ANNAMALAI UNIVERSITY

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

FOUR YEAR B.E. (ELECTRONICS AND INSTRUMENTATION) DEGREE COURSE

FULL-TIME DEGREE COURSE

REGULATIONS AND SYLLABUS

1. Condition for Admission:

Candidates for admission to the first year of the four year B.E. Degree programme shall be required to have passed the final examination of the plus 2 Higher Secondary Course with Mathematics, Physics and Chemistry as subjects of study conducted by the Board of Secondary Education, Tamilnadu Government or an examination of any other authority accepted by the syndicate of this University as equivalent thereto. They shall satisfy the conditions regarding qualifying marks, age and physical fitness as may be prescribed by the syndicate of the Annamalai University from time to time. Candidates who have passed the Higher Secondary Examination through vocational stream under ENGINEERING AND TECHNOLOGY and candidates who have passed the Diploma Course in Engineering of the State Board of Technical Education and Training, Tamil Nadu, will also be eligible for admission to the first year of the four year degree programme in B.E. provided they satisfy other conditions.

2. Eligibility for the degree:

A candidate shall be eligible for the degree of Bachelor of Engineering if the candidate has satisfactorily undergone the prescribed courses of study for a period of not less than four academic years and has passed the prescribed examinations in all the four academic years.

3. Branches of study in B.E.

BRANCH I	- Civil Engineering
BRANCH II	- Civil and Structural Engineering
BRANCH III	- Mechanical Engineering
BRANCH IV	- Mechanical Engineering (Manufacturing)
BRANCH V	- Electrical and Electronics Engineering
BRANCH VI	- Electronics and Instrumentation Engineering
BRANCH VII	- Chemical Engineering
BRANCH VIII	- Computer Science and Engineering
BRANCH IX	- Information Technology
BRANCH X	- Electronics and Communication Engineering

4. Courses of study:

The courses of study are given separately. The syllabus for the courses are also given separately.

5. Scheme of Examinations

The scheme of Examinations is given separately.

6. Choice Based Credit System (CBCS):

Each course is normally assigned one credit per period of lecture/tutorial per week and one credit for two periods or part thereof for laboratory or practical or drawing per week. Each semester of curriculum shall normally have a blend of theory and practical courses. The total credits for the entire degree course will be 200. For the award of the degree a student has to

1. Earn a minimum of 200 credits.
2. Serve in the NSS or NCC for at least one year, and
3. Enroll as a student member of a recognized professional society.

7. Duration of the programme:

A student is normally expected to complete the B.E. programme in four years but in any case not more than seven years from the time of admission.

8. Registration for courses:

A newly admitted student will automatically be registered for all the courses prescribed for the first year without any option.

Every other student shall submit a completed registration from indicating the list of courses intended to be credited during the next semester. This registration will be done a week before the last working day of the current semester. Late registration with the approval of the Dean on the recommendation of the Head of the Department along with a late fee will be done up to the last working day.

Registration for the project work shall be done only for the final semester.

9. Assessment:

The break-up of assessment and examination marks for theory courses is as follows.

First assessment	: 15 marks
Second assessment (mid semester test)	: 15 marks
Third assessment	: 10 marks
End Semester Examination	: 60 marks

The break-up of assessment and examination marks for practical courses is as follows.

First assessment (test)	: 15 marks
Second assessment (test)	: 15 marks
Maintenance of record book	: 10 marks
End Semester Examination	: 60 marks

The project work will be assessed for 40 marks by a committee consisting of the guide and a minimum of two members nominated by the Head of the Department. One of the committee members will be nominated as the chairman by the Head of the Department. The Head of the Department may himself be a member or the chairman. 60 marks are allotted for the project work and viva voce examination at the end of the semester.

10. Student Counsellors:

To help the students in planning their course of study and for general advice on the academic programme, the Head of the Department will attach a certain number of students to a member of the faculty who shall function as student counselor for those students throughout their period of study. Such student counselors shall advise the students, give preliminary approval for the courses to be taken by the students during each semester and obtain the final approval of the Head of the Department.

11. Class Committee:

For all the branches of study during the first year, a common class committee will be constituted by the Dean of the faculty.

From among the various teachers teaching the same common course to different classes during the first year, the Dean shall appoint one of them as course coordinator.

The composition of the class committee during first year will be as follows.

Course co-ordinators of all common courses.

Teachers of all other individual courses.

All Heads of Departments, among whom one may be nominated as Chairman by the Dean.

The Dean may opt to be a member or the chairman.

For each of the higher semesters, separate class committees will be constituted by the respective Heads of Departments.

12. Withdrawal from a course:

A student can withdraw from a course at any time before a date fixed by the Head of the Department prior to the second assessment, with the approval of the Dean of the faculty on the recommendation of the Head of the Department.

13. Temporary break of study:

A student can take a one-time temporary break of study covering the current semester and/or the next semester with the approval of the Dean on the recommendation of the Head of the Department, not later than seven days after the completion of the mid semester test. However, the student must complete the entire programme within the maximum period of seven years.

14. Substitute assessments:

A student who has missed, for genuine reasons accepted by the Dean/Head of the department, one or more of the assessments of a course other than the end semester examination, may take a substitute assessment for any one of the missed assessments.

The substitute assessment must be completed before the date of the fourth meeting of the respective class committees.

A student who wishes to have a substitute assessment for a missed assessment must apply to the Dean/Head of the Department within a week from the date of the missed assessment.

14. Attendance requirements:

To be eligible to appear for the examination in a particular semester, a student must put in a minimum of 80 % of attendance in that semester. However, if the attendance is 75 % or above but less than 80 % in any semester, the authorities can permit the student to appear for the examination in that semester on payment of the prescribed condonation fee.

A student who withdraws from or does not meet the minimum attendance requirement in a semester / academic year (in case of first year) must register for and repeat the semester/ academic year (in case of first year) respectively.

15. Passing and declaration of examination results:

All assessments of the entire course on an absolute marks basis will be considered and passed by the respective results passing boards in accordance with the rules of the University. Thereafter, the Controller of examinations shall convert the marks for each course to the corresponding letter grade as follows, compute the grade point average (GPA) and overall grade point average (OGPA), and prepare the grade cards.

90 to 100 marks	: Grade ‘S’
80 to 89 marks	: Grade ‘A’
70 to 79 marks	: Grade ‘B’
60 to 69 marks	: Grade ‘C’
55 to 59 marks	: Grade ‘D’
50 to 54 marks	: Grade ‘E’
Less than 50 marks	: Grade ‘F’
Insufficient attendance	: Grade ‘I’
Withdrawn from the course	: Grade ‘W’

A student who obtains less than 24 marks out of 60 in the end semester examination or 50 marks out of total 100 or is absent for the examination will be awarded grade 'F'.

A student who earns a grade of S, A, B, C, D or E for a course is declared to have successfully completed that course. Such a course cannot be repeated by the student.

A student who obtains letter grade F in a course has to reappear for the examination in that course.

A student who obtains letter grades I or W in a course must reregister and repeat the course.

The following grade points are associated with each letter grade for calculating the grade point average and overall grade point average.

S – 10; A – 9;

B – 8; C – 7;

D – 6; E – 5;

F – 0;

Courses with grades 'I' and 'W' are not considered for calculation of grade point average or overall grade point average. F grade will be considered for computing GPA and OGPA.

A student can apply for re totaling of one or more of his examination answer papers within a week from the date of issue of grade sheet to the student on payment of the prescribed fee per paper. The application must be made to the controller of examinations with the recommendation of the Head of the Department.

After results are declared, grade cards will be issued to the students. The grade card will contain the list of courses registered during the semester, the grades scored and the grade point average (GPA) for the semester.

GPA is the sum of the products of the number of credits of a course with the grade point scored in that course, taken over all the courses for the semester, divided by the sum of the number of credits for all courses taken in that semester. OGPA is similarly calculated considering all the courses taken from the third semester.

16. Awarding degree

The results of the final semester will be withheld until the student obtains passing grade in all the subjects of all earlier semesters.
After successful completion of the programme, the degree will be awarded with the following classifications based on OGPA.

For first class with Distinction the student must earn a minimum of 200 credits within four years from the time of admission, pass all the courses in the first attempt and obtain a OGPA of 8.25 or above for all the subjects form III Semester to VIII Semester.

For First class the student must earn a minimum of 200 credits within five years from the time of admission and obtain a OGPA of 6.75 or above for all the subjects from III Semester to VIII Semester.

For Second class the student must earn a minimum of 200 credits within seven years from the time of admission.

18. Ranking of Candidates:

The candidates who are eligible to get the B.E. degree in First Class with distinction will be ranked together on the basis of OGPA for all the subjects of study from III to VIII Semester.

The candidates passing with First class will be ranked next after those with distinction on the basis of OGPA for all the subjects of study from III and VIII Semester.

The ranking will be done separately for each branch of study.

19. Electives:

Apart from the various elective courses offered in the curriculum of the branch of specialization, a student can choose a maximum of two electives from any specialization under the faculty during the entire period of study, with the approval of the Head of the Department and the Head of the Department offering the course.

20. Transitory Regulations:

The University shall have powers to revise or change or amend the regulations, the scheme of examinations, the courses of study and the syllabi from time to time.

Wherever there had been change of syllabi, examinations based on the existing syllabus will be conducted for three consecutive times after implementation of the new syllabus in order to enable the students to clear the arrears. Beyond that the students will have to take up their examinations in equivalent subjects, as per the new syllabus, on the recommendations of the Head of the Department concerned.

Procedure for withdrawing from the Examinations:

A student can withdraw from all the examinations of the academic year/semester once only during the entire course on valid grounds accepted by the University. For such candidate for classification of results the time will be extended by one semester provided the candidate passes all the examinations as permitted in the Regulations but will not be ranked.

Such withdrawal from the examinations of a year/semester will be permitted only if the candidate applies for withdrawal at least 24 hours before the commencement of the last examination.

B.E. ELECTRONICS AND INSTRUMENTATION

(Full time)

(Four Year Degree Course)

Choice based credit system

Subjects of study and Scheme of Examinations

FIRST YEAR (ANNUAL PATTERN)

No	Code No	Course Title	L	T	P	D	Marks			Credit points
							Ex.	CA	Total	
THEORY (Duration of Examination – 3 Hrs)										
1	101	Technical English	3				75	25	100	3
2	102	Engineering Mathematics - I	3	1			75	25	100	4
3	103	Engineering Physics	3				75	25	100	3
4	104	Engineering Chemistry	3				75	25	100	3
5	105	Engineering Mechanics	3				75	25	100	3
6	106	Basic Engineering (Civil, Mech. & Elect.)	6				75	25	100	3
7	107	Environmental Studies	3				75	25	100	3
PRACTICAL (Duration of Examination – 3 Hrs)										
8	108	Engineering Drawing	-	-	-	3	60	40	100	2
9	109	Physics Laboratory	-		3		60	40	100	2
10	110	Chemistry Laboratory	-				60	40	100	2
11	111	Computer Programming	1		2		60	40	100	2
12	112	Workshop Practice	-		3		60	40	100	2
		Total	25	1	8	3	825	375	1200	32

L - Lecture, T - Tutorial, P- Practical, D – Drawing, Ex. – Examination, CA – Continuous Assessment

SEMESTER –III

Code	Subjects	Periods/Week			Exam Duration Hours	Marks		Total Marks	Credits
		L	T	P		CA	FE		
EIEC 301	Engg. Mathematics -II	4	1	-	3	25	75	100	4.0
EIEC 302	Objected Oriented Programming	4	-	-	3	25	75	100	3.0
EIEC 303	Circuit Theory	4	1	-	3	25	75	100	3.0
EIEC 304	Electronics – I	4	1	-	3	25	75	100	4.0
EIEC 305	Applied Mechanics	4	-	-	3	25	75	100	3.0
EIEC 306	Mechanical Engineering	4	-	-	3	25	75	100	3.0
EIEP 307	Circuits and Devices Lab	-	-	6	3	40	60	100	3.0
EIEP 308	Mechanical Engineering Lab	-	-	3	3	40	60	100	2.0
EIEP 309	Programming Lab	-	-	3	3	40	60	100	2.0
	Total	24	3	12		270	630	900	27

SEMESTER –IV

Code	Subjects	Periods/Week			Exam Duration Hours	Marks		Total Marks	Credits
		L	T	P		CA	FE		
EIEC 401	Engg. Mathematics-III	4	1	-	3	25	75	100	4.0
EIEC 402	Electronics -II	4	1	-	3	25	75	100	4.0
EIEC 403	Digital Electronics	4	-	-	3	25	75	100	3.0
EIEC 404	Electrical Technology	4	1	-	3	25	75	100	3.0
EIEC 405	Electrical Measurements	4	-	-	3	25	75	100	3.0
EIEC 406	Fluid Mechanics and Hydraulic Machinery	4	-	-	3	25	75	100	3.0
EIEP 407	Electronics Lab	-	-	6	3	40	60	100	3.0
EIEP 408	Electrical Measurements Lab	-	-	3	3	40	60	100	2.0
EIEP 409	Hydraulics Lab	-	-	3	3	40	60	100	2.0
	Total	24	3	12		270	630	900	27

SEMESTER –V

Code	Subjects	Periods/Week			Exam Duration Hours	Marks		Total Marks	Credits
		L	T	P		CA	FE		
EIEC 501	Signals and Systems	4	1	-	3	25	75	100	3.0
EIEC 502	Linear Integrated Circuits	4	-	-	3	25	75	100	3.0
EIEC 503	Microprocessors and Applications	4	-	-	3	25	75	100	4.0
EIEC 504	Power Electronics	4	-	-	3	25	75	100	4.0
EIEC 505	Control Systems	4	1	-	3	25	75	100	4.0
EIEC 506	Transducers and Measurement Systems	4	-	-	3	25	75	100	4.0
EIEP 507	Linear and Digital ICs Lab	-	-	6	3	40	60	100	3.0
EIEP 508	Transducers and Signal Conditioning Lab	-	-	3	3	40	60	100	2.0
EIEP 509	Electrical Machines Lab	-	-	3	3	40	60	100	2.0
	Total	24	2	12		270	630	900	29

SEMESTER –VI

Code	Subjects	Periods/Week			Exam Duration Hours	Marks		Total Marks	Credits
		L	T	P		CA	FE		
EIEC 601	Digital Signal Processing	4	-	-	3	25	75	100	4.0
EIEC 602	Electronic Instrumentation and Measurement Techniques	4	-	-	3	25	75	100	4.0
EIEC 603	Industrial Instrumentation	4	-	-	3	25	75	100	4.0
EIEC 604	Process Control -I	4	1	-	3	25	75	100	4.0
EIEC 605	Digital System Design	4	-	-	3	25	75	100	3.0
EIEC 606	Microcontroller and its Applications	4	-	-	3	25	75	100	3.0
EIEP 607	Control Systems Lab	-	-	3	3	40	60	100	2.0
EIEP 608	Microprocessor Lab	-	-	6	3	40	60	100	3.0
EIEP 609	Power Electronics Lab	-	-	3	3	40	60	100	2.0
EIEP 610	Mini Project Work and Viva-Voce	-	-	1	3	40	60	100	1.0
	Total	24	1	13		310	690	1000	30

SEMESTER –VII

Code	Subjects	Periods/Week			Exam Duration Hours	Marks		Total Marks	Credits
		L	T	P		CA	FE		
EIEC 701	Process Control-II	4	-	-	3	25	75	100	4.0
EIEC 702	Computer Networks and DCS	4	-	-	3	25	75	100	4.0
EIEC 703	Personal Computer System	4	-	-	3	25	75	100	4.0
EIEC 704	Analytical Instrumentation	4	-	-	3	25	75	100	3.0
EIEC 705	Elective -I	4	-	-	3	25	75	100	4.0
EIEC 706	Elective -II	4	-	-	3	25	75	100	4.0
EIEP 707	Instrumentation and Process Control Lab	-	-	6	3	40	60	100	3.0
EIEP 708	Embedded Systems Lab	-	-	3	3	40	60	100	2.0
EIEP 709	Instrumentation System Design Lab	-	-	3	3	40	60	100	2.0
EIEP 710	Project Work*	-	-	3	-	-	-	-	-
	Total	24	-	15		270	630	900	30

*Includes seminar hours

SEMESTER –VIII

Code	Subjects	Periods/Week			Exam Duration Hours	Marks		Total Marks	Credits
		L	T	P		CA	FE		
EIEC 801	Ethics in Engineering	2	-	-	3	25	75	100	2.0
EIEC 802	Management Techniques	4	-	-	3	25	75	100	3.0
EIEC 803	Computer Control of Processes	4	-	-	3	25	75	100	4.0
EIEC 804	Elective –III	4	-	-	3	25	75	100	4.0
EIEC 805	Elective –IV	4	-	-	3	25	75	100	4.0
EIEP 806	Instrumentation and Computer Control Lab	-	-	6	3	40	60	100	2.0
EIET 807	Project Work and Viva-Voce	-	-	12		40	60	100	6.0
	Total	18	-	18		205	495	700	25

101 TECHNICAL ENGLISH

Aim

To encourage learners to become active participants in the learning progress and acquire proficiency in target language. To develop the four basic skills (Listening, Speaking, Reading and Writing) of language learning with special reference to technical aspects.

Objectives

To help learners increase the lingual power and word power, and frame suitable structures to use appropriately in different contexts.

To train learners use diversified rhetorical functions of technical English.

To increase learners comprehension of the technical expertise while reading the prescribed text.

To develop the oral communication skills of the learners to make them speak effectively.

To initiate learners to adopt different strategies for personal and professional writing.

Unit I Listening Comprehension (18 Periods)

Types of Listening – Effective listening strategies – Team listening – Active listening to broadcasted programmes - listening to seminars and workshops – listening and notes taking.

Suggested Activities:

The students are exposed to a listening exercise. (for a specific purpose). The students will listen to the teacher's instruction over a short span of time – five to ten minutes.

The student will listen to the teacher's lectures (from the text and in general) over a period of forty-five minutes.

The learners will register ideas in their minds by listening to short and long lecturers delivered to them in seminars, workshops and in broadcasted programmes.

Unit II Speaking Strategies (18 Periods)

Sounds in English – Pronunciation –vowels, consonants, stress, syllables, intonation.

Suggested Activities:

Students shall be trained to speak in English on familiar and unfamiliar topics. Questions are asked so as to motivate students to speak in English. The learners will learn to speak complete sentences without inhibitions, and no mumbling is allowed, learning right pronunciation is the target, and students are trained so as to achieve competency in oral expression.

To make right pronunciation in English, the phonetic symbols in English shall be taught. Rigorous training shall be imparted in the class to register the phonetic symbols in English in the minds of the students.

Syllable, stress, pitch, intonation and such other phonetic components may be taught to gain proficiency in oral communication.

Unit III Reading skills (18 Periods)

Comprehension – note making – summarizing and paraphrasing – technical reports.

Suggested Activities:

Students shall be trained in skimming the lessons for understanding the ideas given therein. Based on reading, topic sentence of a paragraph will have to be arrived at.

Short answer questions shall have to be responded to on the basis of reading.

Comprehension notes making, summarizing, organizing of ideas from the lessons of the given text may be achieved by making the students respond to questions.

The learners shall have to be given drill in silent reading.

Unit IV Writing I (18 Periods)

Paragraph writing, essays, stories, letters both formal and informal, e-mail message, and report writings.

Suggested Activities:

Students shall be trained in writing paragraphs, essays, review of articles and stories and letters both formal and informal, business letters calling for quotations, asking clarifications, placing orders and so on.

Unit V Writing II (18 Periods)

Parts of speech - word order extension – tense – active and passive voice - articles – concord – gerund – prefix – suffix – synonym – antonym – one word substitution - tag questions.

Suggested Activities:

The nuances of English grammar may be taught to the students so as to make them

flawless English both in their oral and written communications.

Text Book

1. Ashraf Rizvi, M(2005), *Effective Technical Communication*, Tata McGraw-Hill Publishing Company Limited, New Delhi.

Reference Books

1. Narayanaswami, V.R(2005), *Strengthen Your Writing*, 3rd Edition. Orient Longman, Pvt. Ltd, Chennai.
2. Department of Humanities and Social Sciences, Annamalai University (2006), *English for Engineers and Technologists, Vol. I & II* (Combined Edition), Orient Longman Pvt. Ltd. Chennai.
3. Daniel Jones (2002), *English Prouncing Dictionary*, J.M. Dents & Sons Ltd. London.

102 ENGINEERING MATHEMATICS – I

Aim

The course is aimed at developing the basic Mathematical skills of Engineering students that are imperative for effective understanding of Engineering subjects. The topics introduced will serve as basic tools for specialized studies in many Engineering fields, significantly in fluid mechanics, field theory and Communication Engineering.

Objectives

On completion of the course the students are expected to

Identify algebraic eigen value problems from practical areas and obtain the eigen solutions in certain cases.

Diagonilize a matrix which would render the eigen solution procedure very simple

Understand effectively the geometrical aspects of curvature, maxima and minima concepts as elegant applications of differential calculus.

Solve differential equations of certain types, including systems of differential equations that they might encounter in the same or higher semesters.

Understand double and triple integrations and enable them to handle integrals of higher orders.

Know the basis of vector calculus comprising of gradient, divergence & curl and line, surface and volume integrals along with the classical theorems involving them.

Understand analytic functions and their interesting properties.

Know conformal mappings with a few standard examples that have direct application.

Grasp the basics of complex integrations and the concept of contour integrations which is important for evaluation of certain in integrals encountered in practice.

