of applications. Calculations of Power budgets and feasibility of system design for above optical sources.

Unit – III: Optical Detectors: Introduction & study of type of detectors characteristics. Spectral spread and availability of detectors for 980 nm, 1.3 ìm & 1.55 ìm _ systems. Calculation of detector sensitivity and design considerations of suitable receivers for LAN, WAN applications Multiplexing Components & Techniques : Concepts of WDM, DWDM system design parameters, Optical multiplex / Demultiplex design considerations- Angular dispersive devices, Dielectric thin film filter type devices,

Unit – IV: Hybrid & planer wave guide devices, Active WDM devices, Wavelength non selective devices, System application. Long Haul High Band Width Tx System : Designing systems for long haul high band width consideration-Outage, Bit error rate, Cross connect, Low & high speed interphases, Multiplex / Demultiplex consideration, Regenerator spacing, Degeneration & Allowances, Application consideration.

Reference Books:

1. Optical Communication Systems by John Gowar (PHI)

2. Optical Fiber Communication by Gerd Keiser (MGH) .

3. Optical Fiber Communication Principles & Practice by John M. Senior (PHI pub. 1996.)

Recommended Journals:
1. IEEE Proceeding In Optics.
2. Journal of Optical Society of America.
3. AT&T, Alcatel Optics Journals.
4. Hand book of Optics Vol I & II (MGH.)
5. Optics & Opto Electrics, vol I & II, Nigihawan & Gupta, (Narsoa publication.)
6. Advance In Light Wave Nypters Research Journals of AT & T ,Vol. 66
7. IIT Rourkee Compiled Seminar Proceeding of Fiber Optics in 1994.

1 ENTC2 RANDOM PROCESSES

Unit – I: Concepts of Probability: Conditional probability and Baye's theorem, Independence of events, Bernoulli trails,Random variables: Cumulative distribution, Joint probability density function, Statistical properties, Jointly distributed Gaussian random variables, Conditional probability density, properties of sum of random variables, Central limit theorem, Estimate of population means, expected value and variance and covariance, Computer generation of random variables.

Unit – II: Multiple Random Variables: joint cumulative distribution function, Joint probability density function statistical properties, Jointly distributed Gaussian random variables, Conditional probability density, properties of sum of random variables, Central limit theorem, Estimate of population means, Expected value and variance and covariance, Computer generation of random variables.

Unit – III: Markov Chains: Chapman Kolmogorov equation, Classification of states, Limiting probabilities, Stability of Markov system, Reducible chains, Markov chains with continuous state space. Queuing Theory: Introduction, Cost equation, steady state probabilities, Models of single server exponential queuing system with no limit and with finite buffer capacity (M/M/I, M/M/N). Queuing system with bulk service, Network of queues with open system and closed system. The M/G/I system and application of work to M/G/I.

Unit – IV: Random Processes: Properties, Auto correlation and cross correlation function, Estimate of auto correlation function, Spectral Density: Definition, Properties, white noise, Estimation of auto-correlation function using frequency domain technique, Estimate of spectral density, cross spectral density and its estimation, coherence.

Reference Books:
1. Introduction to probability Models,(Third edition) - Sheldon M. Ross.
2. Probability and Random Processes for Electrical Engg.-Alberto Lean-Garcia (Pearson Education.)
3. Stochastic Processes – J. Medhi , (New Age International.)
4. Probability random variables & Stochastic process- Athanasios Papoulis (MGH)
5. Introduction to Probability and Random Processes. By Jorge I. Aunin, V. Chandrashekar.
6. Probability & Statistics- Murrary R. Spiegel – (MGH.)

1 ENTC3 DIGITAL COMMUNICATION TECHNIQUES

Unit – I: Baseband and Bandpass Digital Transmission: Baseband modulation, Correlative coding, Detection of binary signals in Gaussian Noise, ISI, Eye pattern and equalization, Bandpass modulation techniques, coherent and noncoherent detection of signals in Gaussian noise, error performance for binary and M-ary signals.

Unit – II: Error Control Coding: Linear block codes, error detecting and correcting capability, cyclic codes, convolution codes, properties of convolution codes, Viterbi decoding algorithm, Turbo code concepts, Trellis codes.

Unit – III: Synchronization, Multiplexing and Multiple Access: Carrier and Symbol synchronization, Frequency Division Multiplexing/Multiple Access, Time Division Multiplexing/ Multiple Access, performance comparison of FDMA & TDMA, Code Division Multiple Access, capacity of multiple access methods, Access algorithms: ALOHA, Slotted ALOHA, Reservation ALOHA, Carrier sense systems and protocols.

Unit – IV: Spread Spectrum Techniques: Model of spread spectrum digital communication system, direct sequence spread spectrum system, frequency hopped spread spectrum system, generation of PN sequences, synchronization of spread spectrum systems.

Reference Books:
1. J. G. Proakis, "Digital Communications", Fourth Edition, McGraw Hill Inc.
2. Bernard Sklar, "Digital Communications: Fundamentals and Applications", Second Edition, Pearson Education Asia (LPE)
3. Simon Haykin, "Digital Communications", John Wiley and Sons
4. K Sam Shanmugam, "Digital Communications", John Wiley and Sons

1 ENTC4 DIGITAL SIGNAL PROCESSING AND APPLICATIONS

Unit – I: Representation of deterministic signals, orthogonal representation of signals. Dimensionality of signals spaces, construction of orthogonal basis functions. Time bandwidth relationship: RMS duration and bandwidth, uncertainty relations.

Unit – II: Introduction: Review of Discrete time signals and systems, Different transforms, use of DFT in linear filtering, filtering of long data sequences, Algorithm for convolution and DFT.

Unit – III: LS and LMS, spectral estimation, adaptive filters DSP Algorithm, Multirate Digital Signal Processing and its applications.

Unit – IV: Issues involved in DSP processor design, Architecture and applications of TMS 320 C6XX, Multiprocessing with DSP processors, Applications of DSP to speech & radar signal processing.

Reference Books:
1) Advanced Digital Signal Processing, Proakis, McMillan
2) Discrete time Signal Processing, A.V. Oppenheim and Schafer, PHI, 1989
3) Digital Signal Processing – Principles, Algorithms and Applications, John G. Proakis, PHI, 1997
4) Digital Signal Processing, S.K. Mitra, TMH (2nd Edition)
5) Texas Instruments Application reports
6) Adaptive Filter Theory, Simon Haylein Jhon Wiley
7) Theory and Applications of Digital Signal Processing by Rabiner & Gold, Prentice –Hall

1 ENTC4   Elective-I
1. REAL TIME EMBEDDED SYSTEM

Unit – I: Fundamentals of Real-Time Theory : Real-time, embedded multitasking systems challenges, Best effort, Hard real-time, Soft real-time, Best Effort scheduling (Round- Robin Time slice Scheme - Review), Introduction to Fixed priority preemptive
Scheduling, Introduction to Dynamic priority scheduling, Utility Curves, Real-Time Services: Service Release Timeline, The CPU, I/O, Memory Resource Space (Characterizing RT Applications), Introduction to Timing diagrams (interference), Introduction to Hard real-time safe resource utilization bounds, The hard real-time requirements and performance

Unit – II: Rate Monotonic Policy and Feasibility Overview: Rate Monotonic Assumptions and Constraints, More on Fixed priority preemptive scheduling, Hard real-time safe resource utilization bounds, EDF and LLF Overview, Introduction to Feasibility Tests, Deadline Monotonic Policy and Feasibility Overview, HW and HW+FW Implementations of RT Services, SW Implementations of RT Services Synchronization and Resource Issues : Problems with Blocking (resources other than CPU, e.g. I/O), Break up into more threads (better scheduling control), Interrupt driven/O - e.g. Programmable FIFOs, Model Blocking Time, Priority inversion (general concept), Unbounded priority inversion problem (mutex C.S.), Priority inheritance, Priority ceiling.

Unit – III: Scalable Embedded Systems Architectures: Intro to PCI Architecture and I/O Architectures, PCI Plug and Play Concept, Embedded System PCI Form Factors and Standards, Device Drivers and Characterization of Embedded I/O : I/O interfaces, Digital, Analog (ADC, DAC interfaces), Microprocessor interface types (word or block), Register-based control, status, data, Higher rate FIFO I/O, Block-oriented 1st/3rd party DMA tx/rx between I/O interfaces and memory, Bus burst transfers and block transfers, system memory map for MMIO devices - DRAM/SDRAM/DDR, BOOTROM, Flash, External interface types, CPU local bus IO/MMIO E.g. PCI 2.x, GPIO, DRAM, Flash, Point-topoint or switched devices E.g. RS-232, RS-422, PCI-Express, Network multi-access devices E.g. Ethernet Device interfaces-introduction to drivers: Top half (driver entry point interface to tasks), bottom half (interface to devices), ring buffers, blocking/non-blocking, ioctl, ISRs and signals/semaphores, scheduled I/O (handle buffering and processing in task).

