St. PETER'S UNIVERSITY

St. Peter's Institute of Higher Education and Research
(Declared under section 3 of UGC Act 1956)
Avadi, Chennai – 600 054.

B.E. (ELECTRONICS AND INSTRUMENTATION ENGINEERING) PROGRAMME

(I TO VIII SEMESTERS)

REGULATIONS AND SYLLABI

(REGULATIONS – 2012)

(Effective from the Academic Year 2012-'13)

B.E. (ELECTRONICS AND INSTRUMENTATION ENGINEERING) PROGRAMME

Regulations and Syllabi

(Effective from the Academic Year 2012-'13)

1. Eligibility:

(1) Candidates who passed the following Examination or any other equivalent Examination thereto and who appeared for the entrance test conducted by the University or approved institutions wherever prescribed are eligible for admission to Four Year B.E. (Electronics and Instrumentation Engineering) Programme.

Higher Secondary Examination with Mathematics, Physics and Chemistry conducted by the Government of Tamil Nadu or its equivalent in the relevant subjects.

(2) Candidates who passed Three Year Diploma in Technical Education in the concerned subject conducted by the Government of Tamil Nadu are eligible for admission to Second Year of Four Year B.E. (Electronics and Instrumentation Engineering) Programme.

2. Duration: Four Years comprising 8 Semesters. Each semester has a minimum 90 working days with a minimum of 5 hours a day.

3. Medium: English is the medium of instruction and examination.

4. Weightage for Continuous and End Assessment: The weightage for Continuous Assessment (CA) and End Assessment (EA) be 25:75 unless the ratio is specifically mentioned in the scheme of Examinations.

5. Credit System: Credit system be followed with 18 credits for each semester and each credit is equivalent to 25 hours of effective study provided in the Time Table.

6. Scheme of Examinations

I Semester

Code No.	Course Title	Credit	Marks		
Theory			**CA**	**EA**	**Total**
112EHT01	Technical English – I	1	25	75	100
112MAT02	Mathematics – I	3	25	75	100
112PHT03	Engineering Physics – I	3	25	75	100
112CYT04	Engineering Chemistry – I	3	25	75	100
112EGT05	Engineering Graphics – I	3	25	75	100
112FCT06	Fundamentals of Computing – I	3	25	75	100
Practical					
112CLP01	Computer Practices Laboratory – I	1	25	75	100
112ELP02	Engineering Practices Laboratory – I	1	25	75	100
	Total	**18**	**200**	**600**	**800**

II Semester

Code No.	Course Title	Credit	Marks		
Theory			**CA**	**EA**	**Total**
212EHT01	Technical English – II	2	25	75	100
212MAT02	Mathematics – II	3	25	75	100
212PHT03	Engineering Physics – II	2	25	75	100
212CYT04	Engineering Chemistry – II	2	25	75	100
212CTT05	Circuit Theory	3	25	75	100
212CMT06	Basic Civil & Mechanical Engineering	3	25	75	100
Practical					
212CLP01	Computer Practices Laboratory – II	1	25	75	100
212PCP02	Physics & Chemistry Laboratory – II	1	25	75	100
212ELP03	Electrical Circuits Laboratory	1	25	75	100
	Total	**18**	**225**	**675**	**900**

III Semester

Code No.	Course Title	Credit	Marks		
Theory			**CA**	**EA**	**Total**
312MAT01	Transforms and Partial Differential Equations I	3	25	75	100
312EIT02	Environmental Science and Engineering	2	25	75	100
312EIT03	Electrical Machines	2	25	75	100
312EIT04	Electronic Devices and Circuits	2	25	75	100
312EIT05	Data Structures and Algorithms	3	25	75	100
312EIT06	Electrical Measurements	3	25	75	100
Practical					
312EIP01	Electron Devices and Circuits Laboratory	1	25	75	100
312EIP02	Data Structures and Algorithms Laboratory	1	25	75	100
312EIP03	Electrical Machines Laboratory	1	25	75	100
	Total	**18**	**225**	**675**	**900**

IV Semester

Code No.	Course Title	Credit	Marks		
Theory			**CA**	**EA**	**Total**
412EIT01	Control Systems	3	25	75	100
412EIT02	Industrial Instrumentation - I	2	25	75	100
412EIT03	Transducer Engineering	2	25	75	100
412EIT04	Digital logic Circuits	3	25	75	100
412EIT05	Linear Integrated Circuits and Applications	2	25	75	100
412EIT06	Applied Thermodynamics	3	25	75	100
Practical					
412EIP01	Transducers and Measurements Laboratory	1	25	75	100
412EIP02	Thermodynamics Laboratory	1	25	75	100
412EIP03	Linear and Digital Integrated circuits Lab	1	25	75	100
	Total	**18**	**225**	**675**	**900**

V Semester

Code No.	Course Title	Credit	Marks		
Theory			**CA**	**EA**	**Total**
512EIT01	Microprocessor and Microcontroller	3	25	75	100
512EIT02	Communication Engineering	2	25	75	100
512EIT03	Object Oriented Programming	3	25	75	100
512EIT04	Industrial Electronics	3	25	75	100
512EIT05	Analytical Instruments	2	25	75	100
512EIT06	Industrial Instrumentation – II	2	25	75	100
Practical					
512EIP01	Microprocessor and Microcontroller Lab	1	25	75	100
512EIP02	Object Oriented Programming Laboratory	1	25	75	100
512EIP03	Industrial Instrumentation Laboratory	1	25	75	100
	Total	**18**	**225**	**675**	**900**

VI Semester

Code No.	Course Title	Credit	Marks		
Theory			**CA**	**EA**	**Total**
612EIT01	Modern Electronic Instrumentation	2	25	75	100
612EIT02	Process Control	3	25	75	100
612EIT03	Digital System Design	2	25	75	100
612EIT04	Digital Signal Processing	3	25	75	100
612EIT05	Embedded System	3	25	75	100
612EIT06	Biomedical Instrumentation	2	25	75	100
Practical					
612EIP01	Communication and DSP Laboratory	1	25	75	100
612EIP02	Process Control System Lab	1	25	75	100
612EIP03	Virtual Instrumentation Lab	1	25	75	100
	Total	**18**	**225**	**675**	**900**