Have a sound knowledge of Laplace transform and its properties and solve certain linear differential equations using the Laplace transform technique which have applications in other subjects of the current and higher semesters.

Unit I Matrices and Differential Calculus (18 Periods)

Eigen value problem – Eigen values and Eigen vectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigen vectors – Cayley-Hamilton theorem (excluding proof) – Similarity transformation (Concept only) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form – Orthogonal reduction to its canonical form.

Curvature – Cartesian and Parametric Co-ordinates – Centre and radius of curvature – Circle of curvature- Evolutes – Maxima / Minima for functions of two variables – Constrained maxima and minima - Jacobians.

Unit II Ordinary Differential Equations (ODE) and Applications **(18 Periods)**

Solution of second order linear ODE with constant coefficients – Second order linear differential equations with variable coefficients – Euler's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients – Complete solution using method of variation of parameters. Application of second order differential equations related to electric circuits, bending of beams.

Unit III Multiple Integrals and Vector Calculus (18 Periods)

Double integration – Cartesian and polar co-ordinates – Change of order of integration – Area as a double integral – Triple integration – Volume as a triple integral.

Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (excluding proof) – Simple applications.

Unit IV Analytic Functions and Complex Integration (18 Periods)

Function of a complex variable – Analytic function – Necessary conditions – Cauchy – Riemann equations – Sufficient conditions (excluding proof) – Properties of analytic function – Harmonic conjugate – Construction of Analytic functions – Conformal mapping : w = z2, 1/z, ez, sinz **, cosz.**

Statement and application of Cauchy's integral theorem and integral formula – Taylor and Laurent's expansions – Isolated singularities – Residues – Cauchy's residue theorem. Contour integration over unit circle and semicircular contours (excluding poles on boundaries) (18 periods)

Unit V Laplace Transforms (18 Periods)

Laplace Transforms of elementary functions – Basic properties – Derivatives and integrals of transforms – transforms of derivatives and integrals – initial and final value theorems – Transform of periodic functions. Inverse Laplace transforms Convolution theorem–Solution of linear ODE of second order with constant coefficients and first order simultaneous equation with constant coefficients using Laplace transformation.

Text Book

1. Venkataraman.M.K (2004)., *Engineering Mathematics*, Volume I & II, Revised enlarged Fourth Edition, The National Publishing Company, Chennai.

Reference Books

1. Kandasamy, P.,Thilagavathy. K, and Gunavathy, K (2005), *Engineering Mathematics*, Volume I & II, S.Chand & Co, New Delhi.
2. Kreyszig, E(2001)., *Advanced Engineering Mathematics*, Eighth edition, John Wiley and Sons (Asia) Limited, Singapore.

3. Veerarajan. T(2005)., *Engineering Mathematics (for first year)*, Fourth edition, Tata McGraw – Hill Publishing Company Limited, New Delhi.
4. Grewal, B.S(2004)., *Higher Mathematics*, thirty Eight Edition, Khanna Publishers, New Delhi.
5. Vairamanickam, K. Nirmala P.Ratchagar, and Thillaigovindan, N(2005)., *Engineering Mathematics,* Vol. I, Prientice Hall Pvt. Limited, New Delhi.

103 ENGINEERING PHYSICS

Aim

- To enhance students' knowledge on theoretical and modern technological aspects in Physics
- To enable the students to correlate the theoretical principles with application.
- To introduce fundamentals of science for engineering and technology

Objectives

At the end of the course the students would be exposed to fundamental knowledge in

- Various engineering subjects and applications
- Design of acoustically good buildings
- Structure identification of engineering materials
- Non destructive techniques
- Interferometric techniques in communication and civil engineering
- Application of quantum physics
- Application of lasers in engineering and technology
- Conducting, superconducting and dielectric materials
- Semi conducting and new engineering materials

Unit I Properties of Matter and Sound (18 Periods)

Stress and strain-hook's law-different modulii of elasticity(relation between Y,K,n and σ)-bending of beams-determination of young's modulus by bending of beams(uniform and non uniform bending)-torsional pendulum theory-experiment-uses of torsional pendulum.

Viscosity-streamline and Turbulant flow-poisuilli equation-capilliary flow method-stokes law-terminal velocity-determination of viscosity by stokes method.

Classification and characteristics of sound-acoustics of buildings-absorption coefficient-reverberation time-sabine's formula-acoustics design of an auditorium-factors affecting acoustics of buildings and their remedies.

Ultrasonics-production-magneto striction and piezo electric methods-detection-determination of velocity of ultrasonic waves (Acoustics grating)-Applications-holographic NDT

Unit II Light (18 Periods)

Eienstein co-efficient(A&B)-laser principles-Ruby, He-Ne, CO2,Nd-YAG and semiconductor lasers-uses-Holography-construction and re construction of hologram-uses

Fibre optics - principle and propagation of light in optical fibres -Numerical aperture and acceptance angle –types of optical fibres(material, Refractive index, mode)-preparation-applications-Fibre optics communication system (Block diagram only)-fibre optic sensors(Displacement sensor and pressure sensor)

Interference – Theory of Interference in a thin film – Airwedge – Michelsons Interferometer – formation of circular and whitelight fringes and their theory - Determination of wavelength of monochromatic source and thickness of a thin transparent sheet. Resolving power and dispersive power of prism and grating-Polarization – Plane, circular and elliptical polarization – Waveplates and polariscopes - Photo elasticity: Stress optics law-effect of a stressed model in plane polariscope-isoclinic and isohromatic fringes-photo elastic bench – uses.

Unit III Crystal Structure and Crystal Defects (18 Periods)

Unit cell-Bravais lattice-crystal systems-miller indices-sc, fcc, bcc and hcp structures-atomic radius, co-ordination number, atomic packing factor and their calculations-production, characteristics, origin and uses of x-rays-Bragg's law- Bragg's spectrometer-determination of crystal structures-x-ray diffraction Laue method-characteristics of inter atomic and inter molecular bonds
Crystal imperfections - schottky defect, frenkel defect and dislocations, grain boundaries - F and E colour centres.

Unit- IV Characteristics of Different Materials (18 Periods)

Thermal and electrical conductivities-widemann – franz's law-dielectrics-determination-internal fields-clausius mossotti relation-dielectric loss-dielectric break down-properties and types of dielectric materials-super conductivity-properties-Meissner effect-type1& type 2 super conductors-Qualitative idea of BCS Theory and Josephson's effects-High temperature super conductivity-Applications.

Carrier concentration in an intrinsic semiconductor-calculation of density of holes and electrons-Fermi level and its variation with temperature-mobility and conductivity-determination of band gap-Expression for carrier concentration in N type and P type semi conductor-variation of Fermi level with temperature and impurity concentration-Hall effect-Determination of Hall coefficient

Introduction to new materials; Metallic glasses-Nano materials-Shape memory alloys-Bio materials.

Unit-V Atomic and Nuclear Physics (18 Periods**)**

Wave particle duality-Compton effect-Theory and experimental verification-Matter waves- De Broglie wavelength - properties -Davission and Germer experiment-Uncertainty principle with an illustration-Schrodinger time independent and dependent equations-physical significance of wave function-particle in one dimensional box.

Nuclear fission-nuclear chain reaction-criticality factors-Reactor design-Types of reactors-Nuclear fusion-Interstellar energy-Controlled thermo nuclear reaction-Hydrogen bomb-Nuclear Detectors-Ionization Chamber, G.M counter-Scintillation counter and Ge-Li detector.

Text Books

1. Avadhanulu M.N. and Kshirsagar P.G., "A Text Book of Engineering Physics", S.Chand & Company Ltd., 7th Enlarged Revised Ed., 2005.

2. Gaur R. K. and Gupta S. L., "Engineering Physics", Dhanpat Rai Publishers, New Delhi, 2001.

Reference Books

1. Pillai S. O., "*Solid State Physics*", New Age International Publication, New Delhi, Fifth Edition, 2003.

2. Palanisamy P. K., "*Physics for Engineers*", Scitech Publications (India) Pvt. Ltd., Chennai, Second Edition, 2005.
3. Suresh.G.,Ponnusamy.V and Veluchamy.P "*Engineering Physics*" Best publication ,Rajapalayam
4. Mani. P "*Engineerring Physics*" Dhanam Publication ,Chennani

5. Arumugam M., "*Engineering Physics*", Anuradha Agencies, Kumbakonam, Second Edition, 2005.
6. Rajendran V. and Marikani A., "*Materials Science*", Tata McGraw Hill Publishing Company Ltd, New Delhi, 2004.
7. Rajendran V. and Marikani A., "*Applied physics for engineers*", Tata McGraw Hill Publishing Company Ltd, Third edition,New Delhi, 2004.

104 ENGINEERING CHEMISTRY

Aim

To enable the students to understand the chemistry of different types of engineering materials which are used in industrial and manufacturing sectors.

Objectives

The course materials are designed in such a way that the chemical concepts and

applications of various engineering materials are introduced to the engineering students. Applications of chemical reaction in water purification, corrosion prevention, pollution control are emphasized.

Basic knowledge about refectories, abrasives, industrial waste treatment methods, lubricants, polymers and nano materials are introduced so that different branches of students are benefited by this course of study.

Unit I (18 Periods)

Water: Hardness of water - Softening of water by ion - exchange process - boiler feed water - Boiler troubles - internal treatment of boiler feed water - desalination of brackish water - reverse osmosis - determination of total hardness by EDTA method, Chloride and dissolved oxygen by volumetric method - disinfection of water.

Environment: Air Pollution-: classification and sources of air pollutants and their effects on man and environment, acid rain, greenhouse effect, photochemical smog, effects of ozone depletion, control of air pollution.

Water pollution: classification of water pollutants, Disposal of radioactive wastes, significance of BOD & COD.

Unit II (18 Periods)

High Polymers: Polymers - nomenclature, functionality, types of polymerization, addition, condensation, copolymerization mechanism of addition polymerization, free radical ionic and co-ordination polymerization. Plastics - thermoplastic and thermosetting resins, preparation, properties and uses of some thermoplastics (Cellulose derivatives, Vinyl resins, Polyamides, Nylons), thermosetting plastics (Phenolics, Polyester resins, silicone resins).

Surface Chemistry: Adsorption of gases on solids - Adsorption of ions and molecules from solutions - Adsorption isotherms - Adsorbents and Adsorbates.

Unit III **(**18 Periods**)**

Energy: Fuels - definition & classification - calorific value, Gross and net calorific values analysis of coal - proximate and ultimate analysis,. Refining of petroleum, cracking, knocking in petrol and diesel engines, Octane and cetane number, Synthetic petrol, Combustion - theoretical calculation of air by weight and volume analysis, flue gas analysis, Orsat's apparatus. Solar energy: Photovoltaic cells, solar grade silicon and its relevance to photovoltaics, working of Photovoltaic cells.

Unit IV (18 Periods)

Electro Chemical Energy- Electrochemical cell - Electrochemical series - concentration cells, commercial voltaic cells, dry cell, storage cell lead cell, nickel cadmium cell, fuel cells. Corrosion- dry and wet corrosion, mechanism of wet corrosion, factors affecting

corrosion, types of corrosion, corrosion control, design and material selection, Cathodic protections sacrificial anodic method and impressed voltage method, surface preparation.

Protective Coatings: Principles of protective coatings with special reference to Inorganic coating (i) anodizing (ii) Phosphating metal coatings (iii) Galvanization (iv) Tinning.

Unit V (18 Periods)

Engineering Materials: General methods of preparation - classification characteristics and applications of Refractories ,Abrasives, lubricants.

Nano materials: Introduction to Nano materials - Brief outline of SOL-GEL Processes - CVD methods -Carbon nanotubes, FULLERENES and SEMICONDUCTORS SENSORS, NANOCOMPOSITES - NANOWIRES, NANOSHEETS.

Text book

1. Jain, P.C and Monica Jain(1986)., *Engineering Chemistry*, Dhanpat Rai & Sons, New Delhi.

Reference Books

1. Sharma, B.K(2000)., *Industrial Chemistry*, GOEL Publishing House, Meerut.
2. Krishnamurthy,N., Vallinayagam, P., and Jeyasubramanian, K(2001)., *Applied Chemistry,* Second Edn., Tata McGraw-Hill Publishing Company Limited. New Delhi.
3. R.Gopalan, D.Vengappayya & S.Nagarajan (2004), *Engineering Chemistry*, Tata McGraw-Hill Publishing Company Limited, New Delhi.
4. Daniel Yesudian, *Engineering Chemistry*, Hi-tech Publications, Mayiladuthurai.

105 ENGINEERING MECHANICS

Aim

To introduce the fundamentals of forces and their effects of structural bodies with specific properties

Objectives

To understand the definitions of particle, body forces and their equilibrium conditions.

To know the principles of simple machines and their applications

Unit I (18 Periods)

Introduction: – Definition of particle and rigid body- Units and dimensions- equilibrium of particle- classification of forces – coplanar forces-resolution of forces-parallelogram,

triangular and polygon law of forces- analytical method- free body diagram- lami's theorem- vector representation of space force- equilibrium of particle in space.

Unit II (18 Periods)

Equilibrium of Rigid Bodies : moment of a force- Varignon's theorem- moment of a couple- equations of equilibrium of a rigid body- types of supports- types of beams- types of loads- determination of beam reactions.

Unit III (18 Periods)

Centroid and Centre of Gravity : determination of centroid of sections of different geometry- centre of gravity of a body. Area moment of inertia- radius of gyration- parallel axis theorem- perpendicular axis theorem-determination of moment of inertias of rectangular, triangular, circular, semi-circular, elliptical areas from first principles- moment of inertias of structural steel sections of standard and composite sections-product of inertia- polar moment of inertia.

Mass moment of inertia- determination of mass moment of inertia of a thin rectangular plate, thin circular disc, solid cylinder, prism, sphere and cone from first principles.

Unit IV (18 Periods)

Rigid and deformable bodies: tension, compression and shear stresses- deformation of simple and compound bars- elastic constants. Stresses at a point- stresses on inclined planes- principal stresses and principal planes- principal strains- Mohr's circle.

Unit V (18 Periods)

Simple machines: definitions- velocity ratio- mechanical advantage- law of machine- efficiency-reversibility- simple screw jack- simple wheel and axle- worm and wheel- handle winch- pulley systems.

Text Books

1. Natesan,S.C(2002)., *Engineering Mechanics (Statics and Dynamics)*, first edition, Umesh Publications, New Delhi (I,II,III & V Units).
2. Khurmi.R.S (1998), *Strength of Materials*, S-Chand & Co., Ltd., Chennai. (IV Unit)

Reference Books

1. Beer, F.P and Johnson, R (1984), *Vector Mechanics for Engineers (Statics),* McGraw- Hill Book company, New Delhi.

2. Khurmi, R.S (1988), *Engineering Mechanics*, S.Chand & Company Ltd., Ram nagar, New Delhi.
3. Sadhu Sing (1983), *Engineering Mechanics,* Oxford & IBH Publishing Co., New Delhi.
4. Palanichamy, M.S and Nagan, S (1997), *Engineering Mechanics (Statics and Dynamics),* Tata McGraw Hill Publishing Company, Ltd., New Delhi.

106 BASIC ENGINEERING

PART A (Civil Engineering)

Aim

To realise the importance of Civil Engineering, developing the basic knowledge of Buildings and structures with their components, service requirements and functioning.

Objectives

To teach the types of building components, design requirements, materials, planning and survey.

To expose to the field conditions of water distribution and environments.

Unit I (20 Periods)

Introduction: Civil Engineering- Contribution to Society- Scope of Civil Engineering. Civil Engineering materials: stones, bricks, cement, cement concrete, Reinforced cement concrete, steel sections - types, properties and uses. Foundations: Objectives - Bearing Capacity of soil - Types of foundations shallow, deep and machine foundations - super structure - Brick masonry - bonds in brick work - stone masonry - types - beams - columns - lintels - roofing - RCC roof steel trusses - roof coverings - types of flooring - plastering.

Surveying: principles - types - classification - measurement of distances- chain- measurement of horizontal angles- compass- bearings- concept of traverse– leveling - instruments- classification- reduction of levels- determination of area- simple problems.

Unit II (20 Periods)

Planning of buildings - residential, institutional and industrial - functional requirements. Roads - benefits - different classification of roads - traffic signs – Bridges necessity - site selection - components of a bridge - different classifications. Dams - purpose - reservoir - site selection - different classification of dams and their description.

Environmental Engineering - elements of protected water supply – objectives planning a water supply scheme - sources of water supply - simple description of water treatment methods - sewage treatment - simple description of different treatment processes - septic tank.

(20 Periods)

Text Book

1. Ramesh Babu, V(1995), *A Text Book of Basic Civil Engineering, Anuradha Agencies, Kumbakonam.*

Reference Book

1. Shanmugam.G and Palanichamy. M.S (1996), *Basic Civil and Mechanical Engineering*, Tata McGraw Hill Publishing Company Ltd.

PART B (Mechanical Engineering)

Aim

To introduce to the students the basics of Mechanical and Manufacturing Engineering.

Objectives

To familiarize the students the functioning of different types of Boilers, their mountings and accessories.

To Provide basic knowledge about the use of various machine tools and the basic principles of Welding, Brazing and Soldering.

To illustrate the concepts of various Metal Forming Operations and the different types of Mechanical Drives.

Unit I

Boilers : Classification – Description and Working of Simple vertical boiler, Locomotive boiler, Cochran boiler, Babcock and Wilcox boiler. Description and working of boiler mountings: water level indicator, Pressure gauge, Dean weight and Spring loaded Safety valve, Fusible plug, Feed check valve, Steam stop valve and Blow–off cock. Description and working of boiler accessories: Economiser and Super heater. (10 Periods)

Prime movers: Steam turbines: Principles and working of Impulse and Reaction turbines – Comparison. Gas turbines: Principles and working of Open cycle and Closed cycle gas turbines. (5 Periods)

Internal combustion engine: Classification, principal parts and comparison – two stroke and four stroke engines. Working principle of petrol and diesel engines. Description and working of Simple carburetor, Fuel injector and Spark plug. (5 Periods)

Unit II

Machine Tools: Description of parts and operations performed – Lathe, Shaper, Drilling machine and planer.
Metal Joining : Gas welding: Principle – Oxy – acetylene welding – Equipment – Types of flames -Advantages and disadvantages of Gas welding. Arc welding- Principles only - Electric arc welding, Carbon arc welding, Inert gas arc welding, Shielded metal arc welding, Submerged arc welding, Arc welding equipment – Advantageous and disadvantageous of arc welding. Brazing- Torch brazing, Dip brazing, Furnace brazing, Resistance brazing. Soldering- Soft soldering and hard soldering. Comparison of Brazing and Soldering. (10 Periods)

Metal Forming: Introduction to Hot working and cold working. Forging- Hand forgoing operations – Upsetting, Fullering, Setting down, Bending Punching, drifting, Swaging, and Cutting off. Types of Forging – Press forging, Upset forging, Roll forging, Steam and Air forging. Rolling -Principle, Rolling mill configuration, Two high non – reversing, Two – high reversing, Three high, Four high and Cluster rolling mill. (5 Periods)

Power Transmission: Belt drives- Open and crossed belt drives – Types of pulley: Fast and Loose pulley, Stepped pulley Idler pulley, Guide pulley – Advantages and disadvantages of belt drives. Gear drives - Type of gears: Spur gear, Helical gear, Spiral gear, Bevel gear, Worm and Worm wheel, Rack & Pinion – Types of gear trains: simple gear train, Compound gear train, Epicyclic gear train – Advantages and disadvantages of gear drives. Chain drives - Types of chains – Roller chain, Block chain, Silent chain – Advantages and disadvantages of chain drives. (5 Periods)

Text Books

1. Prabhu, T.J., Jaiganesh,V., and Jebaraj, S(2000)., *Basic Mechanical Engineering*, Scitech publication(India) Pvt.Ltd, Chennai

Reference Books

1. Hajra Choudhury, S.K., Hajra Choudhury, A.K., and Nirjhar Roy (1997)., *Elements of Workshop Technology*, Vol. I & II, Media promoters and Publishers pvt. Ltd. Mumbai.
2. Venugopal and Praburaj,(1996).,*Basic Mechanical Engineering*, A.R.S. Publications, Sirkali.
3. Chethan Kumar C.S., Mahesh B.P,(2004), *Elements of Mechanical Engineering*, S.Chand & Company, Chennai.

PART C (Electrical Engineering)

Aim

To explain to the students the need and use of electric utilities.

Objectives

A review of the basic concepts of DC and AC electric circuits is envisaged.

The operating principle of the different electrical apparatus along with their characteristics is to be explained

The physics of device operation and their usage in electronic circuits is to be highlighted.

Unit I

DC Circuits: Definition of current , voltage, power and energy-DC voltage and current sources-resistance, types of resistors, series and parallel connections of resistors, current and voltage division – loop method of analysis of simple circuits. (6 Periods)

AC Circuits: Sinusoidal signals- average, r.m.s values –inductance, capacitance and their V-I relationships. Analysis of simple single phase series circuits –power and power factor – phasor diagrams- Introductions to three phase AC circuits. (6 Periods)

Power Apparatus: Sources of Electrical energy - Generation of electrical energy – working principles of DC generators and alternators – advantages of electrical energy over other forms of Energy. Operating principle of DC motors – Types of DC motors – Characteristics and uses of DC motors. working principles of Single and Three phase transformers.