Unit – IV: Power PC Architecture: PowerPC 8xx architecture review, Power PC 8xx and 82xx Architecture Power Point Overviews, Xscale Architecture: Xscale Architecture Docs, x86 Architecture:, IA32 Architecture Docs,Estimating/Measuring Performance Based on CPU Architecture: Measuring / Controlling CPU Efficiency, Trace Ports (e.g. IBM PowerPC 4xx series, Strong Arm), Built-in PMU (Performance Monitoring Units) (e.g. Intel Pentium, Xscale), External Methods, Logic Analyzer Memory Traces (Cache Misses, DMA, Un-cached access), Memory Port Markers (Writes to Un-cached Memory), Profiling Code by Function or Block, Software in Circuit Methods (e.g. CodeTest Trace SW In-Circuit, gprof), Hardware Supported

Profiling (e.g. Intel Vtune, CodeTest HW In-Circuit), Cycle-based profiling, Event-based profiling, Cache Coherency, Harvard I-Cache, D-cache Architecture, Cache Invalidate, Flush, Lock, Pre-fetch, Measuring/Controlling I/O Efficiency, Bus Analyzers - e.g. PCI Event Traces, Logic Analyzer with Support Package.

Reference Books:
1. Real-Time Embedded Systems and Components: Sam Siewert, ISBN 1584504684 Books, Barnes & Noble
2. PCI System Architecture (Paperback) Mindshare Inc Tom Shanleyr, Don Anderson

1 ENTC4   **Elective-I**
2. DIGITAL DATA COMPRESSION

Unit – I: Introduction to Data Compression: Data compression, Loss less compression, Lossy Compression, Performance Measures, Coding, Modeling, Grading Compression Algorithms, Minimum Redundancy Coding: The Shannon-Fano algorithm, The Huffman Algorithm, Adaptive coding: Adaptive Huffman Coding, Updating The Huffman trace, Decoding, The overflow problem, Rescaling Bonus, Arithmetic Coding: Difficulties, Practical Matters, a complication, Decoding.

Unit – II: Statistical Modeling: Higher order modeling, finite context modeling, adaptive modeling, Escape code as a fall back, Improvements. Highest order modeling, updating the model, Escape probabilities, score boarding, data structures, modes flushing and implementation. Static v/s Adaptive Compression: Adaptive Methods, Sliding window compression: The algorithm and encoding problem. Speech compression: Digital audio concepts, fundamentals, sampling variables,

Unit – III: PC- Based sound, Lossless compression of sound, problem and result, Lossy compression, silence compression, companding and other techniques. Lossy Graphics Compression: Statistical and Dictionary compression methods, Lossy Compression, Differential modulation, JPEG-overview, JPEG-Enhancement, Loss less
JPEG, JPEG Compression, The discrete cosine transform, Implementing The DCT, Matrix Multiplication, Improvements, output of the DCT, quantization methods, selection of quantization of coding: zigzag sequence, entropy encoding and about color.

Unit – IV: Speech Compression: MPEG, MP3.Video compression: Pixel details, Motion estimation, quantization and bit packing, MPEG-2. Fractal Image compression: History, Iterated function system (IFS), Basic IFS, Image compression with IFS and with partitioned IFS. Fractal Image decoding, Resolution independence. Introduction to Wavelet based compression Techniques.

Reference Books:
1) The Data Compression- Mark Nelson, Jean-Ioup Gailly, 2nd edition, (M&T pub.)
2) Data Compression: The complete Reference-David Saloman, D., 3rded, (Springer Publication.)
3) Introduction to Data Compression-Khalid Sayood, 2nd ed. (Academic press ltd.)
4) Introduction to Information Theory and Data Compression- Darrel Hankerson, 2nd ed, (Chapman and Hall/CRC publications.)
5) Handbook of Image and video Processing-Al Bovik(Academic press ltd. Publication.)
6) Compression Algorithms for Real Programmers- Peter Wayner (Academic press ltd.)

1 ENTC4   **Elective-I**
3. ARTIFICIAL INTELLIGENCE

Unit – I: Fuzzy set Theory, Introduction to Fuzzy sets, Fuzzy relation, Membership functions, fuzzification, defuzzification, fuzzy logic, fuzzy rule based system fuzzy inference system.

Unit – II: Fuzzy Decision Making, Fuzzy modeling, Adaptive neuro fuzzy inference system, cognitive neurofuzzy modelling, Neuro fuzzy control, Application of neuro fuzzy control.

Unit – III: Fundamental of Artificial Neural Network: Artificial Neuron model. Learning process, Single layer and multilayer feed forward network, training by back propagation, Hop-field model basic concept of bidirectional associative memory, self organization map, and optimization model.

Unit – IV: Recurrent Networks, Hamming Net and MAXNET, Feature mapping, counter propagation networks, cluster discovery Network (ART), Applications of Neural Network Characters Recognition Network, Neural Network control Application, Network for Robot kinematics, Hand written Numeral recognition.

Reference Books:

1) "Neural Networks in Computer Intelligence", Limin Fu , McGraw Hill Inc., 1994.

2) "Neural Network Fundamentals", N. K. Bose, P. Lling , McGraw Hill.

3) "Artificial Neural Networks", Zurada

4) " Fuzzy Logic with Engg. Applications", Timothy J. Ross ,McGraw Hill.

5) "Neuro Fuzzy and Soft computing", Jang, Sun, Mezutani

6) "Fuzzy Engineering", Bart Kasko, PHI

7) "Neural Networks", S. Hykin ,Pearson Education.

1 ENTC4   **Elective-I**
4. CRYPTOGRAPHY & NETWORK SECURITY

Unit – I: Overview: Services, Mechanisms, and attacks, The OSI Security Architecture. A model for network security, Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography, Block Ciphers and the Data Encryption Standard: Simplied DES, Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Differential Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation, Contemporary symmetric Ciphers: Triple DES, Blowfish, RC5, Characteristics of Advanced Symmetric Block Ciphers, Confidentially using symmetric Encryption: Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation.

Unit – II: Public Key Cryptography and RSA: Principles of Public Key cryptosystems, The RSA Algorithm, Key Management, other Public Key Cryptosystems key Management, Diffle- Hellman Key exchange. Message Authentication and hash functions: Authentication Requirements, Authentication Function, Message Authentication Codes, Hash Functions, Security of Hash Functions and MACs.

Unit – III: Hash Algorithms: MD5 Message Digest Algorithm, Secure Hash Algorithm, Authentification Applications: Kerberos, X. 509 Authentication Service.

Unit – IV: Electronic Mail Security: Pretty Good Privacy, S/MIME, IP Security Overview, IP Security Architecture, Authentifications, Header, Encapsulating Security Payload, Combining Security Associations, Key Management, Web Security: Web Security Considerations, System Security: Intruders, Malicious Software, Viruses, Viruses and Related Threats, Firewalls: Firewall Design Principles.

Reference Books:

1. Willam Stallings, Cryptography and Network Security, Third Edition, Pearson Education

2. Cbarlie Kaufman, Radia Perlman, Mike Speciner, Network Security, Provate Communication in a public world, Second Edition, Pearson Education Asia, 2002.

3. Atul Kahate, Cryptography and Network Security, Tata McGrawhill, 2003.

1ENTC6   **Lab – I (based on 1ENTC1 & 1ENTC3)**

1ENTC7   **Lab – I (based on 1ENTC4)**

****
SEMESTER : SECOND
2 ENTC1   **ADAPTIVE SIGNAL PROCESSING**

Unit – I: **General Introduction**
Adaptive systems-Definition and characteristics, areas of applications, general properties, Open and closed loop adaptation, applications of closed loop adaptation. The adaptive liner combiner-General description, input signal and weight vectors, desired Response and error, the performance function, gradient and minimum mean square error. Example of performance surface, alternative expression of the gradient, decorrelation of Error and input components.

Unit – II: **Theory of adaptation with stationary signals.**
Properties of the quadratic performance surface-Normal form of the input correlation Matrix, eigen values and eigen vectors of the input correlation matrix, an example with two weights, geometrical significance of eigen vectors and eigen values. Searching the performance surface-Methods of searching the performance surface, basic ideas of gradient search methods, a simple gradient search algorithm and its solution, stability and rate of convergence, Gradient estimation and its effects on adaptation – Gradient component estimation by derivative measurement, the performance penalty, derivative measurement and performance penalties with multiple weights, variance of the gradient estimate.

Unit – III: **Stochastic processes and models: Partial Characterization of a Discrete-Time Stochastic**
Process, Mean Ergodic Therom, Correlation Matrix, Correlation Matrix of Sine Wave Plus Noise, Stochastic Models, World Decomposition, Asymptotic Stationary of an

Autoregressive Process, Yule-Walker Equations, Computer Experiment: Autoregressive Process of Order Two, Selecting the Model Order, Complex Gaussian Process, Power Spectral Density, Properties of Power Spectral Density, Transmission of a Stationary Process Through a Liner Filter, Cramer Spectral Representation for a Stationary Process, Power Spectrum Estimation, Other Statistical Characteristics of a Stochastic Process, Polyspectra, Spectral-Correlation Density.