VII Semester

Code No.	Course Title	Credit	Marks		
Theory			**CA**	**EA**	**Total**
712EIT01	Industrial Data Networks	3	25	75	100
712EIT02	Logic and Distributed Control System	3	25	75	100
712EIT03	VLSI Design	3	25	75	100
712EIT04	Fibre Optics and Laser Instruments	3	25	75	100
712EIT05	**Elective – I :Artificial Intelligence**	2	25	75	100
712EIT09	**Elective – II :Power Plant Instrumentation**	2	25	75	100
Practical					
712EIP01	VLSI Lab	1	25	75	100
712EIP02	Instrumentation System Design Laboratory	1	25	75	100
	Total	**18**	**200**	**600**	**800**

VIII Semester

Code No.	Course Title	Credit	Marks		
Theory			**CA**	**EA**	**Total**
812EIT01	Principles of Management	3	25	75	100
808EIT05	**Elective–III : Robotics and Automation**	3	25	75	100
808EIT08	**Elective –IV : Digital Control System**	3	25	75	100
Practical					
812EIP01	Project Work	9	25	75	100
	Total	**18**	**100**	**300**	**400**

LIST OF ELECTIVE COURSES

Code No.	Course Title	Credit
Elective – I		
712EIT05	**Artificial Intelligence**	2
712EIT06	Computer Architecture	2
712EIT07	Operating System	2
712EIT08	Visual Programming	2
Elective – II		
712EIT09	**Power Plant Instrumentation**	2
712EIT10	Instrumentation in Petrochemical Industries	2
712EIT11	Micro Electro Mechanical Systems	2
712EIT12	Fundamental of Nanoscience	2
Elective – III		
812EIT02	Digital Image Processing	3
812EIT03	Advanced Communication Engineering	3
812EIT04	Advanced Digital Signal Processing	3
812EIT05	**Robotics and Automation**	3
Elective – IV		
812EIT06	Total Quality Management	3
812EIT07	Professional Ethics in Engineering	3
812EIT08	**Digital Control System**	3
812EIT09	Applied Soft Computing	3

7. **Passing Requirements:** The minimum pass mark (raw score) be 50% in End Assessment (EA) and 50% in Continuous Assessment (CA) and End Assessment (EA) put together. No minimum mark (raw score) in Continuous Assessment (CA) be prescribed unless it is specifically mentioned in the scheme of Examination.

8. **Grading System:** Grading System on a 10 Point Scale be followed with 1 mark = 0.1 Grade point to successful candidates as given below.

CONVERSION TABLE

(1 mark = 0.1 Grade Point on a 10 Point Scale)

Range of Marks	Grade Point	Letter Grade	Classification
90 to 100	9.0 to 10.0	O	First Class
80 to 89	8.0 to 8.9	A	First Class
70 to 79	7.0 to 7.9	B	First Class
60 to 69	6.0 to 6.9	C	First Class
50 to 59	5.0 to 5.9	D	Second Class
0 to 49	0 to 4.9	**F**	**Reappearance**

Procedure for Calculation

Cumulative Grade Point Average (CGPA) = $\frac{\text{Sum of Weighted Grade Points}}{\text{Total Credits}}$

= $\frac{\sum (CA+EA)\ C}{\sum C}$

Where Weighted Grade Points in each Course = Grade Points (CA+EA) multiplied by Credits

= (CA+EA)C

Weighted Cumulative Percentage of Marks(WCPM) = CGPAx10

C- Credit, CA-Continuous Assessment, EA- End Assessment

9. Pattern of the Question Paper: The question paper for End Assessment will be set for three hours and for the maximum of 100 marks with following divisions and details.

Part A: 10 questions (with equal distribution to all units in the syllabus). Each question carries 2 marks.

Part B: 5 question with either or type (with equal distribution to all units in the syllabus). Each question carries 16 marks.

The total marks scored by the candidates will be reduced to the maximum prescribed in the Regulations.

10. Effective Period of Operation for the Arrear Candidates : Two Year grace period is provided for the candidates to complete the arrear examination, if any.

Registrar

11. Syllabus

112EHT01 - TECHNICAL ENGLISH – I

AIM:

To encourage students to actively involve in participative learning of English and to help them acquire Communication Skills.

OBJECTIVES:

- To help students develop listening skills for academic and professional purposes.
- To help students acquire the ability to speak effectively in English in real-life situations.
- To inculcate reading habit and to develop effective reading skills.
- To help students improve their active and passive vocabulary.
- To familiarize students with different rhetorical functions of scientific English.
- To enable students write letters and reports effectively in formal and business situations.

UNIT I

General Vocabulary - changing words from one form to another - Adjectives, comparative adjectives – Adverbs - Active and passive voice – Tenses - simple present, present continuous - Adverb forms – Nouns – compound nouns - Skimming and scanning - Listening and transfer of information – bar chart, flowchart - Paragraph writing, description – Discussing as a group and making an oral report on the points discussed, conversation techniques - convincing others.

Suggested activities:

1. Matching words & meanings - Using words in context – Making sentences.
2. Changing sentences from active to passive voice & vice versa.
3. Skimming, cloze exercises, exercises transferring information from text to graphic form – bar charts, flow charts.
4. Writing descriptions using descriptive words & phrases, and technical vocabulary.
5. Role play, conversation exercises, discussions, oral reporting exercises
   Any other related relevant classroom activity

UNIT II

Vocabulary – prefixes & suffixes – simple past tense - Spelling and punctuation – 'wh' Question forms - Scanning, inference - Listening & note-taking - Paragraph writing - comparison and contrast - Creative thinking and speaking.

Suggested Activities:

1. a. Vocabulary actiivities using prefixes and suffixes.
   b. Exercises using questions – asking & answering questions.
2. Scanning the text for specific information
3. Listening guided note-taking - Writing paragraphs using notes, giving suitable headings and subheadings for paragraphs. Using expressions of comparison and contrast.
4. Discussion activities and exploring creative ideas.
   Any other related relevant classroom activity

UNIT III

Tenses - simple past, simple future and past perfect - Reading in Context -Listening & note-taking – single line – Definitions – sequencing of sentences – instruction - Persuasive speaking.

Suggested activities:

1. a. Providing appropriate context for the use of tenses
2. Listening and note-taking
3. (a) Writing sentence definitions, instructions
   (b) Identifying the discourse links and sequencing jumbled sentences / writing instructions.
4. Speaking exercises, discussions, role play exercises using explaining, convincing and persuasive strategies
   Any other related relevant classroom activity

UNIT IV

Modal verbs and Probability – Concord subject verb agreement – Correction of errors - Cause and effect expressions – Extended Definition - Speaking about the future plans.