Operating Principle of three phase and single phase induction motors – types , characteristics and uses of induction motors – operating principle and uses of synchronous motors – Working principles of MC and MI voltmeters and Ammeters, Dynamo meter type wattmeter, induction type energy meter and multimeter – types of wiring – requirements for house wiring – typical layout for a small house – earthing.
(12 Periods)

Unit II

Basic Electronics: Active and passive components – Introduction to transducers- Types of transducers – principle and characteristics, uses of PN junction Diode, Zener diode, BJT, FET,UJT, Thyristors, photoelectric and photovoltaic devices- Operating principle of Halfwave, Fullwave and Bridge rectifiers. (8 Periods)

Digital Electronics and Communications : Symbol, truth table and basic logic gates, universal gates, Half adder, Full adder, flip flops- RS, T,D and JK, flipflops-Block

diagram of a computer system. Telecommunication system – block diagram, Principles of modulation: AM, FM, Pulse and Digital modulation – Modem, communication systems - Radio, TV ,Microwave, Satellite, Radar, Fibre optic and ISDN (block diagram description only), Principle of operation of Mobile phones. (8 Periods)

Text Book

1. Theraja, B.L and Theraja, A.K(1998)., *Electrical Technology. Vol I,II, and IV*, S. Chand and Co., New Delhi.

Reference Books

1. Gupta, B.R (2002)., Principles *of Electrical Engineering*, S.Chand & Co, New Delhi.
2. Nagrath, I.J(2000)., *Elements of Electrical Engineering* ,Tata McGraw Hill Publishing Co. Limited, New Delhi.
3. Floyd & Jain (2003), *Digital Fundamentals*, 8th Edition, Person Education.
4. Anok Singh(1994)., *Principles of Communication Engineering*, S.Chand & Company Ltd., Ram nagar, New Delhi.

Note : Examination Question Paper Pattern: There will be three parts and for each part three questions will be set. Two questions from each part (totally six questions) should be answered.

107 ENVIRONMENTAL STUDIES

Aim

To realise the importance of Environmental Engineering, the existence of natural resources and their ecology, the severity of issues on environments.

Objectives

To teach the types of existing sources of nature and interrelated problems.
To expose to the field conditions of environmental assets and role on the preservation.

Unit I **(**18 Periods)

The Multi Disciplinary Nature of Environmental Studies: Definition, Scope and importance, need for public awareness. Natural Resources: Renewable and Non-Renewable Resources- Natural Resources and associated problems.

Forest resources - Use and over exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people. Water Resources- Use and over-utilization of surface and ground water, floods, drought, conflicts over

water, dams – benefits and problems. Mineral Resources - Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food Resources - World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging salinity, case studies. Energy Resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources, case studies. Land Resources - Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources - Equitable use of resources for sustainable life styles.

Field Visit: Visit to local area to document environmental assets- river / forest / grassland / hills/ mountains.

Unit II **(**18 Periods)

Ecosystem: Concept of ecosystem, Structure and function of an ecosystem. Producers, Consumers and Decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids.

Introduction: Types, characteristics features, structures and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries).

Unit III **(**18 Periods)

Biodiversity and its Conservation: Introduction – Definition : genetic, species and ecosystem diversity. Biogeographical classification of India. Value of Biodiversity; consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity.

Threats to Biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of Biodiversity- In-situ and Ex-situ conservation of biodiversity.

Unit IV **(**18 Periods)

Environmental Pollution: Definition, causes, effects and control measures of Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Thermal pollution, nuclear hazards, Solid waste management. Role of individual in prevention of pollution. Pollution case studies. Disaster management : floods, earthquake, cyclone and landsides. (18 Periods)

Unit V **(**18 Periods)

Social Issues and the Environment : From unsustainable to sustainable development, urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case

studies. Environmental ethics : Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environmental production Act. Air(prevention and control of pollution) Act. Water (prevention and control of pollution) Act. Wild life protection Act, Forest conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

Human Population and Environment : Population growth, variation among nations. Population explosion-family welfare programme. Environment and human health. Human rights. Value education. HIV / AIDS. Women and child welfare. Role of Information Technology in environment and human health. Case studies.

Text Book

1. Erach Bharucha, (2005), Text Book of Environmental Studies, Universities Press (India) Pvt., Ltd.,

Reference Books

2. Suresh K Dhameja (2003), ***Environmental Engineering and Management,*** **S.K.Kataria & Sons, New Delhi.**
3. V.Subramanian, V(2002), *A text book in Environmental Science*, Narosa Publishing House, New Delhi.
4. D.K.Asthana and Meera Asthana(1998), *Environment Problems & Solutions*, S.Chand & Co., Ltd., New Delhi.

108 ENGINEERING DRAWING

Aim

To improve the imagination capability of the student by logical thinking and impart the basic principles of instrumental drawing.

Objective

To develop the means for communication of ideas, thoughts and design of objects, related to engineering applications, to others through drawing.

To expose the international standards of technical drawing.

1. Introduction to Engineering Drawing: BIS Conventions and specifications-Lettering and dimensioning – use of drafting instruments. Construction of conic sections (Eccentricity method, Rectangle method, Intersecting arcs method) – Construction of cycloids and involutes - Tangent and normal at points on the curves only. (15 Periods)

2. Orthographic projections: Projection of points - Projections of straight lines (given the projections, to determine the true length and true inclinations). (10 Periods)
3. Projections of simple solids: prism, pyramid, cylinder, cone, tetrahedron and octahedron in simple positions - auxiliary projections of prism, pyramid, cylinder and cone-axis inclined to one plane. (10 Periods)
4. Sections: prism, pyramid, cylinder, cone in simple position - true shape of sections. (10 Periods)
5. Intersection of surfaces - cylinder to cylinder and cylinder to cone with axes intersectingatrightangles. (10Periods)
6. Development of lateral surfaces- prism, pyramid, cylinder, cone and cut solids. (10 Periods)
7. Isometric Scale- isometric projections of simple solids and combinations. (10 Periods)
8. Perspective projections of simple solids. Conversion of pictorial view of simple objects into orthographic views. (15 Periods)

Text Book

1. Bhatt, N.D, Engineering Drawing, Charotar Book Stall, Anand.

Reference Books

1. Gopalakrishna, K.R(1983)., Engineering Drawing, Vol. I and II, Subhas Stores, Avenue Road, Bangalore, 1983.
2. Venugopal, K(1999)., Engineering Drawing and graphics, New age international (p) Ltd., Publishers, Chennai.
3. Natarajan, K.V(1989).,A text book of Engineering Drawing, M 97-B, 7th Avenue, Besant nagar, Chennai.
4. Narayana, K.L and Kannaiah, P(1989)., Engineering Graphics, Tata McGraw - Hill, New Delhi.
5. Kumar, M.S., Engineering Drawing, D.D Publications, Chennai, 600 048.

Note: University examination question pattern for the Engineering drawing: There will be eight questions, one from each division to answer five out of eight questions.

109 PHYSICS LABORATORY

List of Experiments (Any Ten)

1. Torsional Pendulum – Determination of Moment of Inertia of disc and Rigidity Modulus of the material of a wire.
2. Non-Uniform Bending - Determination of Young's modulus.
3. Viscosity –Determination of co-efficient of Viscosity of a highly viscous liquid by Stokes method.
4. Air wedge – Determination of thickness of a thin wire / paper.

5. Ultrasonic Interferometer- Velocity of ultrasonic waves in a liquid and Compressibility of the liquid.

6. Spectrometer – Dispersive power of a prism.

7. Spectrometer – Determination of wavelength of Hg source using Grating.

8. Band gap determination of a Semiconductor.

9. Semiconductor diodelaser – (a) Determination of wavelength of Laser using Grating.
(b) Determination of Numerical Aperture, Acceptance angle and attenuation of an Optical Fibre.

10. Calibration of Galvanometer into an Ammeter and Voltmeter.

11. Newton's rings- Determination of Radius of curvature of the given lens.

12. Field along the axis of coil- Determination of horizontal flux density.

13. Post office box-Determination of resistivity of a wire.

14. Determination of dielectric constant-Scherring bridge method.

110 CHEMISTRY LABORATORY

List of Experiments
Quantitative Analysis

1. Estimation of Potassium hydroxide
2. Estimation of acetic acid in vinegar
3. Estimation of alkalinity by double indicator method
4. Estimation of temporary hardness of water
5. Estimation of total hardness of water
6. Estimation of Mohr's salt
7. Estimation of oxalic acid
8. Estimation of iron by dichrometry
9. Estimation of copper in brass by iodimetry
10. Determination of free chlorine in municipal water
11. Estimation of ferrous sulphate (External Indicator Method)
12. Estimation of nickel in an alloy

Conductrometry

13. Estimation of strong acid
14. Estimation of weak acid

Viscometry

15. Determination of viscosity of an oil

111 COMPUTER PROGRAMMING

Aim

To impart concepts of C language and a drafting tool AUTOCAD.

Objectives

At the end of the course, the students will have an access to program in C and fluency to draw basic diagrams using AUTOCAD.

Unit I (18 Periods)

Overview of C: Introduction-importance of C-Sample C programs- basic structure of C programs- executing a C program. Constants, Variables & Data types: Introduction – Character set – C tokens – Key words – Identifiers – constants – Variables – Data types – Declaration of Variables – Assigning values to variables – Defining symbolic constants.

Operators and expressions: Introduction– Arithmetic, relational, Logical, Assignment, Increment, Decrement, Conditional, Bitwise and Special operators– Arithmetic expressions– Evaluation expressions– operator precedence and associatively– Type conversions– Mathematical functions. Managing Input and output operators: Introduction – Reading, Writing a character – Formatted input and output.

Unit II (18 Periods)

Decision making, branching & looping: Introduction – Simple IF, IF, ELSE, nested IF..ELSE, Switch, WHILE, DO, FOR and GOTO statements –? : operator – Arrays: One, Two and multi dimensional arrays – Initialising arrays.

Unit III (18 Periods)

Handling of character strings: Declaring, initialising, reading, writing string variables – Arithmetic operations on characters – Comparison of strings – String handling functions.

User defined functions: Need for User-defined functions – Form of C functions – Returning values and their types – Calling a function – Arguments and returning values – Recursion – Function with arrays. Structures & unions: Definition – Initialisation – Comparison – Arrays of structures – Nested structure – Unions – Size of structures – Bit fields.

Unit IV (18 Periods)

Pointers: Understanding pointers – Simple problems.

File management in C: Defining, Opening, Closing, Input/output operations and error handling operations – Simple programs.

Unit V (18 Periods)

AUTOCAD: Introduction- terminology- operations- control keys- commands- utilities-2-D and 3-D drawings- Utility commands- File commands-Edit & Inquiry Commands - Display Control Commands–Modes –Layers- Colors- Blocks.

Special features – Dimensioning – Angular, Diameter, Radius – Utility commands – DIM variables, Hatching– Pattern – Slides – Attributes– Configuring, Plotting-Engineering applications - Exercises in AUTOCAD.

Text Book

1. Balagurusamy, E(2006)., *Programming in ANSI C*, Second Edition, Tata McGraw Hill Publications, New Delhi.

Reference Books

1. Byron Gottfried (1990), *Programming with C*, McGraw Hill International Edition.
2. Kermingham, B.W and Ritchie, D.M (1998)., *The C Programming Language*, Second Edition, PHI.
3. AUTOCAD Reference Manual by AutoDesk Inc.

112. WORKSHOP PRACTICE

Aim

To give exposure to the use of hand tools on wood and metal working

Objectives

To provide the students simple hands on - experience in the basic ideas of production engineering in Fitting, Carpentry and sheet metal.

Workshop Practice in shops

1. **Carpentry-** Use of hand tools- Exercises in planning and making joints namely half lap joint, Dovetail joint, mortising and tenoning.
2. **Fitting -** Use of bench tools, Vices, Hammers, Chisels, Files, Hacksaw, Centre punch, twist drill, Taps and Dies. Simple exercise in making T joint and Dovetail joints.
3. **Sheet Metal Work-** Use of hand tools. Simple exercises in making objects like cone, Funnel, Tray, Cylinder etc.,
4. **Smithy -** Demonstration of hand forging and drop forging.

Note: Workshop practice Examination shall be conducted in any two shops.

EIEC 301. ENGINEERING MATHEMATICS-II

UNIT-I
Partial Differential Equations

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions - solution of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second order with constant coefficients.

UNIT-II
Fourier series

Dirichlet's conditions – General Fourier series odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier series – parseval's identity.

UNIT-III
Boundary value problems

Solutions of one dimensional wave equation – One dimensional heat equation (without derivation) Fourier series solutions in Cartesian Co-ordinates.

UNIT-IV
Fourier Transform

Fourier integral theorem (without proof) – Fourier transform pair - Sine and Cosine transforms – properties - Transforms of simple functions – Convolution theorem-parsevals identity.

UNIT-V
Z-Transform and Difference Equations

Z-transform – Elementary properties – Inverse z-transform Convolution theorem – Solution of difference equations using z-transform

Text Books:

1. Venkataraman M.K., Engineering Mathematics series, National publishing Co., Chennai - 600 001, 1992.
2. Kandasamy.P, Thilagavathy.K, and Gunavathy.K, Engineering Mathematics series, S.Chand & Co. Ltd., New Delhi, 2004

Reference Books:

1. Veerarajan. T., Engineering Mathematics Series, Tata McGraw –Hill pub. Co., Ltd. New Delhi, 2002.
2. Singaravelu. A., Engineering Mathematics Series, Meenakshi publications, Chennai, 2004.
3. Wylie. C., Ray and Barrett Louis, C., Advanced Engineering Mathematics, McGraw – Hill Inc., New York.

EIEC 302. OBJECT ORIENTED PROGRAMMING

UNIT – I

Object Oriented Programming - objects and classes - specifying classes - using classes - methods, messages, encapsulation, abstraction, inheritance, polymorphism, dynamic building. Traditional approach versus object orientation: benefits of object orientation - flexibility in software development - reusability - extensibility - maintainability. Addresses and pointers, simple file operations: streams - string I/O - character I/O. Simple programs.

UNIT – II

C++ objects and data types - constructors and destructors - Inline functions - Friend functions - object as function arguments. Array fundamentals - array as class member data - array of objects. Structures - simple structure - accessing structure members - structure within structure - structure versus classes - virtual function. Simple programs.

UNIT-III

Polymorphism – Function overloading - Operator Overloading - overloading unary operator - overloading binary operator - data conversion. Inheritance - derived class and base class - derived class constructors – public, private and protected inheritance - level of inheritance. Simple programs.

UNIT-IV

C++ graphics - text-mode graphics functions - graphics mode graphics functions: colors - rectangle, circle, ellipse, arc, line, move, random functions - pixel functions – fill functions – functions on polygons – polygons and inheritance - text in graphics mode - drawing of bar chart, trend, simple instrumentation symbols. Simple programs.

UNIT-V

Objects - Classes - VC++ Components - Resources Event Handling - Menus - Dialog Boxes - Importing VBX Control Files - MFC File Handling - Document View Arch - Serialization - Multiple Document Interface (MDI) - Splitter Windows.

Text Books:

1. E.Balagurusamy, Object Oriented Programming with C++, Tata McGraw Hill, New Delhi, 1996.
2. Robert Lafore, Object Oriented Programming in Turbo C++, Galgotia Publications Pvt. Ltd., New Delhi, 2004.
3. J. David Kruglinski, Inside Visual C++, Microsoft Press, 1993.

Reference Books:

1. Bjarne Stroustrup, The C++ Programming Language, Addison-Wesley Publication, New York, 1994.
2. Herbert Schildt, C++ from the Ground Up, Tata McGraw Hill, New Delhi, 2003.
3. Keith wleiskamp and Bryan Flaming, The Complete C++ premier, Academic Press Inc, 1990.
4. Murray & Pappas, The Visual C++ Complete Reference, Tata McGraw-Hill, 1999.

EIEC 303. CIRCUIT THEORY

UNIT-I

Ideal sources - linear relation between voltage and current of network elements - types of networks: active, passive, linear, nonlinear, unilateral, bilateral, lumped and distributed. Kirchoff's laws - node and mesh analysis of electrical circuits. Introduction to the graph of a network.

UNIT-II

Network Theorems and Transformations : Superposition theorem - Thevenin's theorem - Norton's theorem - Millman's theorem - Tellegen's theorem - Reciprocity theorem - Substitution theorem - Maximum power transfer theorem - Star-Delta transformation.

UNIT-III

Time Domain Analysis : Step, ramp, sinusoidal and impulse functions - review of Laplace transform - solution of circuit problems using Laplace transform - transient response of R, L,C circuits with different types of forcing functions - complex frequency concept - poles and zeros.

UNIT-IV

AC Circuits: Basic definitions - phasor and complex number representation - analysis of R, L, C circuits - power and power factor - application of basic theorems in the analysis of AC circuits - resonance in series and parallel circuits - Q factor, bandwidth of resonant circuits. Principle of duality.

UNIT-V

Coupled circuits: Analysis of magnetically coupled circuits - single and double tuned coupled circuits. Three phase circuits : Three phase sources - analysis of three phase 3-wire and 4-wire circuits with balanced and unbalanced loads - power relations.

Text Books:

1. K.Nagappan and K.R. Mohanram, Electrical circuits, Vidhuth Consultants, 55, Alwar Thirunagar (Annex), Chennai- 600 087, 1989.

2. R.L. Boylested, Introductory Circuit Analysis, Universal BookStall, 1989.

Reference Books:

1 S.R.Paranjothi, Electric Circuit Analysis, New Age International Publishers, 1996.

2 M.E. Van Valkenburg, Network Analysis, Third Edition, Prentice Hall of India, 1976.

3 Joseph Edminister, Electric Circuits, Schaum’s Outline Series, McGraw-Hill, 1991.

EIEC 304. ELECTRONICS - I

UNIT-I

Electron Ballistics and semiconductor basics: Motion of charged particles in uniform electric and magnetic fields, electric and magnetic deflection of electron beam, focusing of electron beam in C.R.O. - qualitative study of motion of charged particles in concurrent fields. Transport phenomena in semiconductor - mobility and conductivity - charge densities in semiconductor- electrical properties of Si and Ge - Hall effect-conductivity modulation - generation and recombination of charges - diffusion - graded semiconductors.

UNIT-II

Junction diodes: Open circuited p-n junction - p-n junction diode as a rectifier - current components in a p-n diode - V-I characteristics and its temperature dependence - diode resistance - transition and diffusion capacitance - varactor diode - Junction diode switching times - Zener diode - tunnel diode - photodiode - PIN photodiode. photovoltaic effect - LED's. Principles of operation and characteristics of SCR, TRIAC, DIAC, UJT. Diode as a circuit element - load line concept, piecewise linear model of a diode.

UNIT-III

Bipolar Junction transistor characteristics: Junction transistor - current components - transistor as an amplifier - input/output characteristics of CB, CE, CC configurations-cutoff, saturation, active regions - current gains of various configurations - maximum voltage rating. Photo transistor.

Transistor at low frequencies: Graphical analysis of CE configuration - hybrid model and h-parameters-Comparison of amplifier Configurations - cascading amplifiers. Darlington pair.

UNIT-IV

Transistor biasing and thermal stabilization: operating point - bias stability - stabilization factors - different bias stabilization circuits and analysis - practical conditions. Bias compensation techniques - diode compensation, thermistor and sensistor compensation. Thermal runaway - operating point consideration - thermal stability and use of heat sinks.

Effect of Bias network on input resistance of Transistor amplifiers - Boot strap principle. Transistor at high frequencies: Hybrid - II CE model - CE short circuit current gain. Transistor as a switch-ON state and OFF state resistance and switching times.

UNIT-V

Untuned Amplifiers: Classification of amplifiers - distortion in amplifiers - frequency response - lower, higher cut off frequencies and step response analysis of Transformer coupled amplifier.

Tuned Amplifiers: Single tuned, double tuned and stagger tuned. Noise sources in an amplifier and noise figure.

Text Books:

1 Jacob Millmann and C.C.Halkias, Electronic Devices and Circuits, TATA McGraw - Hill, 1988.
2 Allen Mottershead, Electronic Devices and Circuits, Prentice-Hall of India, 1989.
3 A.P.Godse and U.A.Bakshi, Electronic Devices and Circuits, Technical Publications India, Second Edition Revised, 2001.

Reference Books:

1 Jacob Millman and C.C.Halkias, Integrated Electronics , McGraw Hill, 1972.
2 Ben. G.Streetman, Solid state Electronic Devices, Prentice-Hall India, Third Edition, 1993.

EIEC 305. APPLIED MECHANICS

UNIT-I

Tension, Compression and Shear: Types of external loads - internal forces - normal and shear stress - elasticity, strain - Hooke's law - statically indeterminate problems - two material members - thermal stress-strain diagram - working stress - strain energy in tension and compression - resilience - impact loads - St.Venant's principles - stress concentration in tension and compression.

UNIT-II

Torsion: Torsion of circular solid and hollow shafts - strain energy in shear and torsion - twists in a shaft of non-circular sections (no derivation) - close and open coiled helical springs.

UNIT-III

Geometric properties of sections: Centre of gravity of two dimensional body - centroids of areas - determination of centroids by integration - moment of inertia of an area - polar moment of inertia - radius of gyration of an area - parallel axis theorem.

UNIT-IV

Beams: Shearing force and bending moment - respective diagrams - relation between bending moment, shear force and load - theory of simple bending and its limitations - bending stress in beams of various sections - shear stress in beams - moment of resistance.