Unit – IV: Wiener filters: Linear Optimum Filtering, Statement of the problem, Principle of Orthogonally, Minimum Mean-Square Error Adaptive algorithms and structures: The LMS algorithms, The z-transform in ASP, Other adaptive algorithms and structures, RLS adaptive filters: Some Preliminaries, The Matrix Inversion Lemma, The Exponentially Weighted Recursive Least-Squares Algorithm, Selection of The Regularizing Parameter, Update Recursion for the sum of weighted Error Squares, Example, Single-weight Adaptie noise canceller, convergence analysis of the RLS Algorithm, Computer Experiment on Adaptive Equalization, Robustness of RLS filter

Text Books:
1. Adaptive Filter Theory- S. Haykin, (Pearson edition 4th Edition)
2. Adaptive Signal Processing, - B. Windrow, S.D. Sterns, (Pearson Education).

Reference Books:
1. Digital Signal Processing, S. K. Mitra, TMH
2. Digital Signal Processing: Principles, Algorithms & Applications, John G Prokis, D. G. Manolakis, PHI

2 ENTC2   WIRELESS COMMUNICATION

Unit – I: Review: 2G, 3G wireless networks, WLL, Cellular Concept Mobile Radio Propagation: Large Scale Path Loss: Introduction to Radio Wave propagation, Free Space propagation model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection, Ground Reflection (Two-Ray) Model, Diffraction, Scattering, Practical Link Budget Design Using Path Loss Models, Outdoor Propagation Models, Indoor Propagation Models, Signal Penetration into Buildings, Ray Tracing And Site Specific Modeling, Problem.

Unit – II: Mobile Radio Propagation- Small-Scale Fading and Multipath : Small-Scale Multipath Propagation, Impulse Response Model of a Multipath Channel, Small-Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types of small-

Scale Fading, Rayleigh and Ricean Distributions, Statistical Models for Multipath Fading Channels, Theory of Multipath shape factor for small- Scale Fading wireless Channels, Summary, Problem.

Unit – III: Multi Access Technique for wireless communication: Introduction, Frequency Division multiple Access (FDMA), Time Division Multiple Access (TDMA) Spread Spectrum Multiple Access, Space Division Multiple Access (SDMA) Packet Radio, Capacity of cellular Systems, Problems. Wireless Networking: Introduction to wireless Networks, Difference between Wireless and Fixed Telephone Networks, Development of Wireless Networks, Fixed Network Transmission Hierarchy, Traffic Routing in Wireless Networks, Wireless Data Services, Common Channel Signaling (CCS), Integrated services Digital networks (ISDN), Signaling System No. 7 (SS7), An Example of SS7-Global Cellular Network

Unit – IV: Interoperability, Personal Communication services / Networks (PCS/PCNs), protocols for Network Access, Network Databases, Universal Mobile Telecommunication System (UMTS), Summary, Wireless Systems & Standards: AMPS and ETACS, United States Digital Cellular (IS-54 ad IS-136) Global System for Mobile (GSM) CDMA digital Cellular Standard (IS-95), CT2 standard for cordless Telephones, Digital European Cordless Telephones (DECT) PACS- Personal Access Communication Systems, Pacific Digital Cellular (PDC), Personal Handy phone System (PHS), US PCS and ISM Bands, US wireless Cable Television, Summary Of Standards throughout the world, problems. IEEE 802.11

Reference Books
1. Wireless Communications Principals & Practice- Theodore S. Rappaport, (P.E.)
2. Wireless & Mobile Network Architecture- Yi-Bing Lin, Imrich Chiamtac (John Wiley)
3. Fundamental of Wireless Communication- David Tse, Pramod Viswanath (Cambridge)

2 ENTC3   ADVANCE COMPUTER NETWORKS AND PROGRAMMING

Unit – I : Review of computer networking concepts, Topology, LAN, WAN, MAN, Internet, OSI/ISO, TCP/IP reference models, Point to point protocols. ARQ: Retransmission strategies. Functional elements : Multiplexing, Switching , Networks Management & traffic controls. Delay models in Data

Networks Switching techniques: Performance measures & architectural issues.

Unit – II : Internetworking, TCP/IP Internet architecture, IPV4, IPV6, IP addressing & related issues, IP address resolution techniques (ARP). IP datagram & forwarding, routing algorithms.

Unit – III : Multiple access techniques, ALOHA, CSMA, CSMA/CD, CSMA/CA, CDMA, OFDM, Delay throughput characteristics, WLAN-Protocols, multiple access, Ad-hoc networks, Bluetooth Specifications, WAP.

Unit – IV : Network security issues, Ciphers, DES, Public key cryptography, RAS algorithm, Digital Watermarking, Attacks and Counter Measures, Service Authentication Proforma.

Reference Books:
1) "Data Networks" Dimitri Bertisekas & Robert Gallager, PHI
2) "Local Area Networks", Gerd E Kieser – Mc-Graw-Hill
3) "Computer Networks and Internetworking"D.E.Comer, Pearson Education
4) "Cryptography and Network Security: Principles and Practice",William Stallings, Pearson Education
5) "GSM, CDMA and 3G Systems" , Steele,, Wiely Students Edition
6) "Communication Networking" An analytical approach" Anurag kumar, D. Manjunath & Joy Kuri– Morgn – Kaufmann publishers

2 ENTC4   RF & MICROWAVE CIRCUIT DESIGN

Unit – I: Review of EM Theory : Maxwell's equations, Plane waves in dielectric & conducting media, Energy & Power, Transmission lines, Solid state devices, Monolithic Microwave Integrated Circuits & Technology : History of Monolithic Microwave Integrated Circuits, Monolithic circuit components planner, Transmission Lines, Lumped and Distributed, Passive Elements, GaAs MESFET, Other active devices.Metal Semi-conductor Functions, and their characterization, Physical characteristics, modeling of GaAs MESFET & HEMT.

Unit – II: Material and fabrication techniques of GaAs MESFET. Properties of GsAs. Electron Beam and X-ray lithography, Plasma assisted deposition, Molecular beam epitaxy & MOCVD, Ion milling, S-Parameter measurements and their use in GaAs MESFET, S-Parameter measurements : General concept, measurements, utilization of S-Parameters in circuit design, Amplifiers (Narrow band/Broad band), Oscillators, Mixers, Active & Passive Phase shifters, Monolithic Microwave Integrated circuit Process, Optical Control of MMIC's.

Unit – III: RF And Microwave Circuit Design: Single & multi port network, Basic definitions, interconnecting networks, network properties, & applications, scattering parameters. RF filter design, filter configurations, special filter realizations, filter implementation, coupled filter, Active components: Semiconductor basics, RF diodes, bipolar junction transistor, RF field effect transistors, High electron mobility transistors.

Unit – IV: Active RF components modeling : Diodes models, transistor models, measurement of active devices, scattering parametric device characterization. Matching & biasing network: Impedance matching using discrete components, micro strip line matching networks, amplifier class of operation, biasing networks. RF transistor amplifier design, amplifier power relations, stability considerations, constant gain, noise figure circles, constant VSWR circles, broadband, high power & multistage amplifiers, Oscillators & Mixer: basic oscillator model, High Frequency oscillator configuration, basic characteristics of mixers.

Reference Books:
1. RF circuit design, theory & applications- Reinhold Ludwig, Pavel Bretchko, (Pearson Education – LPE)
2. Microwave Engineering-David M. Pozar (John Wiley & Sons)
3. Microwave Amplifier Design- Samuel Y. Liao, (PHI)
4. Microwave Engineering- Sisodiya and Raghuvanshi, (PHI)
5. Microwave Devices & Circuit Design"-Gupta & Shrivastava(PHI)

2 ENTC5   Elective-II
1. MOBILE COMPUTING

Unit – I: Wireless network technology : Global System for Mobile Communication (GSM) , Wireless media access control protocols; Wireless LAN, TDMA, PRMA, CDMA, etc 2. Routing in wireless networks: Unicast routing protocol, Dynamic source routing, DSR optimization, route caching, Relative distance micro discovery routing, On-demand distance vector routing, power aware routing, Hybrid protocols (5)

Unit – II: Location management: Location management in internet, Location management in cellular phone network and PCN, performance issues, future research directions. Transport protocols in mobile environments: I-TCP, snooping protocols, Multicast transport services.

Unit – III: Services in wireless networks: Quality of service, Delays, error and packet loss, Error control schemes, Mobile distributed

application support: Operating system support, Mobile middleware and object architecture, Mobile transaction, Remote execution and mobile RPC, Cache strategies for wireless networks.

Unit – IV: Security issues in mobile computing: security technique s and algorithms, security protocol, public key infrastructure, trust, security model, security frame work, Wireless devises with symbian OS: Symbian OS architecture, control and compound Control, active objects, Localization, security on the symbian OS.