Suggested activities:

1. a. Making sentences using modal verbs to express probability
   b. Gap filling using relevant grammatical form of words.
2. 2. Writing extended definitions
3. Speaking - role play activities, discussions, extempore speaking exercises speculating about the future.
   Any other related relevant classroom activity

UNIT V

'If' conditionals – Gerunds - Intensive reading - Speaking – Presentation of problems & solutions - Itinerary – planning for an industrial visit - Formal Letter writing – Letter to the editor, invititation letter, accepting, declining letter and permission letter.

Suggested activities:

1. a) Sentence completion exercises using 'If' conditionals.
   b) Gap filling exercises using gerunds and present participle forms
2. Reading comprehension exercises.
3. Role play, discussion, debating and speaking activities for stating, discussing
   a. problems and suggesting solutions.
4. Planning a tour, Writing a travel itinerary. Writing letters to officials and to the
   a. editor in formal/official contexts.

   Any other related relevant classroom activity

TEXT BOOK:

1. Department of Humanities & Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 & 2), Chennai: Orient Longman Pvt. Ltd., 2006. Themes 1 – 4 (Resources, Energy, Computer, Transport)

REFERENCES:

1. Meenakshi Raman and Sangeeta Sharma, 'Technical Communication English skills for Engineers', Oxford University Press, 2008.
2. Andrea, J. Rutherford, 'Basic Communication Skills for Technology', Second Edition, Pearson Education, 2007.

Extensive Reading:

1. A.P.J.Abdul Kalam with Arun Tiwari, 'Wings of Fire' An Autobiography, University Press (India) Pvt. Ltd.,1999, 30th Impression 2007.

NOTE:

The book given under Extensive Reading is meant for inculcating the reading habit of the students. They need not be used for testing purposes.

112MAT02 - MATHEMATICS – I

UNIT I MATRICES

Characteristic equation – Eigen values and eigen vectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT II THREE DIMENSIONAL ANALYTICAL GEOMETRY

Equation of a sphere – Plane section of a sphere – Tangent Plane – Equation of a cone – Right circular cone – Equation of a cylinder – Right circular cylinder.

UNIT III DIFFERENTIAL CALCULUS

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes – Evolute as envelope of normals.

UNIT IV FUNCTIONS OF SEVERAL VARIABLES

Partial derivatives – Euler's theorem for homogenous functions – Total derivatives – Differentiation of implicit functions – Jacobians – Taylor's expansion – Maxima and Minima – Method of Lagrangian multipliers.

UNIT V MULTIPLE INTEGRALS Double integration – Cartesian and polar coordinates – Change of order of integration – Change of variables between Cartesian and polar coordinates – Triple integration in Cartesian co-ordinates – Area as double integral – Volume as triple integral

TEXT BOOK:

1. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", Third edition, Laxmi Publications(p) Ltd.,(2008).
2. Grewal. B.S, "Higher Engineering Mathematics", 40th Edition, Khanna Publications, Delhi, (2007).

REFERENCES:

1. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2007).
2. Glyn James, "Advanced Engineering Mathematics", 7th Edition, Pearson Education, (2007).
3. Jain R.K and Iyengar S.R.K," Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House Pvt. Ltd., (2007).

112PHT03 – ENGINEERING PHYSICS I

UNIT-I: ACOUSTICS & ULTRASONICS

Classifications of sound – Characteristics of musical sound – Intensity – Loudness – Weber Fechner law – Decibel – reverberation – reverberation time, derivation of Sabine's formula for reverberation – (Jager's Method) - absorption coefficient and its determination – factors affecting acoustics of building (optimum reverberation time, loudness, focusing, echo, echelon, effect, resonance, and noise) and their remedies – Ultrasonic production –Magnetostriction and piezoelectric methods – Properties – applications of ultrasonic with particular reference to detection of flaws in metal (Non – Destructive testing NDT) – SONAR.

UNIT II LASER & ITS APPLICATIONS

Introduction – Principle of Spontaneous emission and stimulated emission. Population inversion, pumping. Einsteins A and B Coefficient – derivations. Types of lasers – He-Ne, CO2, Nd-YAG, Semiconductor lasers (homojunction & heterojunction) Qualitative Industrial Applications – Lasers in welding, heat treatment, cutting – Medical applications – Holography (construction & reconstruction).

UNIT III CRYSTAL PHYSICS

Lattice –Unit cell –Bravais lattice –Lattice Planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – atomic radius – Coordination number –Packing factor for SC, BBC, FCC and HCP structure –Polymorphism and allotrophy – Crysal defects – point, line and surface defects.

UNIT IV PROPERTIES OF MATTER

Elasticity – types of moduli of elasticity – stress strain diagram –Young's modules of elasticity – rigidity modules – bulk modules – Factors affecting elasticity – twisting couple on a wire – Torsional pendulum – determination of rigidity modules of a wire – depression of a cantilever – Young's modulus by cantilever – uniform and non uniform bending – viscosity – Coefficient of viscosity – Determination of viscosity - Poiseuille's Method –Ostwalds viscometer – comparision of viscosities.

Unit V OPTICS & FIBER OPTICS

Air Wedge theory and experiment – testing of flat surfaces –anti reflection coating – Michelson interferometer – types of fringes, determination of wave length of monochromatic source and thickness of a thin transparent sheet – Double refraction – Photoelasticity – Photoelastic effect – Photoelastic analysis –Photoelastic material – Block diagram of a photoelastic bench.
Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle – Types – Types of optical fibres (material, refraction index, mode)- Double crucible technique of fibre drawing – Fibre drawing – Fibre optical communication system (Block diagram)

Text Book:

1. S.Stella Mary , m. Parasuraman and a. Mohammed Hidayathullah , 'Engineering Physics I R.K. Publishers, Coimbatore (2012)

REFERENCES:

1. R.K. Gaur and S.C.Gupta, "Engineering Physics" Dhanpat Rai Publications , New Delhi(2003)
2. M.N. Avadhanulu and PG Kshirsagar, 'A Text book of Engineering Physics' S.Chand and company, Ltd. New Delhi, 2005.
3. Serway and Jewett, 'Physics for Scientists and Engineering with Modern Physics', 6th Edition, Thomson Brooks/Cole, Indian reprint (2007).
4. Rajendran, Vand Marikani A, 'Engineering Physics' Tata McGraw Hill Publications Ltd,lll edition New Delhi,(2004).
5. Palaniswamy, P.K. 'Engineering Physics' Scitech publications,Chennai,(2007)
6. Jayakumar.s 'Engineering Physics' , R.K.publishers, Coimbatore. (2007)
7. Jayakumar. S 'Engineering Physics', Pearson Education,New Delhi, (2007).
8. Dr. P. Santhana Raghavan, Dr.P. Ramasamy, Crystal Growth- Process and Methods –KRU Publications-Kumbakonam.