UNIT-V

Balancing: Balancing of rotating masses in parallel planes, balancing of reciprocating parts of single cylinder engine only.

Vibration: Free, damped and forced vibration of systems having single degree of freedom - longitudinal and transverse vibrations - torsional vibration of two rotor systems.

Text Books:

1. S.Timoshenko and D.H.Young, Elements of Strength of Materials, Van Nostrand.

2. R.S.Khurmi, Strength of Materials, S.Chand & Co., 1990.

Reference Books:

1. S.Ramamirtham, Strength of Materials, Khanna Publishers, 1992.

2. P.L. Ballaney, Theory of Machines, Khanna Publishers, 1986.

EIEC 306. MECHANICAL ENGINEERING

UNIT-I

Open and closed system - thermodynamic properties - pressure - temperature - volume internal energy - enthalpy - specific heat - constant pressure - isothermal and adiabatic process - equation of state of an ideal gas.

First law and its application to closed and open loop systems - general energy equation - one dimensional steady flow process - second law - steady flow energy equation - Carnot cycle - concept of entrophy.

UNIT-II

Properties of steam - use of steam tables - Mollier chart - Carnot cycle - Rankine cycle - representation of Rankine cycle on P-V and T-S diagram - reheat cycles - calculation of efficiencies.

UNIT-III

I.C.Engines - basic principles of working of two stroke and four stroke petrol and diesel engines.Otto ,Diesel cycles - testing of I.C.engines and simple problems - ignition, cooling and lubrication systems in I.C.engines.

UNIT-IV

Basic concepts of heat transfer - modes of heat transfer - basic laws of conduction, convection, radiation - simple problems.

Refrigeration - units of refrigeration, refrigerants and their properties - types of refrigeration system - air, vapour compression, vapour absorption - air conditioning, summer and winter air conditioning.

UNIT-V

Metrology, Measurement and precision engineering: Linear and angular - measurement of flatness, stiffness and hardness. Comparators, sidebands, slip gauges, angular gauges and auto colimeter. Mechanical elements, energy storing elements, suspension systems and dampers, pivots, bearings, gears, locks and stops. Coupling and clutches, levers and linkages.

Text Books:

1 R.S.Khurmi, Mechanical Technology, S.Chand & Co.,1993.

2 S.Domkundwar, A Course in Thermodynamics and Heat Engines, Dhanbat Rai & Sons, New Delhi, 1989.

Reference Book:

1. C.P.Gupta & Prakash, Engineering Thermodynamics, Nanchand & Bros., Roorkee, 1978.

EIEP 307 : CIRCUITS AND DEVICES LAB

The list of experiments for the subject EIEP 307 Circuits and Devices Lab will be decided by Head of Department of Instrumentation Engineering time to time depending on the current trends

EIEP 308 : MECHANICAL ENGINEERING LAB

The list of experiments for the subject EIEP 308 Mechanical Engineering Lab will be decided by Head of Department of Mechanical Engineering time to time depending on the current trends

EIEP 309 : PROGRAMMING LAB

The list of experiments for the subject EIEP 309 Programming Lab will be decided by Head of Department of Instrumentation Engineering time to time depending on the current trends

EIEC 401. ENGINEERING MATHEMATICS - III

UNIT-I

Probability and Random Variables

Definition – Types of random variables - probability distribution function - probability density function – expectation and moments – moment generating functions – characteristic functions – joint probability distribution joint cumulative distribution function-marginal probability distribution function – joint probability density function – marginal probability density function –conditional probability distribution function – conditional probability density function - transformation of random variables.

UNIT-II

Random Processes

Classification of random processes – methods of description of a random process – special classes of random processes – Average values of random process stationarity – analytical representation of a random process - Auto correlation function and its properties - Properties of R(t) – cross correlation function and its properties

UNIT-III

Test of Significance

Hypothesis, testing – Large sampling tests – small sampling test based on t, f and chi square distributions – interval estimates of mean, standard derivation and proportion.

UNIT-IV

Interpolation

Gregory Newton forward and back word interpolation formula; sterling's central difference formula; Lagrange's interpolation formula for unequal interval, inverse interpolation numerical differentiation; numerical integration; trapezoidal rule; simpson's one third and three eight rule.

UNIT-V

Solution of algebraic and transcendental equations

Regula-falsi method; Bolzano's bisection method; Newton – Raphson method; solution of simultaneous algebric equation; Gauss elimination method, Gauss Jordon elimination method; Crout's method; Gauss – seidel iteration method;

Solution of ordinary differential equations; taylor series method; Euler's method modified Euler's method (polygon method) Runge – Kutta fourth order method Miluos-predictor corrector method.

Text Books:

1. Kandasamy.P, Thilagavathy.K, and Gunavathy.K, Probability statistics and Queing theory, S.Chand & Co. Ltd.
2. Veerarajan. T., Probability theory and Random Process, Tata McGraw – Hill Co., Ltd. New Delhi 2005.
3. Venkataraman M.K., Numerical method in science and Engineering, National publishing Co., Chennai - 2003.

Reference Books:

1. Lipschutz..S and Schiller. J, Schaums's outlines – introduction to probability and statistics McGraw Hill, New Delhi, 1998.
2. Kandasamy.P, Thilagavathy.K, and Gunavathy.K, Numerical Methods, S.Chand & Co. Ltd., , New Delhi. 2004.

EIEC 402. ELECTRONICS - II

UNIT-I

Junction Field-Effect Transistors (JFETs): Physical operation - static characteristics - JFET circuits at D.C. and graphical analysis - biasing methods - JFET as an amplifier, small signal equivalent circuit models - common source amplifier - source follower - JFET as a switch.

Metal Oxide-Semiconductor FETs (MOSFETs): Structure, operation and characteristics of depletion type and enhancement type MOSFET - biasing - small signal equivalent circuit of MOSFET amplifier - MOSFET as a resistor - MOS amplifier with enhancement MOS load.MOS analog switches. Introduction to CMOS devices.

UNIT-II

Integrated Circuit Fabrication: Monolithic Integrated Circuit Technology - planar processes - bipolar transistor fabrication - fabrication of FETs - CMOS technology - monolithic diodes - metal-semiconductor contact - integrated circuit resistors, capacitors - packaging - characteristics of integrated-circuit components - microelectronic circuit layout.

UNIT-III

Feedback Amplifiers: Positive and negative feedback - effects of negative feedback - loop gain - types of negative feedback.

Oscillators: Requirements for oscillation - Phase shift oscillator - Wien bridge oscillator - Hartley, Colpitts and Crystal oscillators - amplitude and frequency stability. Sawtooth oscillator - UJT Relaxation oscillator - multivibrators – astable , monostable modes.

UNIT-IV

Differential Amplifiers: Analysis of BJT and FET differential amplifiers - differential voltage gain, common mode gain - CMRR.

Power Amplifiers: Classification - class A/B: single ended, push-pull configurations, power dissipation, output power, efficiency, distortion - complementary symmetry power amplifier. Class C power amplifier. Thermal considerations, IC power amplifier.

UNIT-V

Rectifier circuits and D.C. Power supplies: Half wave, full wave and Bridge rectifiers - performance parameters - filters: inductor, capacitor, L-type, Pi-type, ripple

factor and regulation. Shunt and series type voltage regulators - current limit, overload protection. IC voltage regulators. Switched mode regulators.

FET current source - constant current supply - Adjustable current supply using LM317 and its design.

Text Books:

1. Jacob Millmann and Arvin Grabel, Microelectronics , Second Edition, McGraw-Hill, 1987.
2. Allen Mottershead, Electronic Devices and Circuits, Prentice-Hall of India, 1989.

Reference Books:

1. A.S. Sedra and K.C.Smith, Microelectronic Circuits, Rinehart and Winston, 1982.
2. Jacob Millman and C.C.Halkias, Electronic Devices and Circuits, McGraw-Hill, 1987.
3. Paul Horowitz and Winfield Hill, The Art of Electronics, Cambridge Low PriceEdition, 1997.

EIEC 403. DIGITAL ELECTRONICS

UNIT – I

Number Systems: Review of number system - conversion algorithm - binary arithmetic in computers- binary codes - weighted binary codes - non weighted binary codes - error detecting and error correcting codes - alphanumeric codes.

Boolean algebra: Basic logic operations - laws of Boolean algebra - reducing Boolean expressions - Boolean expressions and logic diagrams - universal building blocks - negative logic.

UNIT – II

Logic families: Specifications of a logic circuit - basic logic circuit, operation and characteristics of each of RTL, DTL, HTL, TTL, ECL, MOS, CMOS and I^2L families-comparison of logic families. TTL gate circuits- open collector - totem pole - tri state gate - schottky TTL configurations - strobed gate and expanders. Interfacing CMOS and TTL gates. Logic packages.

UNIT – III

Combinational Logic: Boolean functions - canonical and standard forms - incompletely specified functions (don't cares) - simplification of Boolean functions using Karnaugh maps - Sum of Product (SOP) reduction - Product of Sum (POS) reduction - multiple output minimization - Implementation using NAND-NOR gates. Combinational circuit design - Adder, Subtractor, code converter, magnitude comparator and parity generators.

UNIT – IV

Sequential circuits: Flip flops - Edge triggered flipflops - pulse triggered (master-slave) flipflops. Counters- asynchronous counter design using type T flipflop- synchronous counter design using type T, type D and type JK flipflops - up/down synchronous counter design. Shift registers - shift register counters - Johnson counter - ring counter. Analysis of clocked sequential circuits- design using state diagram.

UNIT – V

Digital Integrated circuits: Logic gates - multiplexers- demultiplexers- decoders - code converters - arithmetic functions - flipflops - shift registers - counters. Memory circuits - ROM, PROM, EPROM, EEPROM, RAM and DRAM- memory subsystems - PLA and PAL - combinational logic function implementation using PLA.

Text Books:

1. M. Morris Mano, Digital Logic and Computer Design, Prentice Hall of India, 1999.
2. M. Morris Mano, Digital Design, Third edition, Pearson Education, 2002.
3. Thomas L. Floyd, Digital Fundamentals, third edition, Charles E. Merrill Publishing Company, 1977.
4. A. Anand kumar, Fundamentals of Digital Circuits, Prentice Hall of India, 1999.

Reference Books:

1. W.H Gothmann, Digital Electronics, Second Edition, Prentice Hall of India, 1990.
2. R.P. Jain, Digital Electronics and Systems, Tata McGraw Hill, 2004.

EIEC 404. ELECTRICAL TECHNOLOGY

UNIT-I

Magnetic Circuit: Magnetomotive force - magnetic field strength - permeability of free space- relative permeability - reluctance - comparison of electric and magnetic circuits - composite magnetic circuit - magnetic leakage and fringing - Kirchoff's Laws for the magnetic circuit - magnetization curve - hysteresis loop - current-ring theory of magnetism - hysteresis loss - minimum volume of a permanent magnet - load line of a permanent magnet - magnetic field of a long solenoid - magnetic energy in a non-magnetic medium - magnetic pull. Inductance of a coil and factors determining inductance of a coil.

UNIT-II

DC Machines: Construction details of machine - operation of DC generators - EMF equation - characteristics of different types of DC generators - commutation - armature reaction - operation of DC motors - torque equation - characteristics of different types of DC motors. Starters - breaking and speed control of DC motors. Applications of DC generators and DC motors.

UNIT-III

Transformers: Principle – types - general constructional features of single phase transformers - phasor diagram and equivalent circuit - regulation, efficiency and all-day efficiency - open circuit and short circuit tests – applications.

Auto-transformer and three phase transformer – types and applications.

UNIT-IV (Qualitative treatment only)

Synchronous machines: Principle - types and general constructional features – synchronous generators - characteristics - EMF equation - armature reaction – regulation - phasor diagram of synchronous motor - V curve - starting methods. Applications of synchronous generators and synchronous motors.

UNIT-V (Qualitative treatment only)

Induction machines: Types - constructional features - equivalent circuit - slip - torque characteristics - starters - breaking and speed control methods - principle of operation and types of single phase induction motors. Application of three phase and single phase induction motors.

Text Books:

1. Edward Hughes, Electrical Technology, ELBS/Longman, Seventh edition,1995.
2. Theraja and Theraja. A Text book of Electrical Technology - Vol.II , AC and DC Machines, 23 rd Revised Edition, S.Chand & Co., Ltd. 2002.

Reference Books:

1. R.Muthusubramanian, S. Salivahanan and K.A.Muraleedharan, Basic Electrical Electronics and Computer Engineering, Tata McGraw – Hill Publishing Company Limited, 2000.
2. IJ.Nagrath and DP.Kothari, Electric Machines, Second Edition, Tata McGraw – Hill Publishing Company Limited, 1997.

EIEC 405. ELECTRICAL MEASUREMENTS

UNIT-I

Units and standards - dimensional analysis. D'Arsonal galvanometer, Principle, operation and constructional details of Moving-coil, Moving-iron, dynamometer type, rectifier type, thermal type instruments, errors and compensations, extension of range using shunt, multiplier, Principle of C.T. and V.T, Equivalent circuit of C.T. and V.T, Errors in C.T. and V.T, Transfer instruments.

UNIT-II

Power measurement - electrodynamic wattmeter, errors and compensation, Hall effect wattmeter, thermal type wattmeter, compensated wattmeter, single and 3- phase power measurements.

Energy measurement - induction type energy meter, principle, construction, errors and compensation. Calibration of wattmeters and energymeters.

UNIT-III

Resistance Measurement – Different methods - Series and shunt type ohmmeter. Wheatstone bridge, Kelvin bridge, Megger.

AC bridges - Maxwell bridge, Wien bridge, Anderson bridge, Hays bridge, Schering bridge - detectors in bridge measurements.

UNIT-IV

DC potentiometer - student type, Leeds and Northrup potentiometer, Vernier potentiometer, Brook's deflection potentiometer.

AC potentiometer - Drysdale potentiometer, Gall potentiometer. Applications of AC and DC potentiometers. Maximum demand meter, Power factor meter, trivector meter.

UNIT-V

Magnetic measurements - flux meter - testing of ring specimen - B-H curve by method of reversal and step by step method - testing of bar specimen - Hopkinson's permeameter - Iron loss measurement by Lloyd Fisher square.

Text Books:

1 F.K.Harris, Electrical Measurements, Wiley Eastern, 1974.
2 A.K.Sawhney, A Course in Electrical and Electronic Measurements and Instruments, Dhanpat Rai & Sons, 1991.

Reference Book:

1. E.W.Golding and F.E. Widdies, Measurements and Measuring Instruments, Sir Isaac Pitman and Sons (P) Ltd., 1985.

EIEC 406. FLUID MECHANICS AND HYDRAULIC MACHINERY

UNIT-I

Properties of fluids and fluid statistics: Density, specific weight, specific volume, specific gravity, viscosity. Newton's Law of viscosity, surface tension, real and ideal fluids.

Pressure - atmospheric and vacuum pressures - measurement of pressure by manometers and pressure gauges - total pressure and center of pressure - metacentre - simple problems.

UNIT-II

Fluid Dynamic and Flow measurements: Euler's equation of motion - Bernoulli's theorem - limitation - applications to problems.

Flow measurement through orfices, mouth pieces, notches, weirs of different types, nozzles, venturimeter, orifice meter, pitot tube, current meter.

UNIT-III

Impact of Jets and Turbines: Pressure of Jet on stationary and moving flat plates - pressure on curved vanes, radially fixed vanes - force exerted on a pipe bend - dynamic force upon a body in motion.

Classification of turbines - velocity triangles for turbines - work done and efficiency, specific speed - Impulse and reaction turbines - Pelton Wheel - Francis and Kaplan turbines - simple problems - selection of turbines.

UNIT-IV

Reciprocating pumps: Types - work done - slip and coefficients of discharge - effect of acceleration and frictional resistance - separation phenomenon - air vessels.

UNIT-V

Centrifugal pumps and other Machines: Classification - velocity triangles - characteristic curves - scale model tests - specific speed - selection and installation of pumps.

Hydraulic accumulator, intensifier, Hydraulic ram, Hydraulic press.

Text Books:

1. Modi and Seth, Fluid Mechanics, Hydraulics and Hydraulic Machines, Tenth Edition, Standard Book House, 1991.

2. Jagdish Lal, Hydraulic Machines, Metropolitan Book Co.,1989.

3. S.Khurmi, Hydraulic Machines, S.Chand & Co.,1990.

Reference Books:

1. K.L.Kumar, Engineering Fluid Mechanics, Eurasia Publication,1984.

2. V.P.Vasandani, Theory of Hydraulic Machines, Khanna Publishers, 1984.

3. R.K.Bansal, A Text Book of Fluid Mechanics & Hydraulic Machines, Lakshmi Publication, Chennai.

EIEP 407 : ELECRONICS LAB

The list of experiments for the subject EIEP 407 Electronics Lab will be decided by Head of Department of Instrumentation Engineering time to time depending on the current trends

EIEP 408 : ELECTRICAL AND MEASUREMENTS LAB

The list of experiments for the subject EIEP 408 Electrical and Measurements Lab will be decided by Head of Department of Electrical Engineering time to time depending on the current trends

EIEP 409 : HYDRAULICS LAB

The list of experiments for the subject EIEP 409 Hydraulics Lab will be decided by Head of Department of Civil Engineering time to time depending on the current trends

EIEC 501. SIGNALS AND SYSTEMS

UNIT I

CONTINOUS TIME (CT) AND DISCRETE TIME (DT) SIGNALS

Classification of signals – Signal Energy and Power – Periodic signals – Even and Odd signals – CT complex exponential and sinusoidal signals – DT complex exponential and sinusoidal signals – CT unit impulse and unit step function – DT unit impulse and unit step sequence – Properties – Random signals – Random processes .

UNIT II

CONTINUOUS TIME SYSTEMS

Properties of continuous time systems – Representation of continuous time Linear time invariant (LTI) systems using differential equations – Block diagram representation – Analysis of continuous time LTI systems – Transfer function model – Block diagram reduction – Continuous time unit impulse response – Convolution integral – Unit step response of LTI system – Frequency response – Singularity function – Analysis of LTI systems using Laplace transform.

UNIT III

FOURIER ANALYSIS

Fourier series representation of continuous time periodic signals – Properties of continuous time Fourier series – Convergence of Fourier series – Representation of Aperiodic signals – Continuous time Fourier transform – Properties of continuous time Fourier transform – Analysis of continuous time LTI systems using Fourier transform.

UNIT IV

DTFT AND DFT

Discrete time Fourier transform (DTFT) – Properties of DTFT – Time and frequency shifting – Conjugation – Parseval's relation - Discrete Fourier transform (DFT) – Properties of DFT – DFT Frequency response characteristics – Weighting function- Circular Convolution – Correlation – Auto Correlation.

UNIT V

DISCRETE TIME SYSTEMS

Properties of Discrete time systems – Representation of discrete time systems using difference equation – Block diagram representation - Z Transform and its

properties - Pole-Zero representation – BIBO stability – Solution using Z transform – State variable equation – State space model.

TEXT BOOKS:

1. Alan V Oppenheim, Alan S.Wilskey and S.Hamid Nawab: "Signals and systems" Second edition prentice Hall India, 1997.
2. Simon Haykin, Barry Van Veen., "Signals & Systems". John Wiley & Sons (ASIA) Pvt Ltd, 1999.
3. Ziemer and Tranter, "Signals and Systems", Maxell Macmillan, 1993.
4. Roberts., "Signals and Systems", TMH-2003.

REFERENCE BOOKS:

1. R.A. Gabel and R.A.Richard : "Signals and linear systems", John Wiley and sons, 1987.
2. Gordan E Carlson: "Signals and linear systems analysis" Allied Publishers, New Delhi, 1993.

EIEC 502. LINEAR INTEGRATED CIRCUITS

UNIT-I

Operational Amplifier (Op.Amp.): Block diagram of an Op.Amp. - simplified internal circuit diagram of 741 - IC package types - pin identification - temperature ranges - equivalent circuit - Op.Amp with negative feedback - voltage series, voltage shunt feedback amplifier - differential amplifier. Characteristics of practical Op.Amp.

Frequency response of Op.Amp: Compensating networks - frequency response of internally compensated and non-compensated Op.Amp - closed loop frequency response - slew rate.

UNIT-II

Comparator - zero crossing detector - schmitt trigger - window detector - precision rectifiers - V/F and F/V converters.

D.C. and A.C. amplifiers - summing, scaling, averaging amplifiers - integrator, differentiator - instrumentation amplifier and CMRR, Optocoupler and isolation amplifier - V to I and I to V Converters.

UNIT-III

Charge amplifier - log amplifier - multiplier - divider - square root circuit - sample-hold Circuit. Data Converters - D/A Converters - Implementing a DAC function - Use of ladder networks - Bipolar coded DACs - Resolution, settling time transient errors. Monotonic, tracking, single-slope, dual-slope, delta-pulse modulation successive approximation and simultaneous (flash) A/D Conversion techniques and comparison - Typical ICs for D/A, A/D Conversion.

UNIT-IV

Active Filters: Butterworth filters - first-order low pass, second-order low pass, first-order high pass, second-order high pass - higher order filters. Band pass filter - band reject filter - all-pass filter. Introduction to switched capacitor filter.

Oscillators: Phase-shift type, Wien bridge and quadrature oscillators.

UNIT-V

Multivibrators: Astable, monostable. Triangular wave and sawtooth wave generators. VCO, Timer 555 and applications.