Reference Books:
1. Mobile Computing, edited by T. Imielinski and H.F. Korth, Kluwer Academic
2. Mobile computing by Asok Talukdar, Roopa Yawagal, TMH

2 ENTC5   **Elective-II**
2. COMMUNICATION SYSTEM DESIGN

Unit – I: Designers perspective of communication system: Wireless channel description, path loss, multi path fading Communication concepts, Receiver Architectures: Introduction, Overview of Modulation Schemes, Classical Channel, Wireless Channel Description, Path Losses: Detailed Discussion.

Unit – II: Multipath Fading: Channel model and Envelope Fading, Multipath Fading: Frequency Selective and Fast Fading, Summary of Standard Translation, Introduction Receiver Architectures, Receiver front End: general discussion, Filter Design, rest of Receiver Front Eng: Nonideatlites and Design Parameters, Derivation of NF, IIP3 of Receiver Front End, Partitioning of required NFrec_front and IIP3,rec_front into individual.

Unit – III: Low Noise Amplifier: Introduction, Wideband LNA, Design, Narrow band LNA:Impedance Matching, Narrowband LNA: Core Amplifier, Active Mixer: Introduction, Balancing, Qualitative Description of The Gilbert Mixer, Conversion Gain, Distortion, Low-Frequency Case: Analysis of Gilbert Mixer, Distortion, High- Frequency Case, Noise, A Complete Active Mixer, References, Problems.

Unit – IV: Analog to Digital Converters: Demodulators, A to D Converters used in receivers, Low cost Sigma delta modulators and it's implementation, Design Technology for Wireless Systems: Design entry / simulation, Validation and analysis tools

Reference Books:
1. VLSI for Wireless Communication- Bosco Leuing, (PE).
2. The design of CMOS Radio frequency integrated circuits – T Lee (Cambridge University press)
3. Analysis and design of analog integrated circuits – P Gray and R Meyer (John Wiley & Sons)
4. Microelectronics Transistor Amplifier, Analysis and design G Gonzalez (Prentice Hall)

2 ENTC5   **Elective-II**
3. OPTICAL NETWORKS

Unit – I: Sonet & SDH : Brief history of Sonet & SDH, Multiplexing hierarchy, Multiplexing structure – Functional components, Problem detection, Virtual tributaries & containers, Concatenation. Architecture of OTN: Digital wrapper, control planes, Control signaling, Multiplexing hierarchies, Current digital hierarchy, revised hierarchies, Optical & Digital Transport hierarchies, Functionality stacks, Encapsulation & Decapsulation, GFP.

Unit – II: WDM, DWDM Topologies : Relationship with SONET / SDH, EDF, WDM Amplifiers, Multiplexers, WADM I/P & O/P ports, spanloss & chromatic, dispersion, Tunable DWDM lasers, Network Topologies & Protection schemes : Non-negotiable requirements of robust networks, Line & Path protection switching, Type of Topologies, Optical Channel Concatenation, Meshed topologies, PON's, Optical Ethernets, Wide area Backbones, Metro optical networking.

Unit – III: MPLS & Optical networks : Label switching, FEC, Scalability & granulity : labels & wavelength, MPLS nodes, Distribution & Binding methods, MPLS support of virtual private networks, Traffic Engineering, MPLS, Relationships of OXC, MPLS operation, MPLS & optical Traffic Engineering, Similarities. Control & Dataplanes interworking, Architecture of IP & MPLS based optical transport Networks : IP, MPLS & Optical control planes- Interworking, The three control planes, Framework for IP Vs. Optical networks, Generalized MPLS use in optical networks, Bidirectional LSP's in optical network, Next horizon of GMPLS, ODVK General communication channels, Traffic parameters

Unit – IV: Link Management protocol (LMP): What is managed, Data Bearing links, Basic function of LMP, LMP messages, LMP message header, TLW's control channel management, LPC, LCV, Fault management, Extending LMP operations to optical

links Optical Routers Management : Switching in optical internets: State of art in optical switching, clarification of Key terms, Evolution of switching technologies, Speeds of electronics & photonics, Optical routers, Control element, switching technologies MEMS, OSP, Setting up protection paths between nodes H, G & J, Expanding the Role of nodes G & I, Node failure, Coupling, decoupling, node to node wavelengths, Approach to problem of LSP & OSP interworking, Thermo-optic switches, Bubble switch. Optical compilers: Building blocks, Serial Binary adder with carry delay, Fiber delay line memory loop, Bit serial, optical counter design, Lumped delay design, Distributed delay design, Time multiplex multiprocessor, Time slot interchange with 2 log 2 (N-1) switch, Hatch design support system.

Reference Books:
1. Optical Networks– Third generation transport system -Uyless Black (Prentice Hall)
2. Opto Electronic computing system – Jordan

2 ENTC5   **Elective-II**
4. SPEECH & AUDIO PROCESSING

Unit – I: Digital models for the speech signal: Process of speech production, Acoustic theory of speech production, Lossless tube models, and Digital models for speech signals. Time domain models for speech processing: Time dependent processing of speech, Short time energy and average magnitude, Short time average zero crossing rate, Speech vs silence discrimination using energy & zero crossings, Pitch period estimation, Short time Autocorrelation function, Short time average magnitude difference function, Pitch period Estimation using autocorrelation function, Median smoothing. Digital representations of the speech waveform: Sampling speech signals, Instantaneous quantization, Adaptive quantization, Differential quantization, Delta Modulation, Differential PCM, Comparison of systems, direct digital code conversion.

Unit – II: Short time Fourier analysis: Linear Filtering interpretation, Filter bank summation method, Overlap addition method, Design of digital filter banks, Implementation using FFT, Spectrographic displays, Pitch detection, Analysis by synthesis, Analysis synthesis systems. Homomorphic speech processing: Homomorphic systems for convolution, Complex cepstrum, Pitch detection, Formant estimation, Homomorphic vocoder.

Unit – III: Linear predictive coding of speech: Basic principles of linear predictive analysis, Solution of LPC equations, Prediction error

signal, Frequency domain interpretation, Relation between the various speech parameters, Synthesis of speech from linear predictive parameters, Applications, Speech Enhancement: Spectral subtraction & filtering, Harmonic filtering, parametric re-synthesis, Adaptive noise cancellation. Speech Synthesis: Principles of speech synthesis, Synthesizer methods, Synthesis of intonation, Speech synthesis for different speakers, Speech synthesis in other languages, Evaluation, Practical speech synthesis.

Unit – IV: Automatic Speech Recognition: Introduction, Speech recognition vs. Speaker recognition, Signal processing and analysis methods, Pattern comparison techniques, Hidden Markov Models, Artificial Neural Networks, Audio Processing: Auditory perception and psychoacoustics - Masking, frequency and loudness perception, spatial perception, Digital Audio, Audio Coding - High quality, lowbit- rate audio coding standards, MPEG, AC-3, Multichannel audio - Stereo, 3D binaural and Multichannel surround sound.

Text Books:
1. L. R. Rabiner and R. W. Schafer, "Digital Processing of Speech Signals," Pearson Education (Asia) Pte. Ltd., 2004.
2. D. O'Shaughnessy, "Speech Communications: Human and Machine," Universities Press, 2001.
3. L. R. Rabiner and B. Juang, "Fundamentals of Speech Recognition," Pearson Education (Asia) Pte. Ltd., 2004.
4. Z. Li and M.S. Drew, "Fundamentals of Multimedia," Pearson Education (Asia) Pvt. Ltd., 2004.

Reference Book:
1. C Becchetti & L P Ricotti, "Speech Recognition Theory & C++ Implementation" John Wiley & Sons
2. D. O'Shaughnessy, "Speech Communication Human & Machine", Universities Press.
3. B. Gold & N. Morga+n "Speech & Audio Signal Processing", John Wiley & Sons

2ENTC6   **Lab – I (based on 2ENTC2 & 2ENTC3)**

2ENTC7   **Lab – I (based on 2ENTC1 & 2ENTC4)**

****

THIRD SEMESTER
3 ENTC1 Seminar & Dissertation

FOURTH SEMESTER
4 ENTC1 Seminar & Dissertation
As per given scheme
*****

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

1KMEF1/ 1RMEF1/1RME1
ADVANCED COMPUTER ARCHITECTURE

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

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

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

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

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

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

Text Book:

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

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

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

1KMEF2/ 1RMEF2/1RME2   ALGORITHMICS

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

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

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

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

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

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

Text Book:

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

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

1KMEF3/1RMEF3/ 1RME3
OPERATING SYSTEM DESIGN

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

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

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

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

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

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

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

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

1KMEF4   OBJECT ORIENTED SYSTEMS

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

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

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

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

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

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

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

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

Reference Books:
1. Booch, Rumbaugh, Jacobson, "The UML Users Manual", Pearson Education.

2. James Rumbaugh, Jacobson, Booch, "UML Reference Manual', Pearson Education.

3. Jacobson et al., 'The Unified Software Development Process', Pearson Education.

4. Bennett, McRobb, Farmer, "Object-Oriented Systems Analysis and Design Using UML" (TMH)

1KMEF5   MOBILE COMPUTING

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

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

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

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

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

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

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

Reference Books:
1. Jochen Schiller, "Mobile Communication", (Pearson Education) Second Edition.