112CYT04 ENGINEERING CHEMISTRY –I

Aim

To impart a sound knowledge on principles of Chemistry involving industrial application oriented topics required for all engineering branches.

Objectives

* The student should be conversant with the principles, treatment of water for potable and industrial purposes
- Principles of polymer chemistry and its application in industries
- Industrial application of surface chemistry
- Conventional and Non- conventional energy sources and Principle and working of energy storage devices
- Chemistry of engineering materials and their industrial applications.

UNIT I WATER TECHNOLOGY

Characteristics –alkalinity-types of alkalinity and determination - Water - Hardness and problems -Estimation of Hardness by EDTA method - Problems in EDTA Titrations - Domestic water treatment-Disinfection methods (boiling, bleaching powder, chlorination UV treatment, ozonisation) Boiler feed water- Requirements -Disadvantages of using hard water in boilers-Scale and sludge formation, Carry over trouble, Caustic embrittlement and Boiler corrosion –Internal conditioning- colloidal,carbonate,phosphate and calgon conditioning methods. External conditioning -Zeolite Process and Demineralization process- Desalination - Reverse osmosis and Electro dialysis

UNIT II POLYMERS AND COMPOSITES

Polymers - Definition –Nomenclature -Functionality- Polymerization –Types -addition condensation, copolymerization and co-ordination polymerization –Mechanism of free radicaland Co-ordination polymerization -Plastics-Classification -Preparation .properties and uses of PVC, Teflon – Polycarbonates, Polyurethanes,Nylon 6,6, PET- Rubber-Vulcanisation of rubber ,synthetic rubber,Butyl rubber ,SBR.

Composites- Definition – Types of Composites - Polymer matrix composites –Metal matrix composites – Ceramic matrix composites ,properties and their application

UNIT III SURFACE CHEMISTRY

Adsorption – Terminology –Types- physical adsorption and chemical adsorption -Differences - Adsorption of gases on solids -Adsorption isotherms -Freundlich adsorption isotherm -Langmuir adsorption isotherm – Limitation. Adsorption of solutes from solutions - Ion exchange adsorption- Pollution abatement -Chromatography

Catalysis –Types-– Role of adsorbent in catalysis.

UNIT IV NON –CONVENTIONAL ENERGY SOURCES AND ENERGY STORAGE DEVICES

Nuclear energy – Difference between chemical and nuclear reactions -fusion and fission reactions – Binding energy – Mass defect-problems- Nuclear reactor- components -Light water nuclear power plant -Breeder reactor –Atom bomb.

Solar energy conversion-Solar cells, wind energy –-Fuel cells– Hydrogen-oxygen fuel cell – Batteries – Dry cell- alkaline battery -Lead - acid battery –Nickel –Cadmium battery - Lithium battery- Lithium – Sulphur battery.

UNIT V ENGINEERING MATERIALS

Refractories –classification –acidic, basic and neutral refractories-properties of refractories – refractoriness- refractoriness under load –dimensional stability-porosity-thermal spalling-chemical inertness-Manufacture of alumina, magnesite and zirconia bricks - Abrasives- natural and synthetic abrasives- Quartz, corundum, emery, garnet, diamond, silicon carbide ,alundum and boron carbide- Lubricants- Mechanism of lubrication – Classification - Solid lubricants-graphite and molybdenum disulphide.- Semi -Solid lubricants – Grease- Liquid lubricants -Synthetic lubricants - Blended oils -Properties- Viscosity ,Viscosity index, Flash and fire points, Cloud and pour points,Oiliness. and their significance –Adhesives -Classification and applications

Nano chemistry- Introduction –Properties –Carbon nanotubes –Classification – Synthesis – Applications

Text Books

1. P.C.Jain and Monica Jain , ''Engineering Chemistry'', Dhanpat Rai Pub Co Ltd New Delhi (2002)
2. S.S.Dara , '' A Text Book of Engineering Chemistry'', S.Chand & Co Ltd New Delhi (2006)
3. Dr.Sayeeda Sultana " Engineering chemistry '' Vol-I Professional and Technical Publishers, Coimbatore (2011)

Reference Books

1. B.K.Sharma ''Engineering Chemistry'',Krishna Prakasan Media (P) Ltd Meerut (2001)
2. B.Shiva Sankar ''Engineering Chemistry'',Tata McGraw-Hill Pub Co Ltd New Delhi (2008)

112EGT05 - ENGINEERING GRAPHICS

AIM
To develop graphic skills in students.

OBJECTIVES
To develop in students graphic skill for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

Concepts and conventions (Not for Examination)
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HAND SKETCHING

Curves used in engineering practices:
Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of squad and circle – Drawing of tangents and normal to the above curves.

Free hand sketching:
Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES
Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT III PROJECTION OF SOLIDS
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES
Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section.

Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS
Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones.

Perspective projection of prisms, pyramids and cylinders by visual ray method.

TEXT BOOKS:

1. N.D. Bhatt, "Engineering Drawing" Charotar Publishing House, 46th Edition, (2003).

REFERENCES:

1. K. V. Natrajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai (2006).
2. M.S. Kumar, "Engineering Graphics", D.D. Publications, (2007).
3. K. Venugopal & V. Prabhu Raja, "Engineering Graphics", New Age International (P) Limited (2008).
4. M.B. Shah and B.C. Rana, "Engineering Drawing", Pearson Education (2005).
5. K. R. Gopalakrishnana, "Engineering Drawing" (Vol.I&II), Subhas Publications (1998).
6. Dhananjay A.Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill Publishing Company Limited (2008).
7. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, (2008).

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. Whenever the total number of candidates in a college exceeds 150, the University Examination in that college will be conducted in two sessions (FN and AN on the same day) for 50 percent of student (approx) at a time.

112FCT06 - FUNDAMENTALS OF COMPUTING AND PROGRAMMING

AIM :

To provide an awareness to Computing and Programming

OBJECTIVES :

- To enable the student to learn the major components of a computer system
- To know the correct and efficient ways of solving problems
- To learn to use office automation tools
- To learn to program in C

UNIT I INTRODUCTION TO COMPUTERS

Introduction – Characteristics of Computers – Evolution of Computers - Computer Generations – Classification of Computers – Basic Computer organization – Number Systems

UNIT II COMPUTER SOFTWARE

Computer Software –Types of Software – Software Development Steps – Internet Evolution - Basic Internet Terminology – Getting connected to Internet Applications.