Phase-Locked Loops (PLLs): Principle, building blocks and characteristics of a PLL - Applications: frequency multiplier, modulator, FSK demodulator, synchronizer, voltage regulators.

Text Books:

1. R.A. Gayakwad, Op-Amp and Linear Integrated Circuits, Third Edition, Prentice Hall of India, 1996.
2. R.F. Coughlin and F.F. Driscoll, Operational Amplifiers and Linear Integrated Circuits, Prentice-Hall of India, 1992.

Reference Books:

1. Roy Choudhury and Shail Jain, Linear Integrated Circuits, Wiley Eastern, 1991.

2. P.Horowitz and W.Hill, The Art of Electronics, Second Edition, Foundation Books, 1997.

EIEC 503. MICROPROCESSORS AND APPLICATIONS

UNIT-I

Microprocessor architecture and assembly language - memory - input and output – Memory and I/O interfacing - Micro computer system - interfacing devices - 8085 based micro computer system - instruction classification, format, timings and operation status - over view of 8085 instruction set.

UNIT-II

Programming the 8085 - data transfer instructions - arithmetic operations - logical and branching operations – Assembler – Assembler directives - writing assembly language programs - looping, counting and indexing - 16 bit arithmetic instructions - arithmetic operations related to memory - logical operations, rotate, compare - counter and time delays - debugging techniques.

UNIT-III

Stack - subroutine - call and return instructions - parallel input output and interfacing applications - 8255 programmable peripheral interface - 8253 programmable interval timer.

UNIT-IV

8085 interrupts - restart as software interrupt - 8259 programmable interrupt controller - direct memory access (DMA) and 8257 DMA controller - 8155 and 8355 multipurpose programmable devices - 8279 programmable keyboard display interface - 8251 and serial I/O and data communication - interfacing data converters.

UNIT-V

Typical applications of 8085: Stepper motor control, temperature control, thermocouple linearization, frequency measurement, motor speed control, traffic light

control - Z-80 microprocessor and its comparison with 8085. Microprocessor development system. Bus interface standards.

Text Book:

1. Ramesh Gaonkar, Microprocessor Architecture Programming and Application with the 8085/8080a, Third Edition Penram International Publishing (India),1997.

Reference Books:

1. Badri Ram, Fundamentals of Microprocessor and MicroComputer, Dhanpat Rai and Sons, 1988.
2. Ramesh Gaonkar, Z-80 Microprocessor, Penram International Publishing(India), Third Edition, 1997.

EIEC 504. POWER ELECTRONICS

UNIT-I

SCR characteristics - Two transistor analogy - Methods of turning on and turning off - Other members of SCR family - Series and parallel connection of SCRs - Thyristor protection. Other semiconductor devices: Power transistors, Power MOSFETs, GTOs, IGBT.

UNIT-II

Single phase controlled rectifiers - Half wave controlled rectifier with i) resistive load ii) R,L load iii) R,L load and free wheel diode iv) R,L load and battery - Full wave controlled rectifier- half controlled bridge rectifier and fully controlled bridge rectifier with the above four types of loads. Three phase controlled rectifiers: Half controlled bridge - Fully controlled bridge.

UNIT-III

Single phase inverter: Series inverter - Parallel inverter - Bridge inverters - Current source inverter. Choppers: Various types - Step-up chopper – AC Chopper. AC voltage controller. Single phase Cycloconverter.

UNIT-IV

DC motor control - Single phase and three phase SCR drives - reversible SCR drives - chopper controlled DC drives. AC motor control: Speed control methods for induction motor - controlled slip system - slip power recovery scheme - braking of induction motor. Synchronous motor control.

UNIT-V

Generation of control pulses for power electronic converters. Applications: Static circuit breakers for DC and AC circuits - soft start circuit - solid state tap changer - Regulated power supply - UPS – SMPS.

Text Books:

1. P.S.Bhimbhra, Power Electronics, Khanna Publishers, Third edition, New Delhi, 2005.
2. H.M.Rai, Power Electronics, Satya Prakhashan, New Delhi, 1999.
3. V.Jagannathan, Introduction to Power Electronics, Prentice- Hall of India, New Delhi, 2004.

Reference Books:

1. M.H. Rashid, Power Electronics, Prentice-Hall, 1988.
2. C.N.Pauddar, Semi conductor Power Electronics (Devices and circuits), Jain brothers, New Delhi, 1999.
3. S.N.Singh, Text book of Power Electronics, Dhanpath Rai & co., New Delhi, 2000.
4. M.Ramamoorthy, An Introduction to Thyristors and their Applications, East West Press, 1991.

EIEC 505. CONTROL SYSTEMS

UNIT-I

Control systems: Servo mechanism - differential equations of physical systems – state variable models - transfer function models - block diagram algebra - signal flow graphs.

UNIT-II

Control System Components: Potentiometers - synchros - AC, DC tachogenerators - AC, DC servomotors - stepper motors - electronic servo amplifiers - hydraulic systems - pneumatic systems - gyroscopes.

UNIT-III

Time response analysis: Standard test signals - impulse response, step response and ramp response analysis of first order system and second order systems - time response specification of a second order system - steady state error and error constants - design specification of second order systems. Compensation: derivative error, derivative output, integral error, Performance indices.

MATLAB: Commands and matrix functions - transient response analysis of continuous - time systems.

UNIT-IV

Concept of stability: Bounded – Input Bounded – Output Stability – Zero Input Stability - Routh-Hurwitz's stability criterion – Stability range for a parameter.

Root locus concept: Guidelines for sketching root loci - root contours.

Root-Locus plots for continuous-time systems using MATLAB.

UNIT-V

Frequency response analysis: Frequency response specifications - polar plots - Bode plots - all-pass and minimum phase systems. Stability in frequency domain: Nyquist stability criterion - assessment of relative stability using Nyquist plots and Bode plots – constant M circles and N circles - Nichol's chart.

Frequency response plots using MATLAB.

Text Books:

1. I.J. Nagarath and M.Gopal, Control Systems Engineering, Fourth Edition, New Age International (P) Ltd., Publishers, 2005.
2. M.Gopal, Control Systems Principles and Design, Tata McGraw-Hill, 1997.

Reference Books:

1. K.Ogata, Solving Control Engineering Problems with MATLAB, Prentice Hall, 1994.
2. B.C.Kuo, Automatic Control Systems, Prentice Hall of Indian, Sixth Edition, 1991.
3. K.Ogata, Modern Control Engineering, Prentice Hall of India, Fourth Edition, 2003.

EIEC 506. TRANSDUCERS AND MEASURMENT SYSTEMS

UNIT-I

Generalised scheme of a measurement system - basic methods of measurement. Errors in measurement - types of errors. Statistical analysis of measurement data - mean, standard deviation. Probability of errors - gaussian distribution - probable error, limiting error. Reliability of measurement systems - failure rate - reliability of systems of elements in series and parallel - reliability improvement, redundancy.

UNIT-II

Static characteristics of instruments - accuracy, precision, sensitivity, linearity, resolution, hysteresis, threshold, input impedance - loading effect - generalised mathematical model of measurement systems - dynamic characteristics - operational transfer function - zero,first and second order instruments - impulse, step,ramp and frequency responses of the above instruments. Techniques for dynamic compensation.

UNIT-III

Resistance potentiometer - Loading effect - strain gauges - gauge factor - types of strain gauges - rosettes - semiconductor strain gauges - installation of strain gauges - strain measuring circuits - resistance thermometers, materials, construction, characteristics - thermowells - thermistors - hot wire anemometer - constant current and constant temperature operation - signal conditioning circuits for RTD,Thermocouple,Thermistor, Strain gauge .

UNIT-IV

Induction potentiometers - variable reluctance transducers - EI pickup - LVDT construction - signal conditioning circuit - applications - RVDT - magnetostrictive transducers. Capacitive transducers - variable area type - variable air gap type - variable permitivity type - signal conditioning circuit - Blumlein bridge - capacitor microphone - frequency response.

Piezoelectric transducers - piezoelectric crystals, Charge amplifier.

UNIT-V

Accelerometer and Vibrometer - Eddy current transducers - Hall effect transducers - photo electric detectors,different types and characteristics - optical sensors, IC sensor for temperature and pressure.

Introduction to fibre optic sensors-optical fibre types-temperature,pressure,flow,level measurement using fibre optic sensors-optical transduction techniques-coupling of detector and source. Introduction to Intelligent and smart sensors.

Text Books:

1. E.O.Doeblin, Measurement Systems, Application and Design, McGraw-Hill, 1998.
2. A.K. Sawhney, A course in Electrical and Electronics measurement and instrumentation, Dhanpatrai and sons, 1996.
3. S. Renganathan, Transducer Engineering, Allied Publishers, 1999.

Reference Books:

1. John B.Bentley, Principles of Measurment Systems, Longman Publishers, 2000.
2. R.K Jain, Mechanical and Industrial Measurement, Khanna Publishers, 1990.
3. D. Patranabis, Sensors and Transducers, Prentice Hall of India, 2nd edition, 2003.
4. Hermann K. P. Neuben "Inst. Trandsducers -An introduction to their performance and design", Oxford publication, 2003.
5. D.A. Krohn, Fiber Optic Sensors – Fundamentals and Applications, ISA publication, 2nd edition, 1992.

EIEP 507 : LINEAR AND DIGITAL ICs LAB

The list of experiments for the subject EIEP 507 Linear and Digital ICs Lab will be decided by Head of Department of Instrumentation Engineering time to time depending on the current trends

EIEP 508 : TRANSDUCERS AND SIGNAL CONDITIONING LAB

The list of experiments for the subject EIEP 508 Transducers and Signal Conditioning Lab will be decided by Head of Department of Instrumentation Engineering time to time depending on the current trends

EIEP 509 : ELECTRICAL MACHINES LAB

The list of experiments for the subject EIEP 509 Electrical Machines Lab will be decided by Head of Department of Electrical Engineering time to time depending on the current trends

EIEC 601. DIGITAL SIGNAL PROCESSING

UNIT I

DISCRETE TIME SIGNALS AND SYSTEMS

Discrete time signals – Properties – Standard test signals – Operations on signals - Discrete time systems – Properties – Representation of LTI Systems -Impulse response - Discrete time Fourier transform (DTFT) – Frequency response - Properties - Sampling analog signals - Shanon's sampling theorem – Aliasing – Multirate sampling – Up sampler – Down sampler.

UNIT II

DIGITAL FILTER STRUCTURES

Definition of digital filters - Impulse response of FIR and IIR filters – Properties of digital filters - Frequency response of FIR and IIR filters – Z-Transforms of FIR and IIR filters – Z-Transforms and Frequency response relationships – Block diagram

representation of discrete time systems- Realization of digital filters direct form, Transposed form, Canonic, Cascade, Parallel and Ladder form.

UNIT III

DESIGN OF DIGITAL FILTERS

FIR filters - Design criteria – Minimizing design criteria (Fourier design technique), Lengths of the filter- Windowing: window responses - Periodic convolution – Response uniform window – Von Hann window – Hamming window – Kaisar window – FIR half-band digital filter – Linear phase FIR digital filters – Design of IIR filters: Analog filter approximation, Butterworths, Chebyshev and Elliptic filters – Frequency band transformation – Digital filter design equations low pass, high pass, bans pass and band stop – Impulse Invariant technique for IIR filter – Impulse Invariant pole mapping – Bilinear transformation – Bilinear transformation pole mapping – Introduction to computer – Aided design of IIR and FIR Digital Filters (Matlab Analysis).

UNIT IV

FAST FOURIER TRANSFORM (FFT) ALGORITHMS

Discrete Fourier Transform (DFT) - Fast Fourier transform (FFT): Decimation-in-time (DIT) algorithm - Decimation-in-frequency algorithm - FFT radix-2 DIT, DIF implementation - Fast convolution procedures, IDFT using Direct FFT Algorithm - Quantization noise introduced by analog-to-digital conversion - Finite register length effects in the realization of IIR and FIR digital filters and in DFT computation.

UNIT V

DS PROCESSORS

Generic DSP Architecture – Architecture of TMS 320 F 2407 and TEXAS 5416 processor – memory and I/O Organization – CPU –Program control – Addressing modes – Assembly Language Instructions – On chip peripherals – Clock, watch dog and real time Interrupt, event manager modules – Interface modules – Simple Programs.

TEXT BOOKS:

1.Proakis J.G, Manolakis D.G, “Digital Processing” Principles, Algorithms and Applications, Second Edition, Prentice Hall of India, 1995.

2.Mitra S.K, “Digital Signal Processing – A computer Based Approach, Second Edition”, Tata McGraw Hill, 2000.

3.Venkatramani. B and Bhaskar.M, “ Digital Signal Processors”, TMH, 2002.

REFERENCE BOOKS:

1. Oppenheim A.V and Schaffer R.W, "Digital Signal Processing" Prentice Hall, 1987.
2. Ludeman L.C, Fundamentals of Digital Signal Processing, Harper and Row Publishers, 1996.
3. Ifeachor E.C and Jervis B.W, “Digital Signal Processing, - A Practical Approach”, Person Education, 2003.
4. Johnson J.R, “Introduction to Digital Signal Processing” Prentice Hall of India, New Delhi, 1994.
5. Simon Haykin, Barry Van Veen., “Signals & Systems”, John Wiley & Sons(ASIA) Pvt Ltd, 1999.

EIEC 602. ELECTRONIC INSTRUMENTATION AND MEASUREMENT TECHNIQUES

UNIT-I

Electronic analog meters: DC and AC voltmeters - true r.m.s. voltmeters - differential voltmeters - a.c. current measurements - multimeters - component measuring instruments – Q-meter - vector impedance meter - Power meter. Lock-in -amplifier

Review of signal sources - signal generator - modulation, wave analyzer - harmonic distortion analyzer- spectrum analyzer - correlator.

UNIT-II

Digital methods of measuring frequency, period, phase difference, pulse width, time interval, total count, AC and DC voltage and current, true r.m.s voltage. DMM, DPM and digital Q-meter. Comparison between analog and digital techniques of measurement.

Introduction to intelligent instruments. Digital displacement transducers, incremental and absolute types - Moire fringe transducer. Digital methods of measuring displacement, velocity, acceleration and temperature.

UNIT-III

Cathode Ray oscilloscopes - general purpose oscilloscope - CRT screen characteristics - vertical, horizontal amplifiers, input coupling - time base: synchronization, free run, auto and single sweep modes - multitrace display: alternate, chop modes of operation - sweep trigger sources, coupling - delayed sweep, delay lines - special probes - high frequency considerations - use as X-Y plotter. Sampling oscilloscope - digital storage oscilloscope. Typical measurements using CRO.

Display devices: LED, LCD - annunciators,numerics, alphanumerics, graphics.

UNIT-IV

Recorders - moving coil, potentiometric, event recorders - X-Y plotters - U.V. recorders - Magnetic tape recording, direct, FM, digital recording.

Interference and screening - component impurities and their effects on signals - electrostatic and electromagnetic interference - multiple earths and earth loops. Practical aspects of interference reduction.

UNIT-V

Computer-Controlled test Systems: Testing an audio amplifier - Instruments used in Computer Controlled Instrumentation - IEEE Electrical Interface and Specifications - Block Diagram of an IEEE-488 bus Connected System and Digital Control Description.

Virtual Instrumentation: Introduction to Data Acquisition - SAMI (Standard Architecture for Measurement for Instrumentation) - Microsoft Windows for Data Acquisition - Basics of Data transfer in DAQ Systems - PC for DAQ and Instrument Control - Instrument Drivers - VXI Bus.

Text Books:

1. W.D.Cooper and A.D.Helfrick, Electronic Instrumentation and Measurement Techniques, Third Edition, Prentice-Hall of India, 1991.
2. A.J.Bouwens, Digital Instrumentation, McGraw Hill, 1986.
3. George.C.Barney, Intelligent Instrumentaion, Prentice Hall of India, 1992.
4. Garry.M.Johnson, Labview graphical programming, TMH 2nd edition, 1996.

Reference Books:

1. H.S.Kalsi, Electronics Instrumentation, Tata McGraw Hill, 1995.
2. B.M.Olive and J.M.Cage, Electronic Measurements and Instrumentation, McGraw Hill, 1977.
3. Stanley wolf and Richard F.M Smith, Student Reference,Manual for Electronic Instrumentation Laboratories Prentice-Hall of India, 1996.
4. A.Gregory, An Introduction to Electrical Instrumentation,English language book society & MACmillan, Recent edition
5. LabVIEW basics, Vol.1&2 manuals, National Instruments, 2006.

EIEC 603. INDUSTRIAL INSTRUMENTATION

UNIT-I

Measurement of speed: Revolution counter, Drag-cup tachometer, stroboscope, ac and dc tachogenerators, speed measurement using reluctance pick-up, photo-transducer. Measurement of force - load cell - strain gauges and LVDT load cells - Pneumatic load cell - hydraulic load cell.

Torque measurements using strain gauges and magneto-elastic principle - Density measurements for liquids and gases.

UNIT-II

Measurement of pressure: Manometers, Bourdon gauges, Diaphragm gauges, Bellow gauges, Bell gauges, Electrical types - vaccum gauges, McLeod gauge, Knudsen gauge, Pirani gauge, thermocouple gauge, ionization gauge, Pneumatic relay direct acting and reverse acting - pneumatic converters (different types)- I/P , P/I converters and differential pressure transmitter- Calibration of pressure gauges-Dead weight tester.

Complete air supply system for pneumatic control equipment and the different components and their functions.

UNIT-III

Measurement of temperature: Temperature scales, Temperature standard, Bimetallic thermometer, filled-in thermometers, vapour pressure thermometers, resistance thermometers, 3-lead and 4-lead arrangement - thermistor, thermocouples - types and ranges - characteristics, laws of thermocouples, cold-junction compensation, linearisation, thermowell, installation of thermocouples - radiation pyrometer, optical pyrometer, temperature transmitter.

UNIT-IV

Measurement of flow: Variable head flow meters, orifice plate, venturi tube, dahl tube, flow nozzle, pitot tube, rotameter, mass flow meter, positive displacement meter, turbine flow meter, electromagnetic flow meter, ultrasonic flow meter, open channel flow measurements, solid flow measurement, flow meters calibration.

UNIT-V

Measurement of level: Sight glass, float gauge, displacer, torque tube, bubbler tube, diaphragm box, D/P methods, electrical methods - resistance type, capacitance type, ultrasonic level gauging. Miscellaneous measurements: Humidity, dew point, psychorometer, hygrometers, moisture measurement in paper, viscosity, consistency, saybolt viscometer, rotameter type viscometer, consistency measurements.

Principle and standard of Intrinsic safety-area classification-safety barrier-principle of hazard reduction.

Text Books:

1. D.Patranabis, Principles of Industrial Instrumentation, Tata McGraw-Hill, 1998.
2. S.K.Singh, Industrial Instrumentation and control,Tata McGraw-Hill,Third Edition

Refernce Books:

1. D.P. Eckman, Industrial Instrumentation,Wiley Eastern Ltd, 1993.
2. A.E. Fribance, Industrial Instrumentation Fundamentals, McGraw-Hill, 1978.
3 R.K.Jain, Mechanical and Industrial Measurements, Khanna Publishers, 1990.
4 N.A.Anderson,Instrumentation for Process Measurement and Control Chilton Company, 1980.
5 B.E. Noltingk, Instrumentation-Reference book Butterworth Heinemann Publication, Second edition, 1996.
6 E.B. Jones, Instrument Technology Vol I,II and III, Butterworth Scientific Publishing Co., 1978.
7. E.C.Magison ,Intrinsic safety ,Instrument Society of America, 1984.
8 B.G. Liptak, Process Measurement and analysis, Chilton Book Company, Third edition, 1995.

EIEC 604. PROCESS CONTROL - I

UNIT-I

Concept of unit operations of Chemical Engineering. Description, types, methods of operation, operating variables and their interaction with each other - unit operations: (i) Heat exchangers (ii) Evaporators (iii) Distillation (iv) Leaching and extraction and (v) Membranes separation.

Incentives for Process Control - design aspects of a Process Control System.
(Note: Only qualitative treatment of Unit-I)

UNIT-II

Process variables - degrees of freedom - characteristics of liquid system, gas system, thermal system - mathematical model of liquid process, gas process, flow process, thermal process, mixing process - batch process and continuous process - self-regulation - inverse response.

MATLAB program to study inverse response, S-type response and the response of first-order system with delay.

UNIT-III

Introduction to design - lag, lead and lag-lead configurations: their effects on system response and their realization - design of cascade compensators in time domain - design of cascade compensators in frequency domain.

MATLAB program to study the time response of an uncompensated system and compensated system.

UNIT-IV

Sampled-data control systems: Z transform - Z transfer function (Pulse transfer function) - The inverse Z transform - response of linear discrete system for step input - stability analysis : Jury's test and bilinear transformation.

MATLAB program to study the response of sampled-data system.

UNIT-V

State variable Analysis : Concept of state variables and state models – State models for linear continuous – time systems – Diagonalisation – Solution of state equations – Concept of controllability and observability.

Text Books:

1. I.J.Nagarath and M. Gopal, Control Systems Engineering, Third Edition, 2004
2. W.L.McCabe, J.C.Smith and Peter Harriot, Unit Operations of Chemical Engineering, Fifth Edition, McGraw Hill, 1993.
3. D.R.Coughanowr, Process System Analysis and Control, Second Edition, McGraw-Hill, 1998.
4. D.P.Eckman, Automatic Process Control, Wiley Eastern Ltd., 1972.