2. C.K. Toh, "Ad Hoc Mobile Wireless Networks: Protocols & Systems", (Pearson Edu.)

3. Rajkamal, "Mobile Computing" (Oxford University Press).

4. George A, "Mobile Ad Hoc Networks: From Wireless LANs to 4G Networks" (TMH).

1KMEF6
Algorithmics-Lab: Based on 1KMEF2 Algorithmics.

1KMEF 7
Operating System Design Lab: Based on 1KMEF3 Operating System Design.

SEMESTER : SECOND
2KMEF1   NETWORK SYSTEMS DESIGN

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

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

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

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

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

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

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

Text Books:

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

Reference Books:

1. Andrew S. Tenanbaum "Computer Networks", 4th Ed., Pearson Education.

2. James F. Kurose, Keith W. Ross "Computer Networking: A Top-Down Approach" TMH.

3. William Stallings "Data and Computer Communications" 7th Ed., Pearson Education.

4. Priscilla Oppenheimer "Top-Down Network Design" Second Edition, Cisco Press, 200

2KMEF2/2 RMEF2/2 RME2
ADVANCED COMPILING TECHNIQUES

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

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

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

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

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

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

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

Reference Books:

1. Aho, Sethi, Ullman, "Compilers: Principles Techniques and Tools" (Pearson).

2. D. M. Dhamdhere, "Compiler Construction" (2/e), Macmillan.

3. Cooper & Torczon, "Engineering a Compiler" Elsevier.

4. K C. Louden, "Compiler Construction: Principles and Practice" Cengage.

2KMEF3   EMBEDDED SYSTEM DESIGN

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

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

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

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

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

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

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

TEXT BOOKS:

1. Dr. K.V. K. K. Prasad "Embedded / Real Time System : Concepts, Design, & Programming" Dreamtech Press Publication

2. Mohammad Ali Mazidi, Rolin D. Mckinly, Danny Causey: "PIC Microcontroller and Embedded system using Assembly and C for PIC18" Pearson Education

3. Jane W.S. Liu : Real Time System, Pearson Education

REFERENCE BOOKS:

1. Raj Kamal, "Embedded Systems Architecture, Programming and Design", Tata McGraw-Hill

2. John B. Beatman, Design with PIC Microntroller, Prentice Hall

3. Barry B. Brey, Applying PIC18 Microntroller, Architecture, Programming and Interfacing using C and Assembly, Prentice Hall.

4. Phillip A. Laplante: Real-Time Systems Design and Analysis, (Wiley InterScience)

2KMEF4 **ELECTIVE**
(1) HUMAN COMPUTER INTERFACES

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

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

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

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

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

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

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

Reference Books:

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

2KMEF4 ELECTIVE
(2) SYSTEMS SECURITY

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

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

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

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

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

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

Text Book:

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

Reference Books:

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

2KMEF4 ELECTIVE
(3) IMAGE PROCESSING & COMPUTER VISION

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

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

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

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

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

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

Text Book:

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

Reference Books:

1. Gonzalez and Woods, "Digital Image Processing" (2/e) Pearson Education.

2. Forsyth, "Computer Vision" Pearson Education.

3. Chanda and Majumdar, "Digital Image Processing and Analysis" PHI.

4. Horn B K P, "Robot Vision" MIT Press, Cambridge, MA.

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

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

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

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

****

THIRD SEMESTER

3KMEF1   SEMINAR AND DISSERTATION

FOURTH SEMESTER

4KMEF1   SEMINAR AND DISSERTATIONI

****

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

Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total Hours/ Week	Credits	Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assess-ment	Total	Min. Passing Theory Paper	Marks Subject	Max. External	Marks Internal	Total	Min. Passing Marks
1	1SFSE1	Introduction to Earthquake Engineering	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	1SFSE2	Theory of Plates and Shells	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	1SFSE3	Computer Methods of Structural Analysis	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	1SFSE4	Structural Dynamics	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	1SFSE5	Earthquake Resistant Design of Reinforced Concrete Structures	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	1SFSE6	Earthquake Resistant Design of Reinforced Concrete Structures - Laboratory	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	1SFSE7	Computer Aided Analysis & Design of Structures – Laboratory	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	23				500					100	
													TOTAL			600	

SECOND SEMESTER

Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total Hours/ Week	Credits	Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assess-ment	Total	Min. Passing Theory Paper	Marks Subject	Max. External	Marks Internal	Total	Min. Passing Marks
1	2SFSE1	Finite Element Method	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	2SFSE2	Advanced Design of Steel Structures	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	2SFSE3	Repairs & Retrofitting of Structures	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4.	2SFSE4	Design of Prestressed Concrete structures	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5.	2SFSE5	Elective*	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6.	2SFSE6	Adv. Design of Steel Structures - Laboratory	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7.	2SFSE7	Design of Prestressed Concrete Structures - Laboratory	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22				500					100	
													TOTAL			600	

Elective-II : 1) Substructures and Foundation Design (2) Earthquake Resistant Design of Bridges and Dams (3) Theory of Elasticity and Stability (4) Design of Environmental Structures

THIRD SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	Internal Marks	Total	Min.Passing Marks
1	3SFSE1	SEMINAR AND DISSERTATION	-	-	6	6	15	100	100	50
			-	-	6	6	15		100	

TOTAL : 100

FOURTH SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	External Marks	Internal Marks	Total
1	4SFSE1	SEMINAR AND DISSERTATION	-	-	12	12	30	200	100	300
		TOTAL	-	-	12	12	30			300
									GRAND TOTAL	1600

Semester III

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

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

Semester IV

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

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

Notes : 1. Student should fill the examination form in the begining of 3rd semester jointly for 3rd & 4th semester.

2. Single marksheet for 3rd & 4th semester together will be given to the student.

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULL TIME)
MECHANICAL ENGINEERING (CAD/CAM)
CREDIT GRADE SYSTEM
FIRST SEMESTER

| | | | Teaching Scheme | | | | | Examination Scheme | | | | | | | | | |
| | | | Hours/Week | | | | | Theory | | | | | | Practical | | | |
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total Hours/ Week	Credits	Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assessment	Total	Min.Passing Marks Theory Paper	Subject	Max.Marks External	Internal	Total	Min. Passing Marks
1	1MCC1	Computer Aided Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	1MCC2	Computer Aided Manufacturing	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	1MCC3	Computer Assisted Production Management	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	1MCC4	Mechatronics	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	1MCC5	Elective-I	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	1MCC6	Computer Aided Design-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	1MCC7	Computer Aided Manufacturing-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22	-	-	-	500					100	
													TOTAL			600	

Elective - I : 1) Concurrent Engineering 2) Engineering Experimental Techniques 3) Management Information Systems 4) Optimization Techniques 5) Design of Manufacturing Assembly and Environment

SECOND SEMESTER

| | | | Teaching Scheme | | | | | Examination Scheme | | | | | | | | | |
| | | | Hours/Week | | | | | Theory | | | | | | Practical | | | |
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/O	Total Hours/ Week	Credits	Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assessment	Total	Min.Passing Marks Theory Paper	Subject	Max.Marks External	Internal	Total Marks	Min. Passing
1	2MCC1	Finite Element Analysis	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	2MCC2	Simulation Theory &Applications	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	2MCC3	Robotics & Robot Applications	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	2MCC4	Industrial Product Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	2MCC5	Elective-II	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	2MCC6	Finite Element Analysis-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	2MCC7	Simulation Theory & Applications V-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22	-	-	-	500					100	
													TOTAL			600	

Elective-II : 1) Flexible Manufacturing System   2) Virtual Manufacturing   3) Industrial Automation 4) Rapid Prototyping and Tooling

THIRD SEMESTER

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

FOURTH SEMESTER

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

Semester III

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

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

Semester IV

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

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

Notes : 1. Student should fill the examination form in the begining of 3rd semester jointly for 3rd & 4th semester.

2. Single marksheet for 3rd & 4th semester together will be given to the student.

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

Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total Hours/Week	Credits	Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assessment	Total	Min.Passing Marks Theory Paper	Subject	Max.Marks External	Internal	Total	Min. Passing Marks
1	1UMEF1	Digital Electronics	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	1UMEF2	Advanced Digital Signal Processing	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	1UMEF3	Elective-I	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	1UMEF4	Digital Communication Techniques	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	1UMEF5	Embeded System Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	1UMEF6	Digital Communication Techniques-Lab.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	1UMEF7	Embeded System Design-Lab.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22				500					100	
													TOTAL			600	

Elective - I : 1) Modern Electronic Design Techniques 2) RF System Design 3) Computer Communication Network

SECOND SEMESTER

Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total Hours/Week	Credits	Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assessment	Total	Min.Passing Marks Theory Paper	Subject	Max.Marks External	Internal	Total	Min. Passing Marks
1	2UMEF1	Digital Image Processing	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	2UMEF2	CMOS VLSI Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	2UMEF3	Parallel Computing	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	2UMEF4	Artificial Intelligent Systems	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	2UMEF5	Elective-II	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	2UMEF6	Digital Image Processing-Lab.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	2UMEF7	CMOS VLSI Design-Lab.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22				500					100	
													TOTAL			600	

Elective - II : 1) Bio-Informatics 2) Micro Electro Mechanical System 3) High Speed Digital System Design

THIRD SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	Internal Marks	Total	Min.Passing Marks
1	3UMEF1	SEMINAR AND DISSERTATION	-	-	6	6	15	100	100	50
			-	-	6	6	15		100	
									TOTAL : 100	

FOURTH SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	External Marks	Internal Marks	Total
1	4UMEF1	SEMINAR AND DISSERTATION	-	-	12	12	30	200	100	300
		TOTAL	-	-	12	12	30			300
									GRAND TOTAL	1600

Semester III

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

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

Semester IV

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

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

Notes : 1. Student should fill the examination form in the begining of 3rd semester jointly for 3rd & 4th semester.