UNIT III PROBLEM SOLVING AND OFFICE APPLICATION SOFTWARE

Planning the Computer Program – Purpose – Algorithm – Flow Charts – Pseudocode -Application Software Packages- Introduction to Office Packages (not detailed commands for examination).

UNIT IV INTRODUCTION TO C

Overview of C – Constants, Variables and Data Types – Operators and Expressions – Managing Input and Output operators – Decision Making - Branching and Looping.

UNIT V FUNCTIONS AND POINTERS

Handling of Character Strings – User-defined Functions – Definitions – Declarations - Call by reference – Call by value – Structures and Unions – Pointers – Arrays – The Preprocessor – Developing a C Program : Some Guidelines

TEXT BOOKS:

1. Ashok.N.Kamthane," Computer Programming", Pearson Education (India) (2008).
2. Behrouz A.Forouzan and Richard.F.Gilberg, "A Structured Programming Approach Using C", II Edition, Brooks-Cole Thomson Learning Publications, (2007).

REFERENCES:

1. Pradip Dey, Manas Ghoush, "Programming in C", Oxford University Press. (2007).
2. Byron Gottfried, "Programming with C", 2nd Edition, (Indian Adapted Edition), TMH publications, (2006).
3. Stephen G.Kochan, "Programming in C", Third Edition, Pearson Education India, (2005).
4. Brian W.Kernighan and Dennis M.Ritchie, "The C Programming Language", Pearson Education Inc., (2005).
5. E.Balagurusamy, "Computing fundamentals and C Programming", Tata McGraw-Hill Publishing Company Limited, (2008).
6. S.Thamarai Selvi and R.Murugan, "C for All", Anuradha Publishers, (2008).

112CLP01 - COMPUTER PRACTICE LABORATORY – I

LIST OF EXERCISES

a) Word Processing

1. Document creation, Text manipulation with Scientific notations.
2. Table creation, Table formatting and Conversion.
3. Mail merge and Letter preparation.
4. Drawing - flow Chart

b) Spread Sheet

5. Chart - Line, XY, Bar and Pie.
6. Formula - formula editor.
7. Spread sheet - inclusion of object, Picture and graphics, protecting the document and sheet.
8. Sorting and Import / Export features.

Simple C Programming

9. Data types, Expression Evaluation, Condition Statements.
10. Arrays
11. Structures and Unions
12. Functions

* For programming exercises Flow chart and pseudocode are essential

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS

Hardware

☐LAN System with 33 nodes (OR) Standalone PCs – 33 Nos.
☐Printers – 3 Nos.

Software

☐OS – Windows / UNIX Clone
☐Application Package – Office suite
☐Compiler – C

112ELP02 - ENGINEERING PRACTICES LABORATORY

OBJECTIVES

To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE

Buildings:

(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
(b) Study of pipe connections requirements for pumps and turbines.
(c) Preparation of plumbing line sketches for water supply and sewage works.
(d) Hands-on-exercise:
Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
(e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

(a) Study of the joints in roofs, doors, windows and furniture.
(b) Hands-on-exercise:
Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE

Welding:

(a) Preparation of arc welding of butt joints, lap joints and tee joints.
(b) Gas welding practice

Basic Machining:

(a) Simple Turning and Taper turning
(b) Drilling Practice

Sheet Metal Work:

(a) Forming & Bending:
(b) Model making – Trays, funnels, etc.
(c) Different type of joints.

Machine assembly practice:

(a) Study of centrifugal pump
(b) Study of air conditioner

Demonstration on:

(a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
(b) Foundry operations like mould preparation for gear and step cone pulley.
(c) Fitting – Exercises – Preparation of square fitting and vee – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EOR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

REFERENCES:

1. K.Jeyachandran, S.Natarajan & S, Balasubramanian, "A Primer on Engineering Practices Laboratory", Anuradha Publications, (2007).
2. T.Jeyapoovan, M.Saravanapandian & S.Pranitha, "Engineering Practices Lab Manual", Vikas Puplishing House Pvt.Ltd, (2006)
3. H.S. Bawa, "Workshop Practice", Tata McGraw – Hill Publishing Company Limited, (2007).
4. A. Rajendra Prasad & P.M.M.S. Sarma, "Workshop Practice", Sree Sai Publication, (2002).
5. P.Kannaiah & K.L.Narayana, "Manual on Workshop Practice", Scitech Publications, (1999).

SEMESTER EXAMINATION PATTERN

The Laboratory examination is to be conducted for Group A & Group B, allotting 90 minutes for each group, with a break of 15 minutes. Both the examinations are to be taken together in sequence, either in the FN session or in the AN session. The maximum marks for Group A and Group B lab examinations will be 50 each, totaling 100 for the Lab course. The candidates shall answer either I or II under Group A and either III or IV under Group B, based on lots.

Engineering Practices Laboratory

List of equipment and components (For a Batch of 30 Students)

CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.	15 Sets.
2. Carpentry vice (fitted to work bench)	15 Nos.
3. Standard woodworking tools	15 Sets.
4. Models of industrial trusses, door joints, furniture joints	5 each
5. Power Tools:	
(a) Rotary Hammer	2 Nos
(b) Demolition Hammer	2 Nos
(c) Circular Saw	2 Nos
(d) Planer	2 Nos
(e) Hand Drilling Machine	2 Nos
(f) Jigsaw	2 Nos

MECHANICAL

1. Arc welding transformer with cables and holders	5 Nos.
2. Welding booth with exhaust facility	5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos.
5. Centre lathe	2 Nos.
6. Hearth furnace, anvil and smithy tools	2 Sets.
7. Moulding table, foundry tools	2 Sets.
8. Power Tool: Angle Grinder	2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner	One each.

ELECTRICAL

1. Assorted electrical components for house wiring	15 Sets
2. Electrical measuring instruments	10 Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp	1 each
4. Megger (250V/500V)	1 No.
5. Power Tools: (a) Range Finder	2 Nos
(b) Digital Live-wire detector	2 Nos

ELECTRONICS

1. Soldering guns 10 Nos.
2. Assorted electronic components for making circuits 50 Nos.
3. Small PCBs 10 Nos.
4. Multimeters 10 Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply

COMMON TO ALL BRANCHES

PHYSICS LABORATORY (Any Ten Experiments)