Reference Books:

1. C. Stephanopoulos, Chemical Process Control, Prentice Hall of India, 1990.
2. P. Harriott, Process Control, Tata McGraw Hill, 1984.
3. K.Ogata, Modern Control Engineering, Prentice Hall of India, 1982.

EIEC 605. DIGITAL SYSTEM DESIGN

UNIT-I

Review of combinational circuit minimization and design – review of sequential design fundamentals.

State machine approach to digital design – Mealy and Moore machines- State machine design utilizing MSI/LSI circuits.

ASICs: Need for ASICs – Design technologies using ASICs–ASIC design process flow - Comparision between types of ASICs .

UNIT-II

Programmable Logic Devices(PLDs) - Architecture and programming technologies of PLDs – Structure of PLDs- Design methodology using PLDs.

Designing an up-down decade counter using a PAL - a sequential circuit realization using EPROM and GAL.

UNIT-III

Field Programmable Gate Arrays (FPGAs): Architecture and programming technologies of FPGAs: Antifuse, Static RAM , EPROM and EEPROM technologies. Xilinx FPGAs: Logic Cell Array - Logic Block - Input/Output Block - Programmable Interconnect - Configuration Memory. Actel FPGAs.

UNIT-IV

VHDL: Design Process flow - Data objects - Data types - Operators - Entities and Architectures - Component declaration - Component instantiation - Concurrent signal assignment - Conditional signal assignment - Selected signal assignment - Process statements - Configuration. VHDL description of combinational logic circuits: Multiplexer, demultiplexer, encoder, decoder and adders.

UNIT-V

IF statement - CASE statement - Loop statement - NEXT statement - EXIT statement- WAIT statement - ASSERT statement. . VHDL description of sequential logic circuits: Up-down decade counter, sequence detector and traffic light controller.

Subprograms: Functions - Procedures- Packages- State Machine Design - Logic synthesis.

Text Books:

1. John M. Yarbrough, Digital logic applications and design, Thomson learning, 2001.
2. William I.Fletcher, An engineering approach to digital design, Prentice Hall of India, 1994.
3. Parag K. Lala, Digital System Design using Programmable Logic Devices, BS Publications, 2003.
4. M.J.S. Smith, Application – Specific Integrated Circuits, Pearson Education, 2006.
5. J. Bhasker , A VHDL Primer, Prentice Hall of India, Third Edition, 2003.

Reference Books:

1. John F.Wakerly, Digital design principles and practices, Third edition, Prentice hall, 1994.
2. Kevin Skahill, VHDL for Programmable Logic, Addison Wesley, 1996.
3. Douglas Perry, VHDL, McGraw-Hill International Edition, Fourth Edition, 2002.
4. Zainalabedin Navabi, VHDL Analysis and Modeling of Digital Systems, McGraw Hill, Second Edition, 1998.
5. Lecture Notes on Curriculam Development Workshop on Programmable Logic Devices in Digital Design Conducted by CCE, IISC Bangalore, 1995.

EIEC 606. MICROCONTROLLERS AND APPLICATIONS

UNIT-I

Intel 8051: Architecture of 8051 - memory organisation - addressing modes - instruction set - Boolean processing - simple programs.

UNIT-II

8051 :Interrupt structure - timer - different modes of operation - serial port - modes of operation - I/O port features and analog/digital interfacing - serial communication interface.

UNIT-III

PIC Microcontroller – CPU architecture – register file structure – addressing modes- instruction set – simple programs- MPASM assembler- PIC development Tools

UNIT-IV

PIC: Timer- interrupts-PWM outputs-I/O port expansion – Keypad and display interface – I^2CBus - Serial EPROM – Analog to Digital Converter – UART- Special features.

UNIT-V

Typical Applications: (i). PID Control Algorithms (ii). DC motor position/speed measurement and control (iii). Discrete state process control (iv). Data transfer between two Microcontroller (v. Stepper motor control (vi). Digital notch filter (vii). Interfacing and LCD display.

Text Books:

1. Kenneth J. Ayala, The 8051 Microcontroller Architecture, Programming & Applications, Penram International Publishing (India), Mumbai, 1996.
2. John Peatman, Design with PIC Microcontrollers, Pearson Eduction, New Delhi, 2001

Reference Books:

1.John B. Peatman, Design with Microcontrollers, McGraw- Hill,New York, 1988.

2.16 Bit Embedded Controllers Hand Book ,Intel Corporation, New York, 1990.

EIEP 607 : CONTROL SYSTEM LAB

The list of experiments for the subject EIEP 607 Control System Lab will be decided by Head of Department of Instrumentation Engineering time to time depending on the current trends

EIEP 608 : MICROPROCESSOR LAB

The list of experiments for the subject EIEP 608 Microprocessor Lab will be decided by Head of Department of Instrumentation Engineering time to time depending on the current trends

EIEP 609 : POWER ELECTRONICS LAB

The list of experiments for the subject EIEP 609 Power Electronics Lab will be decided by Head of Department of Instrumentation Engineering time to time depending on the current trends

EIEC 701. PROCESS CONTROL-II

UNIT-I

Non-Linear Systems: Common non-linear elements and their models – time and frequency response characteristics unique to non-linear systems – analysis of simple second –order systems by phase-plane method using isocline method- singular points – limit cycle behavior.

UNIT-II

Basic control actions - characteristics of On-Off, proportional, single speed floating, integral and derivative control modes - composite control modes - P+I, P+D and P+I+D control modes - response of controller for different types of test inputs - integral windup - automanual transfer – Non linear PID Controller-selection of control mode for different processes - typical control schemes for level, flow, pressure and temperature.

Simulation study of control modes in simple systems using SIMULINK and TUTSIM.

UNIT-III

Optimum controller settings - tuning of controllers by process reaction curve method - continuous cycling method - damped oscillation method - Ziegler-Nichol's tuning - 1/4 decay ratio. Feed Forward control - Ratio control - Cascaded control - Averaging control.

Simulation study of controller-tuning using SIMULINK and TUTSIM.

UNIT-IV

I/P and P/I converters - pneumatic and electric actuators - valve positioner - control valve - characteristics of control valves - valve body - globe, butterfly, diaphargm, ball valves - control valve sizing - cavitation, flashing in control valves. Response of pneumatic transmission lines and valves.

Complete air-supply system for pneumatic control equipment - major components and their functions.

UNIT-V

Distillation column - control of top and bottom product compositions - reflux ratio - control of chemical reactor - control of heat exchanger. Steam boiler - drum level control and combustion control. Piping and Instrumentation Diagram of control loops.

Text Books:

1. D.R. Coughanowr, Process System Analysis and Control, Second Edition, McGraw-Hill, 1991.
2. C.Stephanopoulos, Chemical Process Control, Prentice-Hall of India, 1998.

Reference Books:

1. I.J. Nagrath & M. Gopal, Control Systems Engineering, Third Edition, New Age International (P) Ltd. Publishers, 1999.
2. M. Gopal, Control Systmes Principles and Design, Tata McGraw-Hill, 1997.
3. Peter Harriot, Process Control, Tata McGraw-Hill, 1984.
4. TUTSIM Simulation Language Manual, TUTSIM Products Ltd., U.S.A..

EIEC 702. COMPUTER NETWORKS AND DCS

UNIT-I

Data Acquisition Systems(DAS):

Review of A/D Converters - Sampling and Digitising - aliasing - anti-alias filter - different Configurations of DAS,. - Multiplexing - Data Communication - transmission lines and digital signals - Practical line interface circuits - serial asynchronous communication protocol.

Baseband serial data transmission standard:

20mA current loop, RS 232, RS 422, RS 423, RS 485, GPIB, USB.

UNIT-II

MODEM - Data coding methods - Error detection and correction - Basics of Data compression and encryption.

Introduction to Networks - Network topology and media - Transmission Characteristics of network - Open System interconnection model of ISO - Data link Control protocol: BISYNC-SDLC-HDLC.

UNIT-III

Media access protocol: Command/response - Token passing - CSMA/CD, TCP/IP Bridges - Routers - Gateways - Open System with bridge configuration - Open System with gateway Configuration - Standard ETHERNET configuration – Industrial ETHERNET- Special requirement for networks used for Control - Networking of PLC.

UNIT-IV

Methods of Computer Control of Processes, their configuration and comparison: direct digital Control, supervisory digital Control, Distributed Control System (DCS). DCS - Local Control Unit(LCU) and architecture - LCU languages - Process interfacing issues. Operator interface - Requirements - displays - alarms and alarm management. Engineering interface - requirements. Factors to be considered in selecting a DCS - SCADA.

Study of any one popular DCS available in the market.

UNIT-V

HART: Introduction - Evolution of Signal standard - HART Communication protocol - Communication modes – HART networks - Control System interface - HART Commands – HART field Controller implementation - HART and the OSI model.

Field Bus: Profibus - General Field bus architecture - basic requirements of field bus standard - Field bus topology - Interoperability - Interchangeability.

Text Books:

1.William L. Schweber, Data Communications, McGraw-Hill, 1988.
2.Michale P. Lucas, Distributed Control Systems,Van Nostrand Reinhold Co., 1986.
3.Romilly Bowden, HART Application Guide, HART Communication Foundation, 1999.

Reference Books:

1.A.S. Tanenbaum, Computer Networks, Second Edition, Prentice-Hall of India, 1994.
2.Paul Bates, Practical Digital and Communications, Prentice-Hall, 1987.
3.Lawerence M.Thompson, Industrial data Communications, ISA Press, 1997.

EIEC 703. PERSONAL COMPUTER SYSTEM

UNIT-I

Evaluation of computers generations of computers – basics of computer architecture – stored program organization (Von Neumann architecture).

PC Processor: Architecture of 8086 - Pipelining - Segmentation - Memory Banks - Minimum Mode and Maximum Mode - Comparison of 8086 architecture with 8088 Architecture- Pipeline hazards- Overcoming hazards - Features of Pentium processors - RISC versus CISC.

UNIT-II

AT Architecture: System Units - Task allocations of System Board - PPI, Timer, DMA and Interrupt Controller - Memory Map - I/O Map - Extended and expanded Memory

Memory technology – memory systems – virtual memory – high speed memories – interleaved memories – caches – associative memories

UNIT-III

PC Buses: Specifications of XT bus, ISA bus, EISA bus, VESA bus , PCI bus, MCA bus, - Comparative study of the above buses. Specifications of Instrumentation Buses : VXI bus, MXI bus.

UNIT-IV

PERIPHERAL INTERFACE: Disks - varieties of disks - hard disk features and partitions - detailed disk structure - compact disk features - key board - printer - display adapters - VGA standard - serial interface - SCSI - USB – Bluetooth - IEEE1394 – Data acquisition cards.

UNIT-V

MS DOS and WINDOWS: BIOS - DOS kernel - command processor - specifying files in MSDOS - Boot record - file directory - MSDOS booting process - program segment prefix - .COM and .EXE files - BIOS and DOS interrupts

Windows System Architecture - Device drivers for windows - Virtual machine - virtual hardware - Virtual device drivers – Introduction to RTOS.

TEXT BOOKS:

1. John P Hayes, Computer architecture and organization, III edition McGraw-Hill, 1998.
2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, Computer organization, McGraw-Hill, 2002.
3. Heuring V.P and Jordan H.F, Computer systems design and architecture, Addison wesley, 2000.

REFERENCES

1. Andrew S.Tanenbaum, Sturctured computer organization, PHI, 1990.
2. William Stallings, Computer organization and architecture, Addison Wrsley 5th edition, 2001.
3. Barry B.Brey, The Intel Microprocessor 8086/8085, 80186/80188, 80286/80386, 80486 Pentium and Pentium Pro - processor Architecture programming and interface Prentice-Hall of India, Fourth Edition,1997.
4. M.M.Mano, Computer system architecture, PHI, 1982.
5. Kai Hwang, Advanced Computer architecture, McGraw Hill1993.

EIEC 704. ANALYTICAL INSTRUMENTATION

UNIT-I

Electromagnetic radiations - different regions - their wave lengths, frequencies and energies - interaction of EM radiations with matter - molecular, atomic and nuclear interactions - Principle of spectroscopy - emission, absorption, fluorescence spectroscopy - components of analytical instruments – radiation sources, variety and its types - monochromator - mounting and its performance – filters - detectors – photo emissive tube, PMT, photo diodes - its applications.

UNIT-II

Molecular spectra – electronic, vibrational and rotational energies and spectra – IR absorption spectroscopy – IR detectors – thermal detectors – golay pneumatic detector – instrumentation techniques for analyzing solids, liquids and gaseous samples – sample handling techniques - Lambert's beer's law – single and double beam instruments – double beam spectrophotometer- non dispersive type.

UNIT-III

NMR spectroscopy, ESR, EPR spectroscopy – basic principles – instrumentation techniques and applications – principle of mass spectrometry – instrumentation techniques and applications – different types - single focusing and double focusing mass analyzer – Quadra pole mass analyzer – TOF spectrometer.

UNIT-IV

X-ray Spectroscopy – X-ray spectrometer - different types - Production of X-rays - detection of X-rays and nuclear radiations- ionization chamber – principle of counters - proportional counter , GM counter, scintillation counter - solid state detector - gamma ray spectrometer – isotope dilution and tracer techniques for quantitative estimation and analysis.

UNIT- V

Electrochemical methods - electrical conductivity of liquids conductivity – principle of water purity meter - practical measurements and applications - sulphur dioxide monitor – principle of pH measurement – Technique to measure pH – Oxygen analyzers. Principles of gas and liquid chromatography - process chromatography – operation and typical process chromatograph.

Text Books:

1. Skoog, Holler & Nicman, Principles of Instrumental Analysis. Fifth Edition – Saunders College Publishers, Harcourt Brace College Publishing, 1998.
2. H.H.Willard, L.L.Merrit, J.A. Dean and F.A. Settle Instrumental methods of Analysis. Seventh edition – CBS, Publishers & Distributors, 1986.

Reference Books :

1. D.A. Skoog and D.M.West, Principles of Instrumental Analysis, Second Edition, Holt – Saunders, 1980.
2. Liptak - Handbook on Instrumentation.
3. Robert Brown - Instrumental Analysis.

EIEP 707 : INSTRUMENTTION AND PROCESS CONTROL LAB

The list of experiments for the subject EIEP 707 Instrumentation and Process Control Lab will be decided by Head of Department of Instrumentation Engineering time to time depending on the current trends

EIEP 708 : EMBEDDED SYSTEMS LAB

The list of experiments for the subject EIEP 708 Embedded Systems Lab will be decided by Head of Department of Instrumentation Engineering time to time depending on the current trends

EIEP 709 : INSTRUMENTATION SYSTEM DESIGN LAB

The list of experiments for the subject EIEP 709 Instrumentation System Design Lab will be decided by Head of Department of Instrumentation Engineering time to time depending on the current trends

EIEC 801 ETHICS IN ENGINEERING

UNIT I

Introduction to Engineering Ethics - Senses of "Engineering Ethics" - Variety of Moral Issues - Three Types of Inquiry - Engineering Ethics and Philosophy. Need for Engineering Ethics - Moral Dilemmas - Moral Autonomy - Kohlber's Theory - Gilligan's Theory - Consensus and Controversy. Professions and Professionalism -Professions - Membership Criteria - Persuasive Definitions - Multiple Motives. Model Reasoning and Ethical Theories - Theories about virtues - Professional Responsibility - Integrity - Self-Respect - Senses of" responsibility" Theories about Right Action - Utilitarianism - Duty Ethics - Rights Ethics - Testing Ethical Theories - Self-Interest, Customs, and Religion- Self- Interest and Ethical Egoism - Customs and Ethical Relativism - Religion and Divine Command Ethics. Uses of Ethical theories - Resolving Moral Dilemmas - Justifying Moral Obligations - Relating Professional and Ordinary Morality.

UNIT II

Engineering as Social Experimentation - Engineering as Experimentation - Similarities to Standard Experiments - Learning from the past - Contracts with Standard Experiments Knowledge Gained. Engineering as Responsible Experimenters - Conscientiousness - Relevant Information - Moral Autonomy - Accountability. The Challenger Case - Safety issues. Codes of Ethics - Roles of Codes - Codes and the Experimental Nature of Engineering - Limitations on codes. A balanced outlook on law - A regulated Society - The trend toward Greater Detail - Industrial Standards - Problems with the Law in Engineering - The Proper Role of Law in Engineering. Safety and Risk - The concept of Safety - Risks - Acceptability of Risk - Lessons for the Engineer. Assessment of Safety and Risk - Knowledge of Risk - Uncertainties in Design - Testing for Safety - When Testing is inappropriate. Risk - Benefit analyses and reducing risk - Personal risk - Public risk and public acceptance - Accounting publicly for benefits and risks -incentives to reduce risk - some examples of improved safety - liability. Three Mile island Chernobyl and safe exits -Three Mile Island - Prior warnings - Chernobyl - Three Mile Island, Chernobyl, and a Forerunner - Safe Exit.

UNIT III

Responsibilities to Employers - Collegiality and Loyalty - Collegiality - Two Senses of Loyalty - Obligations of Loyalty - Misguided Loyalty - Professionalism and Loyalty. Respect for Authority - Institutional Authority - Morally Justified Authority - Accepting Authority - Paramount Obligations. Collective Bargaining - Historical Note - Faithful Agent Argument - Public Service Argument - Conclusion. Confidentiality - Definition - Justification and Limits - Changing Jobs - Management Policies. Conflicts of Interest - Impairment of Judgment and Service - Gifts and Bribes - Interests in other Companies - Insider Information - Moral status. Occupational Crime - Industrial Espionage - Price Fixing - Endangering Lives.

UNIT IV

Issues - Professional Rights - Basic Right of professional Conscience - Institutional Recognition of Rights - Specific Rights: Recognition and Conscientious Refusal - Foundation of Professional Rights. Whistle-Blowing - Definition - Three Cases - Moral Guidelines - Protecting Whistle-Blowers - Commonsense Procedures - The right to Whistle-Blow - Beyond Whistle-Blowing. The Bart Case - Background - Responsibility and experimentation - Controversy - Aftermath - Comments. Employee Rights - Employee Bill of Rights - Choice of Outside Activities - Privacy - Drug Testing - Due process. Discrimination - Examples - Definitions - Antidiscrimination Laws - Moral Justification of Nondiscrimination Laws - Preferential Treatment - Sexual Harassment. Multinational Corporations - Three Senses of "Relative" Values - "When in Rome" - International Rights - Promoting Morally Just Measures - Technology Transfer and Appropriate Technology - Bhopal. Environmental Ethics - Case Studies - The Commons and a Livable Environment - Guilty until Proven Innocent? - Internalizing Costs of Environmental Degradation - Technology Assessment - Philosophical View of Nature. Computer Ethics - Power Relationships - Property - Privacy - Professional Issues. Weapons Development - The Weapons Seesaw - The Engineer's Involvement in Weapons Work - Defense Industry Problems - Decommissioning Weapons and Lasting Effects.

UNIT V

Engineers as Managers, Consultants and Leaders - Engineers as Managers - Managers as Professional - Promoting and Ethical Climate - Managing Conflict. Consulting Engineers - Advertising - Competitive Bidding - Contingency Fees - Safety and client needs - Provision for resolution of Disputes. Engineers as Expert witness and Advisers - Experts Witnesses in the courts - Abuses - Advisers in Planning and Policy - making - Normative Models of Advisers. Moral Leadership - Morally Creative Leaders - Participation in Professional Societies Leadership in Communities - Ideals of Voluntary Service. Concluding Remarks. Integrity and Ingenuity - Citicorp Skyscraper.

REFERENCE BOOKS:

1. Mike W.Martin Roland Schinzinger, "Ethics in Engineering - Third Edition", Tata McGraw- ill Publishing Company Ltd., New Delhi, 2003.

EIEC 802. MANAGEMENT TECHNIQUES

UNIT-I

Management science/Operations Research - Development of Scientific Management – origin and development of OR-problem structure of OR-phases of OR-applications of OR –general methods for solving OR models.

Review of probability concepts - rules -Baye's theorem- probability distribution - Decision making using probabilities - Combining money and probabilities - expected value criterion - decision trees.

UNIT-II

Inventory: Importance of inventory-costs involved in inventory- variables in inventory-economic order quantity - - application to production processes : optimal level of safety stock - joint ordering - reordering with planned stock outs - price breaks.- selective control techniques.

UNIT-III

Linear Programming - Introduction - Graphic method to solve linear programs. The Simplex method: The Maximization problem - The Minimization problem. The dual in linear programming. -Transportation problem - balanced - unbalanced problem - Degeneracy - initial solution by Greedy method - Vogel's method -Assignment problem.

UNIT-IV

PERT - program evaluation and review techniques - CPM - Critical Path Method - PERT/cost –cost considerations in PERT and CPM Network :- crashing techniques – project scheduling with limited resources- Introduction to dynamic programming.

UNIT-V

Industrial Psychology: Importance of human resources-definition of human relations- Motivation - Theories of Motivation - Maslows theory of hierarchy of needs, Theory X, Theory Y- Development of leadership, managerial and supervisory skills – Methods of recruitment process-steps in selection procedure- Psychology of interviews.- Group dynamics.

Text Books:

1. Richard I. Levin, David.S. Rubin, Joel P. Stinson, Everette S.Gardner, Jr., Quantitative Approach to Management, Eighth Edition McGraw-Hill International Edition, 1997.
2. Tiffin.J and McCormick, Industrial Psychology Prentice-Hall of India, 1995.