2. Single marksheet for 3rd & 4th semester together will be given to the student.

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

| Sr. No. | Subject Code | Subject | Teaching Scheme Hours/Week | | | | | Examination Scheme Theory | | | | | | Practical | | | |
			Lecture	Tutorial	P/D	Total Hours/Week	Credits	Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assess-ment	Total	Min.Passing Marks Theory Paper	Subject	Max.Marks External	Internal	Total	Min. Passing Marks
1	1SEPS1	Power System Optimization	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	1SEPS2	Generation Planning & Load Dispatch	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	1SEPS3	Microcomputer and Microcontroller	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	1SEPS4	Power System Dynamics	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	1SEPS5	Digital Signal Processing	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	1SEPS6	Power System Lab.-I	0	0	4	4	2	-	-	-	-	-	-	50	50	100	50
			20	0	4	24	22	-	-	-	500					100	
													TOTAL			600	

SECOND SEMESTER

| Sr. No. | Subject Code | Subject | Teaching Scheme Hours/Week | | | | | Examination Scheme Theory | | | | | | Practical | | | |
			Lecture	Tutorial	P/D	Total Hours/Week	Credits	Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assess-ment	Total	Min.Passing Marks Theory Paper	Subject	Max.Marks External	Internal	Total	Min. Passing Marks
1	2SEPS1	Advanced Power System Protection	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	2SEPS2	High Voltage Transmission	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	2SEPS3	Power System Modeling & Control	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	2SEPS4	Computer Methods in Power System Analysis	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	2SEPS5	FACTS & Power Quality	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	2SEPS6	Power System Lab.-II	0	0	4	4	2	-	-	-	-	-	-	50	50	100	50
			20	0	4	24	22	-	-	-	500					100	
													TOTAL			600	

THIRD SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/O	Total	Credits	Internal Marks	Total	Min.Passing Marks
1	3SEPS1	SEMINAR AND DISSERTATION	-	-	6	6	15	100	100	50
			-	-	6	6	15		100	
									TOTAL	100

FOURTH SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	External Marks	Internal Marks	Total
1	4SEPS1	SEMINAR AND DISSERTATION	-	-	12	12	30	200	100	300
		TOTAL	-	-	12	12	30			300
									GRAND TOTAL	1600

Semester III

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

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

Semester IV

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

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

Notes : 1. Student should fill the examination form in the begining of 3rd semester jointly for 3rd & 4th semester.

2. Single marksheet for 3rd & 4th semester together will be given to the student.

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF TECHNOLOGY (FULL TIME)
CHEMICAL TECHNOLOGY (MEMBRANE & SEPARATION TECHNOLOGY)
CREDIT GRADE SYSTEM
FIRST SEMESTER

Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total Hours/Week	Credits	Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assessment	Total	Min.Passing Marks Theory Paper	Min.Passing Marks Subject	Max.Marks External	Max.Marks Internal	Total	Min. Passing Marks
1	1 MST 1	Advances in Absorption & Adsorption Separation Technology	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	1 MST 2	Membrane Separation Process	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	1 MST 3	Chemical Engineering Analysis	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	1 MST 4	Advanced Energy Technologies	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	1 MST 5	Advances in Absorption & Adsorption Separation Technology-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
6	1 MST 6	Membrane Separation Process-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	1 MST 7	Seminar-I	-	-	2	2	5	-	-	-	-	-	-	50	50	100	50
			16	0	6	22	23	-	-	-	400					200	
															TOTAL	600	

SECOND SEMESTER

Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total Hours/Week	Credits	Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assessment	Total	Min.Passing Marks Theory Paper	Min.Passing Marks Subject	Max.Marks External	Max.Marks Internal	Total	Min. Passing Marks
1	2 MST 1	Advanced Downstream Technology for Chemical Recovery & Waste Utilization	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	2 MST 2	Industrial Biotechnology	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	2 MST 3	Elective	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	2 MST 4	Advance Reactor Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	2 MST 5	Advanced Downstream Technology for Chemical Recovery & Waste Utilization -LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
6	2 MST 6	Industrial Biotechnology-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	2 MST 7	Seminar-II	-	-	2	2	5	-	-	-	-	-	-	50	50	100	50
			16	0	6	22	23	-	-	-	500					100	
															TOTAL	600	

Elective : 1) Advance Material Technology 2) Advance Surface Coating Technology 3) Speciality Plastics   4) Insulation Coating

THIRD SEMESTER

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

FOURTH SEMESTER

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

Semester III

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

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

Semester IV

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

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

Notes : 1. Student should fill the examination form in the begining of 3rd semester jointly for 3rd & 4th semester.

2. Single marksheet for 3rd & 4th semester together will be given to the student.

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

Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total Hours/ Week	Credits	Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assess-ment	Total	Min.Passing Marks Theory Paper	Min.Passing Marks Subject	Max.Marks External	Max.Marks Internal	Total	Min. Passing Marks
1	1 CE 1	Transport Phenomena	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	1 CE 2	Advanced Biochemical Engineering	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	1 CE 3	Process Control	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	1 CE 4	Mathematical Modelling & Optimization	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	1 CE 5	Elective - I	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	1 CE 6	Transport Phenomena-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	1 CE 7	Advanced Biochemical Engineering-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22	-	-	-	500					100	
													TOTAL				600

Elective-I : 1) Advanced Chemical Analysis 2) Material Science   3) Pulp & Paper Technology 4) Chemical Process Intensification

SECOND SEMESTER

Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total Hours/ Week	Credits	Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assess-ment	Total	Min.Passing Marks Theory Paper	Min.Passing Marks Subject	Max.Marks External	Max.Marks Internal	Total	Min. Passing Marks
1	2 CE 1	Chemical Reaction Engineering	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	2 CE 2	Advanced Separation Techniques	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	2 CE 3	Process Design & Plant Utilities	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	2 CE 4	Energy Technology & Conservation	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	2 CE 5	Elective - II	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	2 CE 6	Chemical Reaction Engineering-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	2 CE 7	Advanced Separation Techniques-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22	-	-	-	500					100	
													TOTAL				600

Elective-II :1) Environmental Engineering & Waste Management   2) Nanotechnology   3) Chemoinformatics 4) Computational Fluid Dynamics

THIRD SEMESTER

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

FOURTH SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/O	Total	Credits	External Marks	Internal Marks	Total
1	4 CE 1	SEMINAR AND DISSERTATION	-	-	12	12	30	200	100	300
		TOTAL	-	-	12	12	30			300
									GRAND TOTAL	1600

Semester III

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

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

Semester IV

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

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

Notes : 1. Student should fill the examination form in the begining of 3rd semester jointly for 3rd & 4th semester.

2. Single marksheet for 3rd & 4th semester together will be given to the student.

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

Sr. No.	Subject Code	Subject	Teaching Scheme Hours/Week					Examination Scheme Theory						Practical			
			Lecture	Tutorial	P/D	Total Hours/Week	Credits	Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assess-ment	Total	Min.Passing Marks Theory Paper	Min.Passing Marks Subject	Max.Marks External	Max.Marks Internal	Total	Min. Passing Marks
1	1RMEF1/ 1RME1	Advanced Computer Architecture	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	1RMEF2/ 1RME2	Algorithmics	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	1RMEF3/ 1RME3	Operating System Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	1RMEF4/ 3RME1	Expert System Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	1RMEF5/ 3RME2	Database Processing	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	1RMEF6/ 3RME3	Expert System Design-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	1RMEF7/ 3RME4	Database Processing-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22				500					100	
														TOTAL		600	

SECOND SEMESTER

Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total Hours/ Week	Credits	Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assess-ment	Total	Min. Passing Marks Theory Paper	Passing Marks Subject	Max. Marks External	Internal	Total	Min. Passing Marks
1	2RMEF1/ 2RME1	Computer Communication Networks	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	2RMEF2/ 2RME2	Advanced Compiling Techniques	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	2RMEF3/ 4RME1	Real Time Systems	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	2RMEF4/ 4RME2	Elective	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	2RMEF5/ 4RME3	Technical Paper Writing	0	1	0	1	1	-	-	-	-	-	-	-	50	50	25
6	2RMEF6/ 2RME3	Seminar	0	1	0	1	1	-	-	-	-	-	-	-	50	50	25
7	2RMEF7/ 2RME4	Advanced Compiling Techniques-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
8	2RMEF8/ 4RME4	Real Time Systems-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			16	2	4	22	20				400					200	
														TOTAL		600	

Elective : 1) MOBILE COMPUTING 2) NETWORK SECURITY 3) COMPUTER VISION AND IMAGE PROCESSING

THIRD SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	Internal Marks	Total	Min.Passing Marks
1	3RMEF1	SEMINAR AND DISSERTATION	-	-	6	6	15	100	100	50
			-	-	6	6	15	100		
									TOTAL	100

FOURTH SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	External Marks	Internal Marks	Total
1	4RMEF1	SEMINAR AND DISSERTATION	-	-	12	12	30	200	100	300
	TOTAL		-	-	12	12	30			300
									GRAND TOTAL	1600

Semester III

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

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

Semester IV

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

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

Notes : 1. Student should fill the examination form in the begining of 3rd semester jointly for 3rd & 4th semester.