1. Determination of Young's modulus of the material – non uniform bending.
2. Determination of Young's modulus of the material – uniform bending .
3. Determination of viscosity of liquid – Poiseuille's method.
4. Torsional pendulum – Determination of rigidity modulus.
5. Determination of the thermal conductivity of a bad conductor – Lee's Disc method.
6. Determination of the thickness of a thin wire – Air Wedge method.
7. (a) Particle size determination using Diode Laser.
   (b) Determination of Laser Parameters – Wave length, and angle of divergence.
   (c) Determination of acceptance angle in an optical fiber.
8. Spectrometer dispersive power of a prism.
9. Determination of Wave length of mercury spectrum –Spectrometer grating.
10. Determination of Band Gap of a Semiconductor diode.
11. Determination of velocity of sound and compressibility of liquid- Ultrasonic Interferometer.
12. Determination of Hysteresis loss in a ferromagnetic material

- **A minimum of FIVE experiments shall be offered in Each Semester.**
- **Laboratory classes on alternate weeks for physics and chemistry.**
- **The lab examinations will be held only in the second Semester.**

CHEMISTRY LABORATORY – I

LIST OF EXPERIMENTS

1. Estimation of hardness of Water by EDTA method

2. Estimation of Copper in brass by EDTA method

3. Determination of DO in water (Winkler's method)

4. Estimation of Chloride in Water sample (Argentometric)

5. Estimation of alkalinity of Water sample

6. Determination of molecular weight and degree of polymerization of a polymer by viscometry.

7. Determination of cloud and pour point of a Lubricating oil

- Any five experiments

II Semester

212EHT01 - TECHNICAL ENGLISH II

AIM:
To encourage students to actively involve in participative learning of English and to help them acquire Communication Skills.

OBJECTIVES:
1. To help students develop listening skills for academic and professional purposes.
2. To help students acquire the ability to speak effectively in English in real-life situations.
3. To inculcate reading habit and to develop effective reading skills.
4. To help students improve their active and passive vocabulary.
5. To familiarize students with different rhetorical functions of scientific English.
6. To enable students write letters and reports effectively in formal and business situations.

UNIT I
Technical Vocabulary - meanings in context, sequencing words, Articles- Prepositions, intensive reading& predicting content, Reading and interpretation, extended definitions, Process description

Suggested activities:
1. Exercises on word formation using the prefix 'self' - Gap filling with preposition.
2. Exercises - Using sequence words.
3. Reading comprehension exercise with questions based on inference – Reading headings
4. and predicting the content – Reading advertisements and interpretation.
5. Writing extended definitions – Writing descriptions of processes – Writing paragraphs based on discussions – Writing paragraphs describing the future.

UNIT II
Phrases / Structures indicating use / purpose – Adverbs-Skimming – Non-verbal communication - Listening – correlating verbal and non-verbal communication -Speaking in group discussions – Formal Letter writing – Writing analytical paragraphs.

Suggested activities:
1. Reading comprehension exercises with questions on overall content – Discussions analyzing stylistic features (creative and factual description) - Reading comprehension exercises with texts including graphic communication - Exercises in interpreting non-verbal communication.
2. Listening comprehension exercises to categorise data in tables.
3. Writing formal letters, quotations, clarification, complaint – Letter seeking permission for Industrial visits– Writing analytical paragraphs on different debatable issues.

UNIT III
Cause and effect expressions – Different grammatical forms of the same word - Speaking – stress and intonation, Group Discussions - Reading – Critical reading - Listening, - Writing – using connectives, report writing – types, structure, data collection, content, form, recommendations .

Suggested activities:

1. Exercises combining sentences using cause and effect expressions – Gap filling exercises using the appropriate tense forms – Making sentences using different grammatical forms of the same word. (Eg: object –verb / object – noun)
2. Speaking exercises involving the use of stress and intonation – Group discussions– analysis of problems and offering solutions.
3. Reading comprehension exercises with critical questions, Multiple choice question.
4. Sequencing of jumbled sentences using connectives – Writing different types of reports like industrial accident report and survey report – Writing recommendations.

UNIT IV

Numerical adjectives – Oral instructions – Descriptive writing – Argumentative paragraphs – Letter of application - content, format (CV / Bio-data) - Instructions, imperative forms - Checklists, Yes/No question form – E-mail communication.

Suggested Activities:

1. Rewriting exercises using numerical adjectives.
2. Reading comprehension exercises with analytical questions on content – Evaluation of content.
3. Listening comprehension – entering information in tabular form, intensive listening exercise and completing the steps of a process.
4. Speaking - Role play – group discussions – Activities giving oral instructions.
5. Writing descriptions, expanding hints – Writing argumentative paragraphs – Writing formal letters – Writing letter of application with CV/Bio-data – Writing general and safety instructions – Preparing checklists – Writing e-mail messages.

UNIT V

Speaking - Discussion of Problems and solutions - Creative and critical thinking – Writing an essay, Writing a proposal.

Suggested Activities:

1. Case Studies on problems and solutions
2. Brain storming and discussion
3. Writing Critical essays
4. Writing short proposals of 2 pages for starting a project, solving problems, etc.
5. Writing advertisements.

TEXT BOOK:

1. Chapters 5 – 8. Department of Humanities & Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 & 2), Chennai: Orient Longman Pvt. Ltd., 2006. Themes 5 – 8 (Technology, Communication, Environment, Industry)

REFERENCES:

1. P. K. Dutt, G. Rajeevan and C.L.N Prakash, 'A Course in Communication Skills', Cambridge University Press, India 2007.
2. Krishna Mohan and Meera Banerjee, 'Developing Communication Skills', Macmillan India Ltd., (Reprinted 1994 – 2007).
3. Edgar Thorpe, Showick Thorpe, 'Objective English', Second Edition, Pearson Education, 2007.

Extensive Reading:

1. Robin Sharma**, '**The Monk Who Sold His Ferrari', Jaico Publishing House, 2007

Note:
The book listed under Extensive Reading is meant for inculcating the reading habit of the students. They need not be used for testing purposes.

212MAT02 - MATHEMATICS – II

UNIT I ORDINARY DIFFERENTIAL EQUATIONS

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT II VECTOR CALCULUS

Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelpipeds.

UNIT III ANALYTIC FUNCTIONS Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping : w= z+c, cz, 1/z, and bilinear transformation.

UNIT IV COMPLEX INTEGRATION

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions – Singular points – Residues – Residue theorem – Application of residue theorem to evaluate real integrals – Unit circle and semi-circular contour(excluding poles on boundaries).

UNIT V LAPLACE TRANSFORM

Laplace transform – Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse functions – Transform of periodic functions.

Definition of Inverse Laplace transform as contour integral – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

TEXT BOOK:

1. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", 3rd Edition, Laxmi Publications (p) Ltd., (2008).
2. Grewal. B.S, "Higher Engineering Mathematics", 40th Edition, Khanna Publications, Delhi, (2007).