Reference Books:

1. Levin and Kirkpatrick,Quantitative Approach to Management, Second Edition, 1989.
2. Handay A.Taha, Operations Research, Macmillan Publishers, 1990.
3. P.K. Gupta and D.S. Hira, Operations Research, Twelth Edition, S. Chand & Co., 1997.
4. C.B.Mamoria, Personnel management, 4 th edition, himalaya publishings.,1995

EIEC 803. COMPUTER CONTROL OF PROCESSES

UNIT-I

Introduction to Computer Control System-Need for computer in a control system-Functional block diagram of Data Acquisition syste-Sequence Control- Direct Digital Control- Supervisory Control- Hierarchy concept-Distributed system –Introduction to MIMO process

UNIT-II

Review of Z-transform,Building blocks of a computer control system,Representation and analysis of Sampled data control systems-Pulse Transfer function-Zero Order Hold and First Order Hold-Sampling Theorem- Sampling frequency Consideration-,Modified Z transform of systems with dead time.

Digital Control Algorithms - Deadbeat Algorithm - Dahlin's method - ringing - Kalman's approach - discrete equivalent to an analog Controller - design for Set point and load changes. PID Algorithms - tuning techniques. Selection of sampling time. Dead-time Compensation - Smith Predictor Algorithm.

UNIT-III

System Modelling and Identification - mathematical model for processes - first order, second order processes without and with pure delay - higher order systems - process modelling from step test data - pulse testing for process identification - time-domain identification - linear least square algorithm.

UNIT-IV

Programmable Logic Controllers (PLCs): Basic components and configuration - discrete, analog and digital types of I/O modules: typical input and output field devices and modules of each type - I/O signal types and typical signal conditioning circuits - common electrical devices and symbols - intelligent I/O modules like control-loop module - Communication I/O modules, network communication module - distributed I/O - AS-interface. Memory types used in PLCs - memory map - assigning I/O address and internal address - scan sequence.

UNIT-V

Programming Languages: Ladder diagram - boolean - function blocks - programming devices: hand-held programmer - industrial programming terminal - personal computer based programmer - development of programmes for typical applications - editing and testing by simulation of programmes. Basic design aspects of I/O systems - electrical, mechanical and environmental specifications. Installation and maintenance of PLCs.

Interlocks and alarms: Interlock design principles, fail-safe design - alarms and their types.

Text Books

1. Stuart Bennet,Real Time Computer Control,Prentice Hall of India,1988
2. C.L. Smith, Digital Computer Process Control, Intext Educational Publishers, 1972.
3. P.B. Deshpande and R.H. Ash, Elements of Computer Process Control, Instrument Society of America, 1981.
4. T.A. Hughes, Programmable Controllers, ISA, 1989.
5. Donald R.Coughnowr,Process Systems Analysis and Control,Tata Mcgraw Hill International Editions, Chemical Engg Series ,Second Edition,1991

LIST OF ELECTIVES

1. Microprocessor Based System Design
2. Electromagnetic Interference & Compatibility
3. VLSI System Design
4. Biomedical Instrumentation
5. Instrumentation System Design
6. Power Plant Instrumentation
7. Environmental Instrumentation
8. Fiber Optics and Laser Instrumentation
9. Flow Measuring Instruments
10. Neural Networks and Fuzzy Logic
11. Real-Time Systems
12. Robotics and Automation
13. VC++ and Java Programming
14. Operating Systems and Networking
15. Embedded Systems
16. Enterprenemship
17. MEMS
18. Bio Sensors & Instrumentation
19. Biological Control Systems.

1. MICROPROCESSOR BASED SYSTEM DESIGN

UNIT I

Need for microprocessor based system design - design cycle - dimensions of design problem - hardware design and software design - hardware and software tradeoff - system integration. I/O control and timing - handshaking - interrelationship among the time intervals - need for data buffering - FIFO applications - I/O ports - structure and characteristics of typical support devices - Timer/counter - interrupt controller - keyboard display interface - CRT controller - floppy disc controller - DMA controller.

UNIT II

Standard interfaces : Serial interface - RS232C - RS423 - bus structures - instrumentation bus - need for standardisation - multi bus/GPIB - IEEE 488 bus. Algorithms/algorithmic process: Keyboard passing - real time programming - self test algorithm - binary to BCD conversion - addition, subraction, multiplication and division programs.

UNIT III

Trouble shooting systems - logic analysers - logic state analysers, logic timing analysers, display modes, logic analyser features - signature analysis, error detection using signature analysis.

UNIT IV

Review of architecture and instruction set of 8086 processor - 8086/8088 based multiprocessing systems - parallel processing - coprocessor configuration, closely coupled and loosely coupled configurations - 8087 coprocessor - architecture and instruction set of 8089 I/O processor.

UNIT V

System design applications : ADC/DAC interface - data acquisition systems - waveform generators - motor control - intelligent systems - PID controller - computer numeric control applications.

TEXT BOOKS

1. Microcomputer Based Design; Peatman J.B.; Mc Graw-Hill; 1977.
2. Microprocessor and Interfacing; Programming and Hardware: Douglas V. Hall; Mc Graw- Hill; 1999.

REFERENCE BOOKS

1. Introduction to Microprocessor Systems Design; Garland Harry; Mc Graw-Hill; 1979.
2. Microprocessor System Design; Klingman E.E; Prentice Hall of India; 1977.
3. Introduction to Microprocessors ; Software, Hardware, Programming; Leventhal, L.A.; Prentice Hall of India; 1978.
4. Trouble shooting on Microprocessor Based Systems; G.B.Williams; Pergamon Press; 1984.
5. Microcomputer Systems; The 8086/8088 Family; Yu-Cheng Lui and Gleron A. Gibson; Second Edition; PHI; 1990.

2. ELECTROMAGNETIC INTERFERENCE & COMPATIBILITY

UNIT - I

BASIC CONCEPTS: Definition of EMI and EMC, sources of EMI, natural and manmade, Victims of EMI, EMI emission and susceptibility concepts, conducted and radiated, Case histories, Radiation hazards to humans.

UNIT - II

EMI STANDARDS AND REGULATION: EMI standards and specifications, Unit of EMI, National and International EMI standardising organisations-IEC, ANSI, FCC, VDE, BS, CISPR, BIS,CENELEC etc, Emission and susceptibility standards and specifications, civilian and military.

UNIT - III

EMI COUPLING MECHANISM: Intra and inter system EMI, Common mode coupling, Differential mode coupling, Field to cable coupling, cable to cable coupling, Antenna to antenna coupling, Ground loop coupling.

UNIT - IV

EMI TEST METHODS AND INSTRUMENTATION: EMI test sites, shielded chamber, shielded anechoic chamber, open area sites, TEM cell, EMI test receivers Spectrum analyzers, Transient EMI test wave simulators, EMI coupling networks, line impedance stabilization networks, feed through capacitors, antennas, current probes, calibration factor of sensors, MIL-STD 461C/462 test methods, FCC/VDE test methods, IEC test methods.

UNIT - V

EMI MITIGATION TECHNIQUES(EMC): Shielding theory, choice of materials and thickness, shielding of joint with gaskets, Bonding, Filtering, Grounding, Cable grounding, Transient EMI control devices and applications, Surgetor, metal oxide varistors, Avalanche diode, Gas tubes etc.

Text Book:

1. Keiser, Principles of Electromagnetic compatibility, Artech House, Third Edition, 1994 .

Reference Books:

1. Henry Ott, Noise Reduction Techniques in Electronic System, John Wiley and sons, 1988.
2. William G.Duff, Fundamentals at Electromagnetic compatability ICT, Inc Gainesville, 1988.
3. Don White consultant Incorporate Hand Book of EMI/EMC Vol 1, Vol 5 – 1985.

3.VLSI SYSTEM DESIGN

UNIT I

VLSI DESIGN CONCEPTS:

Evolution of VLSI - VLSI design process - Architectural design - Logical design - Physical design - Lay-out styles - Full custom - Semi custom approaches - Need for design rules - Types of design rules - Design for MOS & CMOS circuits - Simple layout examples - Sheet resistance, area capacitance, wiring capacitance - Dry capacitive loads.

UNIT II

VLSI FABRICATION TECHNIQUES:

Wafer fabrication - Wafer processing - Oxidation - Patterning - Silicon gate NMOS process - CMOS process - Nwell - Pwell - Twintub - Silicon on insulator - CMOS Process enhancements - Analytical techniques - Ion beam techniques - Chemical methods - Package fabrication technology - Reliability requirements - Field loss - Failure mechanism .

UNIT III

ANALOG VLSI:

Introduction to analog VLSI - Analog circuit building blocks - Switches,active resistors - Current sources and sinks - Current mirrors/amplifiers - MOS & BJT,inverting amplifiers - CMOS and BJT two stage op-amp - Analog signal processing circuits - Sensors - D/A and A/D converters.

UNIT IV

DIGITAL VLSI:

Logic design - Switch logic - Gate logic - Dynamic CMOS logic - Structured design - Simple combinational logic design - Clocked sequential design - Sub-system design - Design of shifters - Arithmetic processors - ALU - Serial,Parallel and pipelined multiplier arrays.

UNIT V

ASIC DESIGN AND VERILOG

Architecture and programming technologies of ROMs, EPROMs, PLA, PAL, Gate arrays, CPLDs and FPGAs – Xilinx family. LCA – I/O blocks – programmable interconnect - Configuration memory. Verilog:Basics of verilog- Operators, hierarchy procedures and assignments-Timing controls and delays-Tasks and functions-Control statements- Verilog and logic synthesis.

TEXT BOOKS

1. Douglas A.pucknell and kamran Eshranghiaon., "Basic VLSI Design" Prentice Hall of India,New Delhi,3'rd Edition, 1994.
2. Eugene D Fabricus., "Introduction to VLSI Design" Mc Graw Hill International Edition.
3. Malcolm R.Haskard,Lan C.May., "Analog VLSI design - nMOS and CMOS" Prentice Hall,1988.

REFERENCE BOOKS

1. Caver Mead and Lynn Conway., "Introduction to VLSI systems" Addison-Wesley, USA,1980.
2. James E.Palmor,Darid E.Perlman., "Introduction to Digital systems" Tata Mc Graw Hill,1996.
3. Smith., "Application specific Integrated circuits" Addison-Wesley, 2nd reprint, 2000.
4. AMAR Mukherjee., "Introduction to nMOS and CMOS VLSI system Design" Prentice Hall,USA,1986

3. BIOMEDICAL INSTRUMENTATION

UNIT-I

Electrophysiology: Review of physiology and anatomy - resting potential - action potential - propagation of action potential - bioelectric potentials - cardiovascular dynamics - electrode theory - bipolar and unipolar electrodes - surface electrodes - physiological transducers - systems approach to biological systems.

UNIT-II

Bioelectric potential and cardiovascular measurements: EMG - evoked potential response - EEG - fetal monitor. ECG - phonocardiography - vector cardiography - BP - blood flow - cardiac output - plethysmography - impedance cardiology - cardiac arrhythmias - pacemakers- defibrillators.

UNIT-III

Respiratory and pulmonary measurements and rehabilitation: Physiology of respiratory system - respiratory rate measurement - oximeter. Hearing aids - functional neuromuscular simulation - physiotheraphy - diathermy - nerve stimulator.

UNIT-IV

Patient monitoring systems: Intensive cardiac care unit - bedside and central monitoring systems - patient monitoring through bio-telemetry - implanted transmitters - telemetering multiple information. Sources of electrical hazards and safety techniques.

UNIT-V

Recent trends: Medical imaging - laser applications - ultrasound scanner - echo cardiography - CT scan - MRI/NMR - cine angiograms - colour doppler systems - Holter monitoring - endoscopy.

Text Books:

1. Leslie Cromwell,Fred J.Weibell and Erich A.Pleiffer, Biomedical Instrumentation and Measurements, Prentice-Hall of India, 1980.
2. L.A.Geddes and L.E. Baker, Principles of Applied Biomedical Instrumentation, John Wiley.

Reference Books:

1. Richard Aston, Principles of Biomedical Instrumentation and Measurement, Merrill Publishing Company, 1990.
2. R.S.Kandpur, Handbook of Biomedical Instrumentation, Tata McGraw Hill, 1987.
3. M.Arumugam, Biomedical Instrumentation, Anuradha Agencies, Publishers, Vidayal Karuppur - 612 606, Kumbakonam R.M.S., 1992.
4. B.Jacobson, and J.G.Webster, Medical and Clinical Engineers, Prentice Hall, 1979.

5. INSTRUMENTATION SYSTEM DESIGN

UNIT-I

Orifice meter - design of orifice for given flow condition - design of rotameter - design of RTD measuring circuit - design of cold junction compensation circuit for thermocouple using RTD - Transmitters – zero and span adjustment in D/P transmitters and temperature transmitters.

UNIT-II

Bourdon gauges - factors affecting sensitivity - design of Bourdon tube -design of Air purge system for level measurement.

Electronic P+I+D controllers - design - adjustment of setpoint, bias and controller settings.

UNIT-III

Control valves - design of actuators and positioners - types of valve bodies - valve characteristics - materials for body and trim - sizing of control valves - selection of body materials and characteristics of control valves for typical applications.

UNIT-IV

Types of pumps - pump performance - pipe work calculation - characteristics of different pumps - pump operation - maintenance - instruments used in pumping practice - pump noise and vibration - selection of pumps.

UNIT-V

Design of logic circuits for alarm and annunciator circuits, interlocks - design of microprocessor based system for data acquisition - design of microprocessor based P+I+D controller.

Text Books:

1. N.A.Anderson, Instrumentation for Process Measurment and Control, Chilton Company, 1980.

2. D.M.Considine, Process Instruments and Controls Handbook,McGraw-Hill., 1985.

Reference Books:

1. R.H.Warring, Pumping Manual, Gulf Publishing Co., 1984.

2. J.P.Bentley, Principles of Measurment Systems, Longman Inc., 1983.

2. C.D. Johnson, Process Control Instrumentation Technology, Prentice Hall of India, 1998.

6. POWER PLANT INSTRUMENTATION

UNIT-I

Piping and Instrumentation diagram of a thermal power plant, basic processes in a boiler. Fuel measurement - review of pressure and temperature measurement - steam and water flow measurement - instrument applications in power stations: review of indicating and recording instruments, water level gauges for boiler drums, closed circuit television instruments, gas analysis meters, smoke measurement, dust monitor - measurement of impurities in feedwater and steam - generator coolant controls and instruments - instrument maintenance aspects.

UNIT-II

Boiler control objectives - combustion of fuels (gaseous, liquid and solid), excess air, combustion chemistry and products of combustion, requirement for excess combustion air - calculation of efficiency of boilers: input/output method, heat loss method - steam temperature control systems - superheaters and desuperheaters.

UNIT-III

Feedwater supply and boiler water circulation systems - drum level control systems - boiler draft systems - measurement and control of furnace draft - measurement and control of combustion - draft and air flow control related functions.

UNIT-IV

Flue gas analysis trimming of combustion control systems - combustion control for liquid and gaseous fuel boilers - coal or solid fuel stokers - combustion control for stoker - fired boilers - pulverised coal burning systems - combustion control for pulverised coal-fired boilers.

Turbine monitoring and control: speed, vibration, shell temperature monitoring.

UNIT- V

Nuclear power plant instrumentation: Piping and instrumentation diagram of different types of nuclear power plant - radiation detection instruments - process sensors for nuclear power plants -spectrum analyzers - nuclear reactor control systems and allied instrumentation.

Text Books:

1. B.G.Liptak,Instrumentation in Process Industries, Vol I and II, Chilton Book Co., 1973.
2. Sam G.Dukelow, The Control of Boilers, Instrument Society of America Press.
3. A. Sherry et al (Editors), Modern Power Station Practice, Vol.6 (Instrumentation, Controls and Testing), Pergamon Press, 1971.

7. ENVIRONMENTAL INSTRUMENTATION

UNIT-I

Need for environmental monitoring - Indian Standards for pollution levels (concentrations) in respect of air quality and water quality. Noise levels. Impact of pollution on human health, vegetation, animals and property value. Biological quality of water-bacteria and virus - applications of sophisticated microscopes including electron microscope for identification of microbial organisms.

UNIT-II

Water quality parameters - pH - conductivity - temperature - turbidity - chemical pollutants -Chlorides - sulphates - sulphides - Nitrates and nitrites - phosphates - flouride, Phenolic compounds - measurement techniques for these parameters.

UNIT-III

Elemental concentration in water - Mercury, lead, chromium, arsenic, zinc, cadmium, copper, selenium, nickel, sodium, potassium, lithium - measurement techniques for these parameters. Air pollutants - gases, vapours, particulate matter and their impact. Air quality standards prescribed by B.I.S..

UNIT-IV

Measurement Techniques for particulate matter in air - oxides of sulphur, oxides of nitrogen, unburnt hydrocarbons, carbon dioxide, carbon monoxide, ozone.

UNIT-V

Noise pollution - desirable levels of sound. Measurement of sound level.

Soil pollution - insecticides, pesticides, fertilizers - measurement techniques for these pollutants.

Solid waste disposal techniques - incinerators - impact of solid waste dumps.

Reference Books:

1 . S.P.Mahajan, Pollution Control in Process Industries, Tata McGraw Hill, 1985.

2. G.N.Pandey and G.C.Carney, Environmental Engineering,Tata McGraw Hill,1989.

8. FIBER OPTICS AND LASER INSTRUMENTATION

UNIT-I

Fundamental Characteristics of Lasers: Laser rate equation - Three level System - Four level System - Properties of laser beams - Laser modes - Resonator configuration - Q- Switching and mode locking - Cavity dumping; simple frequency operation. Types of laser - Gas lasers - Solid state laser - Liquid lasers - Semiconductor lasers.

UNIT-II

Industrial Applications of Laser: Lasers for measurement of distance and length, velocity, acceleration, atmospheric effects, sonic boom, pollutants, current and voltage; Materials Processing - Laser heating, melting, scribing, splicing, welding and trimming of materials - Removal and vapourisation - Calculation of power requirements of laser for material processing.

UNIT-III

Theory and Classification of Fibre Optics: Principles of light propagation through a fibre - Different types of fibres and their properties - Relative merits and demerits. Fibre optics production and components - Technology of preformed fabrication - Fibre drawing - Material consideration - Loss and bandwidth limiting mechanism - Mechanical and thermal characteristics - Fabrications of multicomponent glass fibres - Light sources for fibre optics - Photo detectors - Source coupling, splicing and connectors.

UNIT-IV

Fibre Optics Sensors: Fibre optics communication and instrument system - Advantage of optical communication - Different types of modulators - Detectors - Fibre optic communication set up - Application in instrumentation: Optical fibre sensors,

Classification of sensor types; Pressure sensors; Electric and magnetic field sensors based on polarisation effects.

UNIT-V

Holography: Basic principle; Methods; Holographic interferometry and applications - Holography for non-destructive testing - Holographic components.

Medical applications of lasers: Lasers and tissue interaction - Laser instruments for surgery, removal of tumours of vocal cords, brain surgery, plastic surgery, determatology, gynaecology and oncology.

Text Books:

1. Allen, H.C., An Introduction of Optical Fibers, McGraw Hill International Book Co., 1993.

2. Smith W.V. and Sorokin P.P.: The Laser; McGraw Hill Book Company, 1996.

Reference Books:

1. Allen L.: Essentials of Lasers; Oxford University Press, 1969.

2. D.C.Oshea and W.Russel Callen, Introduction to Lasers and Applications, Addison Wesley, 1978.

3. Koebner H.: Industrial Application of Lasers; John Wiley,1984.

4. Cuxon J.T and Parker D.E.: Industrial Laser and their Applications; Prentice Hall, 1985.

5. H.M.Smith, Principles of Holography, John Wiley & Sons, 1975.

6. Culshaw B. and Dakin J.(Eds.): Optical Fibre Sensors, Vol.1 & 2; Artech House, 1989.

7. Ghatak A.K.: Optics; Tata McGraw Hill Book Company.

9. FLOW MEASURING INSTRUMENTS

UNIT-I

Differential Pressure Flow Meters: Review of physical properties of flow and fundamentals of flow measurements- Differential flow meters-operating principle-Differenttypes -orifice ,venturi,flow nozzle,Dahl tube,pitot tube,Annubar -Installation and maintenance of flow meters.

UNIT-II

Mechanical Type Flow Meters: Principle of operation -Elements of construction and application of positive displacement meters -Inferential flow meter-Rotameter-Turbine flow meters-Installation and Maintenance -Target flow meter.

UNIT-III

Electrical Type Flow Meter: Principle of operation - construction and Applications - sizing - Installation and maintenance of Electro magnetic flow meter- Ultrasonic flow meters -Cross correlation flow meters- Vortex shedding flow meter- Thermal flow meter.

UNIT-IV

Mass Flow Meters and Open Channel Flow Measurement: Conventional methods - Coriolis flow meter,angular momentum,thermal flow meters-Weirs,flumes-Guide lines for flow meter selections - Flow measurement of gas and solid medium.

UNIT-V

Design ,Calibration and Applications: Design of flow meters -orifice, venturi, pitot tube-sizing of turbine and magnetic flow meters -Calibration of flow meters -volumetric, gravimetric, pipe proven & PVT -flow measuring instruments in flow loops-air flow,liquid flow.