2. Single marksheet for 3rd & 4th semester together will be given to the student.

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

Sr. No.	Subject Code	Subject	Teaching Scheme Hours/Week					Examination Scheme Theory						Examination Scheme Practical			
			Lecture	Tutorial	P/D	Total Hours/ Week	Credits	Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assessment	Total	Min.Passing Marks Theory Paper	Min.Passing Marks Subject	Max.Marks External	Max.Marks Internal	Total	Min. Passing Marks
1	1NMEF1	Operating System Configuration	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	1NMEF2	Database System Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	1NMEF3	Net Centric Computing	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	1NMEF4	Real Time Embeded System Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	1NMEF5	Elective - I	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	1NMEF6	LAB-I (Based On 1NMEF1 & 1NMEF2)	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	1NMEF7	LAB-II (Based On 1NMEF3 & 1NMEF4)	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22	-	-	-	500					100	
											TOTAL						600

ELECTIVE- I : 1) SOFTWARE ENGINEERING METHODOLOGIES 2) INTELLIGENT SYSTEMS 3) LEGAL AND PROFESSIONAL ETHICS

SECOND SEMESTER

Sr. No.	Subject Code	Subject	Teaching Scheme Hours/Week					Examination Scheme Theory						Examination Scheme Practical			
			Lecture	Tutorial	P/D	Total Hours/ Week	Credits	Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assessment	Total	Min.Passing Marks Theory Paper	Min.Passing Marks Subject	Max.Marks External	Max.Marks Internal	Total	Min. Passing Marks
1	2NMEF1	Integrative Programming	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	2NMEF2	Digital Medial Development	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	2NMEF3	Information Technology Management	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	2NMEF4	System Security	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	2NMEF5	Elective - II	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	2NMEF6	LAB-III (Based On 2NMEF1)	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	2NMEF7	LAB-IV (Based On 2NMEF2 & 2NMEF4)	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22	-	-	-	500					100	
											TOTAL						600

ELECTIVE - II : 1) SOFTWARE TESTING 2) WIRELESS NETWORKS AND COMMUNICATION 3) DATA WAREHOUSING AND DATA MINING

THIRD SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	Internal Marks	Total	Min.Passing Marks
1	3NMEF1	SEMINAR AND DISSERTATION	-	-	6	6	15	100	100	50
			-	-	6	6	15		100	
									TOTAL	100

FOURTH SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	External Marks	Internal Marks	Total
1	4NMEF1	SEMINAR AND DISSERTATION	-	-	12	12	30	200	100	300
		TOTAL	-	-	12	12	30			300
									GRAND TOTAL	1600

Semester III

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

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

Semester IV

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

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

Notes : 1. Student should fill the examination form in the begining of 3rd semester jointly for 3rd & 4th semester.

2. Single marksheet for 3rd & 4th semester together will be given to the student

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

Sr. No.	Subject Code	Subject	Teaching Scheme — Hours/Week — Lecture	Tutorial	P/D	Total Hours/Week	Credits	Examination Scheme — Theory — Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assessment	Total	Min.Passing Marks Theory Paper	Subject	Practical — Max.Marks External	Internal	Total	Min. Passing Marks
1	1ENTC1	Advanced Optical Communication	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	1ENTC2	Random Processes	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	1ENTC3	Digital Communication Techniques	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	1ENTC4	Digital Signal Processing and Applications	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	1ENTC5	Elective - I	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	1ENTC6	Lab – I (based on 1ENTC1 & 1ENTC3)	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	1ENTC7	Lab – I (based on 1ENTC4)	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22	-	-	-	500					100	
											TOTAL					600	

Elective - I : 1) Modern Electronic Design Techniques 2) RF System Design 3) Computer Communication Network

SECOND SEMESTER

Sr. No.	Subject Code	Subject	Teaching Scheme — Hours/Week — Lecture	Tutorial	P/D	Total Hours/Week	Credits	Examination Scheme — Theory — Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assessment	Total	Min.Passing Marks Theory Paper	Subject	Practical — Max.Marks External	Internal	Total	Min. Passing Marks
1	2ENTC1	Adaptive Signal Processing	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	2ENTC2	Wireless Communication	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	2ENTC3	Advance Computer Networks and Programming	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	2ENTC4	RF & Microwave Circuit Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	2ENTC5	Elective - II	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	2ENTC6	Lab – I (based on 2ENTC2 & 2ENTC3)	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	2ENTC7	Lab – I (based on 2ENTC1 & 2ENTC4)	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22	-	-	-	500					100	
											TOTAL					600	

Elective - II : 1) Bio-Informatics   2) Micro Electro Mechanical System 3)   High Speed Digital System Design

THIRD SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	Internal Marks	Total	Min.Passing Marks
1	3ENTC1	SEMINAR AND DISSERTATION	-	-	6	6	15	100	100	50
			-	-	6	6	15		100	
									TOTAL	100

FOURTH SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	External Marks	Internal Marks	Total
1	4ENTC1	SEMINAR AND DISSERTATION	-	-	12	12	30	200	100	300
		TOTAL	-	-	12	12	30			300
									GRAND TOTAL	1600

Semester III

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

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

Semester IV

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

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

Notes : 1. Student should fill the examination form in the begining of 3rd semester jointly for 3rd & 4th semester.

2. Single marksheet for 3rd & 4th semester together will be given to the student

DIRECTION

No. 31/2010   Date : 24 /6/2010

Subject :   Examinations leading to the Degree of अभियांत्रिकी पारंगत (Master of Engineering) (Full-Time) / तंत्रशास्त्र पारंगत (Master of Technology) (Full Time) (Semester Pattern .... Credit Grade System)

Whereas the schemes of teaching & examinations of Master of Engineering (Full-Time) / Master of Technology (Full Time) courses has been accepted by the Academic Council vide Item No. 49 in its meeting held on 28-05-2010 as per the Credit Grade System for its implementation from the Academic Session 2010-2011,

AND

Whereas admissions to the First Year of Master of Engineering (Fullt-Time) / Master of Technology (Full Time) courses are to be made in the Academic Session 2010-2011,

AND

Whereas the matter for admission of the students at the examinations is required to be regulated by an Ordinance,

AND

Whereas the schemes of teaching & examinations of I and II Semesters of Master of Engineering (Full-Time) / Master of Technology (Full Time) courses are to be implemented from the academic session 2010-2011,

AND

Whereas the schemes of teaching & examinations are required to be regulated by the Regulation,

AND

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

AND

Whereas syllabus for I and II Semesters of Master of Engineering (Full-Time) / Master of Technology (Full Time) courses are to be sent for printing.

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

1.   This Direction may be called "Examinations leading to the Degree of अभियांत्रिकी पारंगत (Master of Engineering) (Full-Time) / तंत्रशास्त्र पारंगत (Master of Technology) (Full Time) (Semester Pattern ....Credit Grade System) Direction, 2010.