REFERENCES:

1. Ramana B.V, "Higher Engineering Mathematics",Tata McGraw Hill Publishing Company, New Delhi, (2007).
2. Glyn James, "Advanced Engineering Mathematics", 3rd Edition, Pearson Education, (2007).
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 7th Edition, Wiley India, (2007).
4. Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House Pvt. Ltd., (2007).

212PHT03 – ENGINEERING PHYSICS II

UNIT I: CONDUCTING MATERIALS

Conductors – classical free electron theory of metals-Electrical and thermal conductivity – Derivation – Wiedemann – Franz law – Lorentz number – Draw backs of Classical free electron theory –Quantum theory – Fermi distribution function – Effect of temperature on Fermi function – Density of energy states – Carrier concentration in metals.

UNIT II: SEMICONDUCTING MATERIALS

INSTRINSIC SEMICONDUCTOR: Intrinsic semiconductor – Density of electrons in conduction band – Density of holes in valence band – Intrinsic carrier concentration – derivation – Fermi level – Variation – of Fermi with temperature – electrical conductivity – mobility – band gap determination.

EXTRINSIC SEMICONDUCTOR: Extrinsic semiconductors – carrier concentration derivation in n-type and p- type semiconductor variation of Fermi level with temperature and impurity concentration – compound semiconductors.

UNIT III: DIELECTRIC MATERIALS

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarization- internal field – Claussius – Mosotti relation (derivation) – dielectric loss - dielectric breakdown – uses of dielectric materials (capacitor and transformer) Ferro electricity and applications.

UNIT IV: QUANTUM AND SUPER CONDUCTING MATERIALS

Black body radiation – Planck's theory (derivation) – Deduction of Wien' displacement law and Rayleigh – jeans' Law from Planck's theory - Compton Effect – Theory and experimental verification – Matter waves – Schrodinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box – Superconductivity: Properties – Types of super conductors – BCS theory of superconductivity(Qualitative) – High Tc superconductors – Applications of super conductors - SQUID, cryotron, magnetic levitation.

UNIT V: NEW ENGINEERING & NANO MATERIALS

Metallic glasses: Preparation, properties and applications – Shape memory alloys (SMA): Characteristic, Properties of NiTi alloy, application, advantages and disadvantages of SMA-synthesis –Plasma arcing – Chemical vapour deposition – sol-gels – eletrodeposition – ball milling – properties of nanoparticles and applications Carbon nanotubes: fabrication – arc method – pulsed laser deposition – chemical vapour deposition –Structure – properties and applications.

Text Books:

1. S. Stella Mary, M. Parasuraman and A. Mohammed Hidayathullah, 'Engineering Physics ll' R.K Publishers, Coimbatore(2012).

REFERENCES:

1. Charles Kittel 'Introduction to solid state physics', John Wiley & Sons, 7th edition, Singapore (2007).
2. Charles P.Poole and Frank J. Ownen, 'Introduction to nanotechnology' Wiley India (2007)(for unit V)
3. Rajendran. v and Marikani.A. 'Materials Science' Tata McGraw hill publications, (2004) New Delhi.
4. Jayakumar. S, 'Materials Science' R.K. Publishers, Coimbatore, (2008).
5. Palanisamy P.K, 'Materials Science' , Scitech publications (India) Pvt. Ltd., Chennai, Second Edition(2007).
6. M. Arumugam, 'Materials Science' Anuradha Publications, Kumbakonam, (2006).

212CYT04 ENGINEERING CHEMISTRY –II

To impart a sound knowledge on principles of Chemistry involving industrial application oriented topics required for all engineering branches.

Objectives

* The student should be conversant with the principles of Electrochemistry Electrochemical cells and their applications.
- Principles of corrosion and its inhibition.
* Chemistry of fuels and combustion.
- Importance of phase rule , alloys and their industrial application.
- Analytical techniques and their instrumentation.

UNIT I ELECTROCHEMISTRY

Electrochemical cells-Reversible and irreversible cells-Concentration cells -EMF Measurement of emf- Single electrode potential -Nernst equation(problem)-Reference electrodes-Standard hydrogen electrode-Calomel electrode-Ion selective electrode-Glass electrode-Measurement of pH-Electrochemical series-significance- Potentiometric titration (redox Fe^{2+}Vs Dichromate,) -Conductometric titrations (acid-base and precipitation titrations)

UNIT II CORROSION AND CORROSION CONTROL

Chemical corrosion –Pilling- Bedworth rule-electrochemical corrosion –mechanism Different types of corrosion-Galvanic corrosion-Differential aeration corrosion –pitting corrosion-waterline corrosion –stress corrosion –crevice corrosion-Factors influencing corrosion -corrosion control-sacrificial anode and impressed cathodic current methods-corrosion inhibitors –protective coatings-paints-constituents-functions- metallic coatings- anodic coating –cathodic coating- metal cladding -diffusion coating - electroplating of gold and electroless plating of nickel.

UNIT III FUELS AND COMBUSTION

Calorific value –Classification-coal -Proximate analysis and Ultimate analysis-Metallurgical Coke-Manufacture by Bee-hive oven and Otto-Hoffmann method-Petroleum processing and fractions-Cracking -Catalytic cracking and methods-Knocking –octane number –cetane number-Synthetic petrol-Fischer –Tropsch and Bergius process-Gaseous fuels-,Water gas-Producer gas., CNG and LPG-Flue gas analysis-Orsat apparatus-Theoretical air for combustion-Problems

UNIT IV PHASE RULE AND ALLOYS

Statement and Explanation of terms involved with examples- Phase diagram-One Component system-Water system- Condensed phase rule-Construction of phase diagram by Thermal analysis-Simple eutectic system(Lead-silver system only)- Limitations of phase rule-Alloys-importance of Ferrous alloys-Nichrome-Alnico -Stainless steel-Heat treatment of steel -Non-Ferrous alloys -Brass and Bronze

UNIT V ANALYTICAL TECHNIQUES

Spectroscopy –Atomic and molecular spectroscopy-Absorption spectrum –Emission spectrum **–** Absorbance**-**Beer-Lamberts law-Problems-UV Visible spectroscopy -IR spectroscopy-(principle,instrumentation (block diagram only)and applications colorimetry(principle ,instrumentation and applications)-Estimation of iron by colorimetry.Flame photometry-(principle , instrumentation and applications)-Estimation of Sodium by Flame photometry-Atomic absorption spectroscopy(principle , instrumentation and applications)-Estimation of Nickel by Atomic absorption spectroscopy.