Text Book:

1. David W. Spitzer ,Industrial Flow Measurement, ISA Publication, 1993.

References Books:

1. Fundamentals of flow measurement, Joseph d.Carlo, ISA Publication, 1984.

2. Flow Measurement Engg. Hand Book ,Richard W.Miller, Mc-Graw- Hill Publication, Third Edition,1996.

3. Process Measurement and Analysis,B.G.Liptak, Chilton Book Company. Third Edition,1995.

10. NEURAL NETWORKS AND FUZZY LOGIC

UNIT-I

Motivation for the development of neural networks - artificial neural networks - biological neural networks - application areas. Typical architectures - setting weights - common activation functions. McCulloch-pitts neuron: architecture, algorithm, applications. Simple neural networks for pattern classification: Architecture, biases and thresholds, linear separability, data representation - Hebb Net: algorithm and application - Architecture, algorithm and application of perceptron - perceptron learning rule convergence theorem - delta rule.

UNIT-II

Backpropagation Neural Net: Standard backpropagation - architecture - algorithm - derivation of learning rules - number of hidden layers - learning factors - applications. Hopfield neural net : architecture - algorithm - applications.

UNIT-III

Neural Networks based on Competition: Fixed-weight competitive nets - Kohonen self-organising Maps and applications. Adaptive Resonance Theory : Basic architecture and operation. Neural Network for control : Neuro controller - Functional diagram - Inverse dynamics - coping control action. Case study : Neuro controller for DC motor speed control - Neuro controller for a temperature process.

UNIT-IV

Introduction to Fuzzy Logic : Fuzzy sets - Properties of Fuzzy sets, operations on Fuzzy sets. Fuzzy relations : Cordinality of Fuzzy relations. Linguistic variables - Linguistic approximation. Fuzzy statements : Assignment statements, conditional statements, unconditional statements. Fuzzy rule base. Canonical rule formation, decomposition of compound rules.

UNIT-V

Fuzzy logic Controller : Functional diagram. Membership functions : Triangular, Trapezoidal - scale factors. Fuzzification : Membership value assignments using intution - knowledge base. Defuzzification : Max-Membership principle - centroid method - weighted average method - rule base. Choice of variable - derivation of rules, data base. Case study : Fuzzy logic Controller design for a temperature process.

Introduction to neuro-fuzzy and fuzzy-neuro control schemes.

Text Books:

1. Laurene Fausett, Fundamentals of Neural Networks, Prentice-Hall, New Jersey, 1994.
2. Timothy J. Ross, Fuzzy Logic with Engineering Applications, McGraw-Hill, New York, 1996.

Reference Books:

1. Stamatios V. Kartalopoulos, Understanding Neural Networks and Fuzzy Logic – Basic Concepts and Applications, IEEE Press, New York, 1996.
2. D. Driankov, H. Hellendoorn, M. Reinframe, An Introduction to Fuzzy Control, Narosa Publishing Co., New Delhi, 1996.
3. Robert J. Schalkoff, Artificial Neural Networks, McGraw- Hill, Singapore, 1998.

11. REAL-TIME SYSTEMS

UNIT-I

Introduction to Real-Time Systems (RTS): Typical examples of real-time systems - characteristic features of real-time-structural, functional and performance requirements of reactive real-time system - distinctive features from non-real-time and off-line systems.

UNIT-II

Modelling RTS : Representation of time - concurrency and distributedness in discrete event systems - examples of modelling practical systems.

UNIT-III

Analysis of RTS : Analysing logical properties of discrete event systems - analysing timing related properties. Examples of checking safety and timing properties of industrial systems.

UNIT-IV

Real-time Operating System : Multitasking - task management - task dispatch and scheduling - static and dynamic scheduling. Memory management - code sharing - input/output sub-system - task co-operation and communication. Concurrent programming - mutual exclusion - rendezvous.

UNIT-V

Real-Time programming : User requirement - language requirement - declaration - constants - control structure - modularity - exception handling - low-level and multi-tasking facilities. Introduction to Ada.

Text Books:

1. C.M. Krishna, Real-time Systems, McGraw-Hill, 1998.
2. Stuart Bennett, Real-time Computer Control, Prentice- Hall, 1988.

Reference Books:

1. P.A. Laplante, Real-time Systems Design and Analysis, IEEE Press, 1992.
2. Lawrence, Real-time Microcomputer Systems design - An Introduction, McGraw-Hill, 1992.
3. S. Levi and A.K. Agrawala, Real-time System Design, McGraw-Hill, 1990.
4. Burns and Wellings, Real-time Programming Language, Addison- Wesley, 1990.
5. S.H. Son, Advances in Real-time Systems, Prentice-Hall of India, 1990.

12. ROBOTICS AND AUTOMATION

UNIT-I

Robots - Basic components - Classification - Performance characteristics - Drives and control systems - Electric, hydraulic and pneumatic actuators - control loops using current amplifier and voltage amplifiers.

UNIT-II

Sensors and vision systems: Transducers and sensors - Tactile sensors - Proximity and range sensors - Acoustic sensors - vision systems - Image processing and analysis - image data reduction - Segmentation feature extraction - Object recognition.

UNIT-III

End effectors - Types - Mechanical grippers - Vacuum cups - Magnetic grippers - Robot/end effector interface - Software for industrial robots - Positive stop program, point-to-point program and continuous path program.

UNIT-IV

Robot motion analysis and control: Manipulator kinematics - Homogeneous transformations and robot kinematics - Robot dynamics - Configuration of a robot controller.

UNIT-V

Industrial robots: Robots for welding, painting and assembly - Remote controlled robots - Robots for nuclear, thermal and chemical plants - Industrial automation - Typical examples of automated industries.

Text Books:

1. Yoran Koren, Robotics for Engineers, McGraw Hill, 1980.

2. Mikell P. Groover et al., Industrial Robots -Technology Programming and Applications, McGraw Hill, 1980.

13.VISUAL C++ AND JAVA PROGRAMMING

UNIT-I

Windows Programming : Conceptual comparison of traditional programming paradigms - overview of windows programming - data types - resources - windows messages - device contexts - document interfaces - dynamic linking libraries - software development kit (SDK) tools - context help.

UNIT - II

Objects - Classes - VC++ Components - Resources Event Handling - Menus - Dialog Boxes - Importing VBX Control Files - MFC File Handling - Document View Arch - Serialization - Multiple Document Interface (MDI) - Splitter Windows.

UNIT - III

Exception Handling - Debugging - Object Linking and Embedding (OLE) - Databases Application - DLL, ODBL.

UNIT - IV

JAVA BASICS & APPLETS: Review of Java basics, applets, - java applets, applet viewer, browser infrastructure, applet classes event handling, interactive applets. Review

of java features, java libraries - networking, windowing, graphics programming with AWT - menus, dialogs.

WEB APPLICATION DEVELOPMENT: CGI programming, activeX programming, using javascript,VRML.

UNIT - V

APPLICATIONS: Adding java special effects to HTML document, developing java applets & applications, animation, JDBC - java data base connectivity, java development environments, stand alone applications.

Text Books:

1. Charless Petzold, Windows Programming, Microsoft Press, 1992.
2. Steve Holzner,"Visual Basic 6",PHI publishers, New Delhi, 1997.
3. JAVA: The complete reference, patrick naughton, Tata McGraw-Hill,1997.

Reference Books:

1. J. David Kruglinski, Inside Visual C++, Microsoft Press, 1993.
2. Murray & Pappas, " The Visual C++ -Complete Reference" Tata McGraw-Hill, 1999.
3. Harrington, Java programming, John Wiley,1998.

14. OPERATING SYSTEMS AND NETWORKING

UNIT-I

Introduction to Operating Systems: Early Systems, Simple Batch Systems, Multiprogramming Systems, Time-Sharing Systems, Personal-Computer Systems, Parallel systems, Distributed Systems, Real-time Systems.

Computer-System Structures: Computer-System Operation, I/O Structure, Storage Structure, Storage Hierarchy, Hardware Protection General-System Architecture, Secondary Storage Structures.

UNIT-II

Process, Scheduling and Deadlocks: Process Concept, Process Scheduling,Operation on a Process, Cooperating processes, Threads, Inter-process Communication, Multiple – Processor Scheduling, Real-Time Scheduling. Algorithm Evaluation, Deadlock characterization, Methods for Handling Deadlocks, Prevention Avoidance, Detection, Recovery, In-time scheduling – Premitive and non premptive task scheduling.

UNIT-III

Memory Management: In Operating Systems Address Space, Swapping, Contiguous allocation, Paging Segmentation, Paged segmentation, Demand paging, Page

Replacement, Page - replacement Algorithms, Frame Allocation, Thrashing, File Systems, Virtual memory.

UNIT-IV

File Management: Command Language File Services-Systems Programmer's view of the File System. Disk organization – Disk controller and driver, O/S View of File Management, Disk Caches and Unix Buffer cache.

Case Studies: Command Language users view of Unix System-Call users view of Unix , Implementation of Unix.

UNIT-V

Client server Model: Three Modes of Communication –System Processes- Micro Kernel O/S-Developments toward a Distributed System.

Network Management: Network Design and Implementation, Network Management- Network Security – Novell Netware.

TEXT BOOKS:

1. Andrew S. Tanenbaum, Operating Systems: Design and Implementation, Second Edition, Prentice Hall, 1996.

2. Charles Crowley, Operating Systems, Tata McGraw Hill, 1999.

3. Jerry, Fitzgerald, Alan Dennis, Business Data Communication and Network, Fifth Edition, John Willey, 1996.

REFERENCE BOOKS:

1. Abraham silberschatz, Operating System Concepts, Fifth Edition, Addison Wesley, 1990.

2. William Stallings, Operating Systems, Second Edition , Addison Wesley, 1990.

3. Harvey M. Deitel, An Introduction to Operating Systems, Second Edition, Addison Wesley, 1990.

4. Andrew S. Tanenbaum, Modern Operating Systems, Prentice Hall, 1992.

5. Andrew S. Tanenbaum, Computer Networks , Third Edition, Prentice Hall, 1996.

15. EMBEDDED SYSTEMS

UNIT-I

MC68HC11 Architecture: - memory organisation - addressing modes - instruction set - programming techniques -simple programs.

UNIT-II

MC68HC11 Peripherals :I/O ports - handshaking techniques - reset and interrupts - serial communication interface - serial peripheral interface - programmable timer - analog/digital interfacing - cache memory.

UNIT III

ARM Architecture: Modes of operations –Instruction Formats – ARM derivatives – Programming with ARM embedded controllers –Software tools for ARM –GNU 'C' keil.

UNIT IV

Programming : Embedded software tools – Assembler – Complier – Simulator – Debugger – In-circuit Emulator – Target programming – Integrated Development Environment (IDE) – Embedded 'C' programming software IDEs for 8-bit embedded controller, RIDE, CCs – GNU 'C' keil.

UNIT V

Real Time Operating System: Embedded operating system – Comparison with general purpose OS – Real time operating system – RTOS tasks – Kernel – RT scheduling – Interrupt processing _ Memory management using RTOS – Synchronisation – Message Queues – Control blocks – Porting of RTOS to the target board – Comparison and study of various RTOS like windowsCE, Embedded Linux, VXWORKS, Nucleus.

Text Books

1. Michael Kheir, "The M68HC11 Microcontroller Applications in Control, Instrumentation and Communication", Prentice-Hall, New Jersey, 1997.

2. John B. Peatman "Design with PIC Micro controllers", Pearson Education 1998

3. Jonathan W.valvano., "Embedded Microcomputer systems", Thomas Asia Pvt. Ltd. Singapore.

4. Myke Predko, " Programming & Customizing PIC Microcontrollers", McGraw Hill, 2000.

5. David Scal ARM Architecture Manual, Addison, Wesley professional, 2nd Edition 2000.

Reference Books

1. Todd.D.Mortan., "Embedded Microcontrollers", Pearson Education (Asia) 2003.

16. ENTREPRENEURSHIP

OBJECTIVE

Develop an entrepreneurship sprit

Help the participants to identify business opportunities within an organization or independently

Initiate action on the business plan from the prospective business through EDC

UNIT – 1: Introduction

Introduction to the course entrepreneurship definition, nature and importance. Theories of entrepreneurship. Types and barriers to entrepreneurship. Corporate entrepreneurship. Entrepreneurship versus managers. Motivation converting dream to reality. Role of networks. Entrepreneurship – emerging scenario.

UNIT – II: Idea generation

Entrepreneurship and innovation. Innovation and imaging innovation. The role of incubation in innovation. Innovation diffusion. Idea to an entity – business ideas and opportunity. Idea generation workshop.

UNIT – III: Functional areas

Communication for business. Products and markets negotiation skills. IT for entrepreneurs. People issues in entrepreneurship. Ethics for entrepreneurs. Financing the new business – venture capitalists, financial institutions, and banks. Guest Lecture Series.

UNIT – V: Business plan

Objectives of business plan, contents – Executive summary, product / service and competition, major sections – measurement of objectives, market analysis, micro environmental influences, financial analysis, management analysis, human resource analysis. Critical risk and contingencies. Summary and conclusions.

Business plan preparation – Mini project work.

REFERENCES

1. Entrepreneurship by Madhurina Lall & Shikha Salmi – Excel Books New Delhi.
2. Handbook of entrepreneurship by sexton and landstrom.
3. Innovation and entrepreneurship by Peter Drucker – HRB Publication.
4. Small Business Management by William L.Megginson – Mc Graw Hill (International).
5. Entrepreneurship in the new millennium by Kondaiah – Tata Mc Graw Hill.
6. New Venture Creation by Jeffry A Timmons – Mc Graw Hill (International).

Text Book

1. Entrepreneurship by Hisrich (5^{th} Edition) – Tata Mc Graw Hill, New Delhi.

WEB SITES

www.entrepreneurship.com
www.ncoe.org
www.nfte.com

www.icbs.org
www.esbri.se
www.entrepreneurship.mit.edu
www.entrepreneurship.hbs.edu
www.entrepreneurship.berleley.edu
www.enterworld.com
www.meindia.com
www.sidbi.com

17.Micro Electro Mechanical Systems

Unit- I

Introduction to micro machined devices: Microsystems vs. MEMS - Markets for Microsystems and MEMS, Scaling Principles- Materials for micromachining-Micromachining terms-mechanical properties of silicon-native oxides of silicon and other semiconductors-typical silicon wafer types.

Unit – II

Bulk Micro Machining: wet etching of silicon-Isotropic etching-anisotropic etching-alkali hydroxide etchants-ammonium hydroxide-tetramethyl ammonium hydroxide (TMAH)-ethylene diamine pyrochatechol (EDP)-ultrasonic agitation in wet etching-stop layers for dopant elective etchants. Porous-silicon formation –anistrophic wet etching of porous aluminum-anistrophic wet etching.quartz-vapour phase etches. RIE-laser driven bulk processing.

Surface Micromachining: Thin film processes-nonmetallic thin film for micromachining –silicon dioxide – silicon nitride - silicon carbide - polycrystalline diamond - polysilicon and other semiconductors and thin film transition – wet etching of non-metallic thin film-metallic thin film for micromachining - Resistive evaporation – E-beam evaporation-sputter deposition-comparison of evaporation and sputtering - CVD of metals - adhesion layer for metals - electro deposition (E plating) - Electrodeposition mechanism: - DC electroplating-pulsed electroplating-Agitation for electroplating-black metal film-electro less plating.

Unit –III

Bonding Processes: Anodic Bonding-Anodic bonding using deposited glass-silicon fusion bonding-other bonding and techniques - compound processes using bonding. **Sacrificial Processes and other Techniques:** Sticking problem during wet releasing-prevention of sticking-phase change release methods-geometry-examples of sacrificial processes.

Unit –IV

MEMS Pressure sensors: Sensing mechanisms – MEMS Pressure sensors – Types of pressure sensors – Piezo resistive pressure sensors – V-grove etching – Surface micro machined pressure sensors using Poly Silicon Piezo resistors – Overload protection – Capacitive pressure sensors – Resonant pressure sensors. **MEMS accelerometers** – Basic accelerometer concepts – Force balance accelerometers – Strain gauged accelerometers – Capacitive accelerometers – Force balance capacitive accelerometers – Piezoelectric accelerometers.

Unit – V

MEMS Actuators and their applications: Actuation mechanisms – Electrostatic actuation – Electrostatic cantilever actuators – Torsional electrostatic actuators – Electrostatic comb drives – Feed back stabilization of electrostatic actuators - Electrostatic rotary micro motors - Electrostatic linear micro motors – Electrostatic micro grippers – Electrostatic relays and switches - Thermal actuation – Thermal expansion of solids – Thermal array actuators –Piezoelectric actuation – Cantilever resonators.

Text Book

1. Gregory T.A. Kovacs, Micro machined Transducers, WCB McGraw Hill, 1998.

Reference Books

1. Stephen D. Senturia, Microsystem Design**,** Springer International Edition, 2001.
2. Chang Liu**,** Foundations of MEMS, (ILLINOIS ECE Series), Pearson Education International, 2006.

3. Tai-Ran-Hsu**,** MEMS & Microsystems Design and Manufacture, Tata McGraw-Hill, New Delhi, 2002.
4. S.M. Sze, Semiconductor Sensors, John Wiley and Sons, 1994.

18. BIO SENSORS AND INSTRUMENTATION

Objectives:

This course is meant to enable the students to conceive and understand the basics of Biosensors when used in few biomedical engineering fields along with the relevant measurement and Instrumentation

Syllabus:

UNIT-I

Electrode theory: electrode-tissue interface, metal-electrolyte interface, electrode-skin interface. Electrode-electrolyte interface: half cell potential polarization,electrode impedance, electrical conductivity of electrode jellies and creams.

Biopotential electrodes: Types of electrodes, reference electrodes, polarizable and nonpolarizable electrodes, electrode circuit model.

Internal electrodes: Needle and wire electrodes (different types). Micro electrodes: Metal, supported metal, micropipette (metal filled glass and glass micropipette electrodes), microelectronic properties, method of use. Electrodes used for measurement of ECG, EEG and EMG.

UNIT-II

Biochemical Measurement : Bio chemical transducer-blood gas and acid-base physiology, reference electrode, pH, pO_2 and pCO_2,electrodes. Ion exchange membrane electrodes, enzyme electrode, glucose sensors, immunosensors. MSI structure – semiconductor solution interface – Chemically sensitive FET Array (CHEMFETArray) – Suspended Gate Field Effect Transistor (SGFET) – Gas Sensitive Metal Gate Transistor (GFET). Basic principles of MOSFET biosensors and BIOMEMS.

UNIT-III

Biomedical instrumentation: Introduction-component of man-instrument system, problems encountered in measuring a living system, biofeedback instrumentation.

Detection of physiological parameters: Impedance techniques: impedance and current distribution, bipolar and tetrapolar circuits, skin impedance, galvanic skin response measurement, total body impedance measurement.

UNIT-IV

Cardiovascular system: Blood pressure measurements. Blood flow measurement: Indicator dilution method, thermo dilution method, manual and automatic counting of RBC, WBC and platelets - measurement of cardiac output. Plethysmography: impedance plethysmography. Heart sounds- measurements.

UNIT-V

Respiratory system: measurements– test and instrumentation - mechanics of breathing – gas exchange and distribution – respiratory therapy equipments.

Instrumentation for sensory measurements-behavioral studies - psycho physiological measurements – instruments for testing motor responses, sensory measurements.

Text Books:

1. R. S. Khandpur Handbook of Bio-Medical Instrumentation, Tata McGraw Hill, New Delhi, 2007

2. Cromwell, Weibell and Pleiffer, Biomedical Instrumentation and Measurement, Prentice Hall of India, New Delhi, 2006.
3. Carr and Brown, Introduction to Biomedical Equipment Technology, Prentice Hall, 2005.

Reference Books:

1. J.Webster, Bio instrumentation, Wiley & Sons., 2004.
2. Joseph D.Bronzino, The Biomedical Engineering handbook, CRC Press, 2006.

19. BIOLOGICAL CONTROL SYSTEMS

Objectives:

This course aims to enable the students to conceive and understand the basics of Biological Control systems.

Syllabus:

UNIT-I

Biological control system: Introduction - components of living control system, Model and Analogy of system properties, resistance, storage, distributed and lumped systems. Mathematical approach, electrical analogues.

Bio process controls: cardiac rate, blood pressure, respiratory rate. Blood - Glucose regulation. Pharmacokinetic modeling - blood-tissue models.

UNIT-II

Bio Dynamical systems : Introduction - control. Pupil control systems: structure - modeling –dynamic response– open loop and closed loop instability – automatic aperture control.

UNIT-III

Human thermal system: Anatomy, modeling. Thermoregulation: cold bloodedness, warm bloodedness –lumped and partial differential equations. Heat transfer examples.

UNIT-IV

Bio Compartment Modeling : Behavior in simple compartmental system – pharmaco kinetic model – urea distribution model – multi compartmental system. Dissolution of drugs in solid form – distribution and accessibility of body water - tissue compartments – basis for zero order and first order chemical kinetic behavior.

UNIT-V

Biological receptors: Introduction – characteristics – transfer function models and perceived intensity. Cardiovascular control system, skeletal muscle servomechanism.

Text Books

1. Howard T Milhorn, The application of control theory of a physiological system, Sounders Publication, 2009.
2. John H Milsum, Biological Control Systems, McGraw Hill, 2006
3. David O.Cooney, Biomedical Engineering Principles, Marcel Deckker Inc. 1976

Reference Books:

1. B.C.Kuo, Automatic Control Systems, Englewood Cliffs, N.J.,Prentice Hall, 2005.
2. K.Ogata, Modern Control Engineering, Prentice Hall of India, Fourth Edition, 2003.