2.   This Direction shall come into force w.e.f. the session :-

i)   2010-2011 for First Year, and

ii)   2011-2012 for Second Year

3.   Following shall be the Examinations leading to the Degree of Master of Engineering (Full Time)/ Master of Technology (Full Time) courses :-

i)   M.E./M.Tech. Semester-I Examination

ii)   M.E./M.Tech. Semester-II Examination

iii)   M.E./M.Tech. Semester-III Examination

iv)   M.E./M.Tech. Semester-IV Examination

4.   Examinations of IIIrd & IVth semesters shall be held at the end of IVth semester seperately.

5.   An applicant for admission to the Degree of Master of Engineering (Full Time) / Master of Technology (Full-Time) courses shall have passed the Degree Examination in Bachelor of Engineering/Bachelor of Technology in the branches mentioned under column No.2 of the following table against respective course :-

TABLE

M.E./M.Tech.	B.E./B.Tech. of this University or any other statutory University
1.	2.
a) M.E. Civil (Structural Engg.)	Civil /Construction Engg., Water Management
b) M.E. Mechanical (CAD/CAM)	Mechanical/Automobile/Production/Industrial Engineering
c) M.E. Digital Electronics	Electronics & Telecommunication, Electronics Engg., Industrial Electronics, Instrumentation & Information Tech.
d) M.E. Electrical (E.P.S.)	Electrical / Electrical Power System / Electronics & Power
e) M.Tech. Chemical Technology (Membrane & Separation Technology)	Chemical Engineering/Chemical Technology
f) M.Tech. (Chemical Engineering)	Chemical Engg./Chemical Tech., Petrochemical Engg./Tech., Plastics & Polymer Engg./Tech., Pulp & Paper Tech.
g) M.E. Computer Science & Engineering	Computer Technology, Computer Engineering, Electronics Engg.,(Computer Science & Electronics & Telecommunication, Information Technology Engineering)
h) M.E. (Information Technology)	Information Technology, Computer Science & Engineering, Computer Technology, Computer Engineering, Electronics & Telecommunication, Electronics Engineering

i)	M.E. (Electronics & Telecommunication)	Electronics & Telecommunication, Electronics Engg., Industrial Electronics & Instrumentation

6. The Degree of Master of Engineering (Full-Time) / Master of Technology (Full-Time) shall be awarded to an examinee who in accordance qualifies in any one of the following subjects :-

    1) M.E. Civil (Structural Engineering)

    2) M.E. Mechanical (CAD/CAM)

    3) M.E. Digital Electronics

    4) M.E. Electrical (Electrical Power System)

    5) M.Tech. Chemical Technology (Membrane & Separation Technology)

    6) M.Tech. Chemical Engineering

    7) M.E. Computer Science & Engineering

    8) M.E. Information Technology

    9) M.E. Electronics & Telecommunication Engineering

7. (i) University shall hold Main Examinations of Semester-I of above mentioned Full Time Degree Courses in Winter every year and Supplementary Examinations in Summer every year at the end of the Second Semester

    (ii) University shall hold Main Examinations of Semesters-II, III & IV in Summer every year and Supplementary Examinations in Winter every year.

    (iii) The period of Academic session shall be such as may be notified in Academic Calender of the concerned academic session.

    (iv) Examinations shall be held at such places and on such dates as may be notified by Board of Examinations.

8. For the purposes of Instructions and Examinations, students shall study sequentially.

9. Subject to his/her compliance with the provisions of Ordinance relating to Examinations in General, the applicant for admission to an examination at the end of the course of study of a particular semester shall be eligible to appear at it, if;

    (i) He/She has satisfied the conditions mentioned in the following table and the provisions thereunder.

TABLE-I

Sr. No.	Name of Exam.	The student should have completed the term satisfactorily of	The student should have passed the subjects of examination of
1.	M.E./M.Tech. Semester-I	Semester-I	----
2.	M.E./M.Tech. Semester-II	Semester-II	----
3.	M.E./M.Tech. Semester-III	Semester-III	2/3 heads of passing of Semester- I & II taken together
4.	M.E./M.Tech. Semester-IV	Semester-IV	-----

(Explanation :- The Theory or Practical part of the subject shall be treated as separate head of Passing.)

    (ii) He/She shall not be allowed to submit the dissertation till he/she has passed in all subjects of I & II Semester.

10. The schemes of teaching & examinations shall be as provided under "Appendices A, B, C, D, E, F, G, H and I" appended with this Direction.

11. The fees for each M.E. (Full Time) / M.Tech. (Full Time) Examinations (Theory & Practical) shall be as prescribed by University from time to time.

12. The computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) of an examinee shall be as given below :-

The marks will be given in all examinations which will include college assessment marks and the total marks for each Theory / Practical shall be converted into Grades as per Table II.

SGPA shall be calculated based on Grade Points corresponding to Grade as given in Table II and the Credits allotted to respective Theory / Practical shown in the scheme for respective semester.

SGPA shall be computed for I, II and IV Semester (**III & IV Semester together**) and CGPA shall be computed in IV semester based on SGPAs of I, II and IV Semester. :-

$$\text{SGPA} = \frac{C_1 \times G_1 + C_2 \times G_2 + \text{.......} + C_n \times G_n}{C_1 + C_2 + \text{.........} + C_n}$$

Where C_1 = Credit of individual Theory / Practial

                     G_1 = Corresponding Grade Point obtained in the respective Theory / Practical

$$CGPA \times (Cr)_{IV} = \frac{(SGPA)_I \times (Cr)_I + (SGPA)_{II} \times (Cr)_{II} + (SGPA)_{IV}}{(Cr)_I + (Cr)_{II} + (Cr)_{IV}}$$

Where $(SGPA)_{I, II, IV}$ = SGPA of I, II & IV Semester

$(Cr)_{I, II, IV}$ = Total Credits for I, II & IV Semester

TABLE II
THEORY & PRACTICALS

Grade	Percentage of Marks	Grade Points
AA	$85 \leq$ Marks < 100	10
AB	$75 \leq$ Marks < 85	9
BB	$70 \leq$ Marks < 75	8
BC	$65 \leq$ Marks < 70	7
CC	$60 \leq$ Marks < 65	6
CD	$55 \leq$ Marks < 60	5
DD	$50 \leq$ Marks < 55	4
FF	$00 \leq$ Marks < 50	0
ZZ	Absent in Examination	--

13. (i) The scope of the subject shall be as indicated in the syllabus.

(ii) The medium of instructions and examination shall be English.

14. Provisions of Ordinance No.18 of 2001 in respect of 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 deficiency of marks in a subject in all the faculties prescribed by the Statute No.18, Ordinance, 2001 shall apply to each examination under this Direction.

15. An examinee, who does not pass or who fails to present himself/herself for the examination, shall be eligible for readmission to the said examination on payment of fresh fees, and such other fees as may be prescribed by the University.

16. As soon as possible after the examination, the Board of Examinations shall publish a result of the examinees. The result of all examinations shall be classified as above and branchwise merit list shall be notified as provided under Original Ordinance No.6.

17. Notwithstanding anything to the contrary, no one shall be admitted to an examination, if he/she has already passed the said examination or an equivalent examination of any Statutory University.

18. (i) Examinees who have passed in all the subjects prescribed for all the examinations of the particular branch shall be eligible for award of the Degree of Master of Engineering/Master of Technology in that branch including specilization.

(ii) The Degree Certificate in the prescribed form shall be signed by the Vice-Chancellor.

Sd/-
Dr. Kamal Singh
Vice-Chancellor

*****

DIRECTION

No.57/2010   Date : 30/9/ 2010

Subject :   Examinations leading to the Degree of अभियांत्रिकी पारंगत (Master of Engineering) (Full-Time) (Computer Engineering) (Semester Pattern .... Credit Grade System)

Whereas Direction No. 30 of 2010 in respect of Examinations leading to the Degree of अभियांत्रिकी पारंगत (Master of Engineering) (Full Time) /तंत्रशास्त्र पारंगत (Master of Technology) (Full Time) (Semester Pattern .... Credit Grade System) is in existence in the University,

AND

Whereas the Master of Engineering (Full Time) (Computer Engineering) course has been started at Collge of Engineering & Technology, Amravati from the session 2010-2011,

AND

Whereas the Board of Studies in Computer Science & Engineering in its meeting held on 23-8-2010 vide Item No. 56, resolved to recommend the schemes of teaching & examinations and syllabi of Master of Engineering (Full Time) (Computer Engineering) course for its implementation from the session 2010-2011,

AND

Whereas Hon'ble Vice-Chancellor has been accepted the above scheme & syllabi u/s 14 (7) of M.U. Act, 1994 on behalf of faculty of Engineering & Technology on 25-8-2010,

AND

Whereas the Academic Council in its meeting held on 27-08-2010 vide Item No. 90 has been accepted the above scheme and syllabi,

AND

Whereas the matter regarding making of Ordinance and Regulation is likely to take some time,

AND

Whereas two year Master of Engineering (Full Time) (Computer Engineering) course is to be implemented from the academic session 2010-2011,

AND

Whereas syllabi for the above course is to be sent for printing.

Now, therefore, I, Dr.Ku.Kamal Singh, Vice-Chancellor of Sant Gadge Baba Amravati University in exercise of powers confirmed 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 "Examinations leading to the Degree of अभियांत्रिकी पारंगत (Master of Engineering) (Full Time) (Computer Engineering) (Semester Pattern .... Credit Grade System), Direction, 2010"

2)   This Direction shall come into force from the date of its issuance.

3)   Schemes of teaching & examinations for I to IV Semesters of Master of Engineering (Full Time) (Computer Engineering) (Semester Pattern .... Credit Grade System) course shall be as per "Appendix-A" appended with this Direction.

4)   The Degree of Master of Engineering (Full Time)shall be awarded to an examinee who accordance qualifies himself / herself in the following subject :-
i) M.E. (Computer Engineering)

Dr. Kamal Singh
Vice-Chancellor

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

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

SECOND SEMESTER

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

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

THIRD SEMESTER

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

FOURTH SEMESTER

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

Semester III

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

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

Semester IV

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

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

Notes : 1. Student should fill the examination form in the begining of 3rd semester jointly for 3rd & 4th semester.

2. Single marksheet for 3rd & 4th semester together will be given to the student.