Text Books

1. P.C.Jain and Monica Jain , ''Engineering Chemistry'', Dhanpat Rai Pub Co Ltd ,New Delhi (2002)
2. S.S.Dara , '' A Text Book of Engineering Chemistry'', S.Chand & Co Ltd New Delhi (2006)
3. Dr.Sayeeda Sultana " Engineering chemistry '' Vol –II, Professional and Technical publishers ,Coimbatore (2011)

Reference Books

1. B.K.Sharma ''Engineering Chemistry'',Krishna Prakasan Media (P) Ltd Meerut (2001)
2. B.Shiva Sankar ''Engineering Chemistry'',Tata McGraw-Hill Pub Co Ltd New Delhi **(** 2008)

212CCT05 - CIRCUIT THEORY
(Common to EEE, EIE and ICE Branches)

UNIT I BASIC CIRCUITS ANALYSIS

Ohm's Law – Kirchoffs laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and node voltage method of analysis for D.C and A.C. circuits.

UNIT II NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS:

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Novton & Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

UNIT III RESONANCE AND COUPLED CIRCUITS

Series and paralled resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input.

UNIT V ANALYSING THREE PHASE CIRCUITS

Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis",Tata McGraw Hill publishers, 6th edition, New Delhi, (2002).
2. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis",Tata McGraw Hill, (2007).

REFERENCES:

1. Paranjothi SR, "Electric Circuits Analysis," New Age International Ltd., New Delhi, (1996).
2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw-Hill, New Delhi (2001).
3. Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, (1999).
4. Charles K. Alexander, Mathew N.O. Sadik, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, (2003)

212CMT06 - BASIC CIVIL & MECHANICAL ENGINEERING
(Common to branches under Electrical and I & C Faculty)

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS

Surveying: Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples.

Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel sections.

UNIT II BUILDING COMPONENTS AND STRUCTURES

Foundations: Types, Bearing capacity – Requirement of good foundations.

Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.

B – MECHANICAL ENGINEERING

UNIT III POWER PLANT ENGINEERING

Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

UNIT IV I C ENGINES

Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

REFERENCES:

1. Shanmugam G and Palanichamy M S, "Basic Civil and Mechanical Engineering",Tata McGraw Hill Publishing Co., New Delhi, (1996).
2. Ramamrutham. S, "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd. (1999).
3. Seetharaman S. "Basic Civil Engineering", Anuradha Agencies, (2005).
4. Venugopal K and Prahu Raja V, "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam, (2000).
5. Shantha Kumar S R J., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai, (2000).

212CLP01 - COMPUTER PRACTICE LABORATORY – II

LIST OF EXPERIMENTS

1. UNIX COMMANDS

Study of Unix OS - Basic Shell Commands - Unix Editor

2. SHELL PROGRAMMING

Simple Shell program - Conditional Statements - Testing and Loops

3. C PROGRAMMING ON UNIX

Dynamic Storage Allocation-Pointers-Functions-File Handling

HARDWARE / SOFTWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS

Hardware

☐1 UNIX Clone Server
☐33 Nodes (thin client or PCs)
☐Printer – 3 Nos.

Software

☐OS – UNIX Clone (33 user license or License free Linux)
☐Compiler - C

COMMON TO ALL BRANCHES

PHYSICS LABORATORY (Any Ten Experiments)

1. Determination of Young's modulus of the material – non uniform bending.
2. Determination of Young's modulus of the material – uniform bending .
3. Determination of viscosity of liquid – Poiseuille's method.
4. Torsional pendulum – Determination of rigidity modulus.
5. Determination of the thermal conductivity of a bad conductor – Lee's Disc method.
6. Determination of the thickness of a thin wire – Air Wedge method.
7. (a) Particle size determination using Diode Laser.
(b) Determination of Laser Parameters – Wave length, and angle of divergence.
(c) Determination of acceptance angle in an optical fiber.
8. Spectrometer dispersive power of a prism.
9. Determination of Wave length of mercury spectrum –Spectrometer grating.
10. Determination of Band Gap of a Semiconductor diode.
11. Determination of velocity of sound and compressibility of liquid- Ultrasonic Interferometer.
12. Determination of Hysteresis loss in a ferromagnetic material

- **A minimum of FIVE experiments shall be offered in Each Semester.**
- **Laboratory classes on alternate weeks for physics and chemistry.**
- **The lab examinations will be held only in the second Semester.**

CHEMISTRY LABORATORY – I

LIST OF EXPERIMENTS

1. Estimation of hardness of Water by EDTA method

2. Estimation of Copper in brass by EDTA method

3. Determination of DO in water (Winkler's method)

4. Estimation of Chloride in Water sample (Argentometric)

5. Estimation of alkalinity of Water sample

6. Determination of molecular weight and degree of polymerization of a polymer by viscometry.

7. Determination of cloud and pour point of a Lubricating oil

- Any five experiments

212ELP03 - ELECTRICAL CIRCUIT LABORATORY
(Common to EEE, EIE and ICE)

LIST OF EXPERIMENTS

1. Verification of ohm's laws and kirchoff's laws.
2. Verification of Thevemin's and Norton's Theorem
3. Verification of superposition Theorem
4. Verification of maximum power transfer theorem.
5. Verification of reciprocity theorem
6. Measurement of self inductance of a coil
7. Verification of mesh and nodal analysis.
8. Transient response of RL and RC circuits for DC input.
9. Frequency response of series and parallel resonance circuits.
10. Frequency response of single tuned coupled circuits.

312MAT01 - TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS
(Common o all branches)

OBJECTIVES

The course objective is to develop the skills of the students in the areas of Transforms and Partial Differtial Equations. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.

1. 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 identify – Harmonic Analysis.

2. FOURIER TRANSFORM

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

3. PARTIAL DIFFERENTIAL EQUATIONS

Formation of partial differential equations - Lagrange's linear equation - Solution of standard types of first order partial differential equations – Linear partial differential equations of second and higher order with constant coefficients.

4. APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat equation (Insulated edges excluded) – Fourier series solutions in cartesian coordinates.

5. Z -TRANSFORM AND DIFFERENCE EQUATIONS

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

TEXTBOOKS

1. Grewal B.S, 'Higher Engineering Mathematics', 39th Edition, Khanna Publishers, Delhi, 2007.

REFERENCE BOOKS

1. Bali.N.P. and Manish Goyal 'A Textbook of Engineering Mathematics', Seventh Edition, Laxmi Publications (P) Ltd.
2. Ramana.B.V. 'Higher Engineering Mathematics' Tata Mc-GrawHill Publishing Company Limited, New Delhi.
3. Glyn James ' ADVANCED MODERN ENGINEERING MATHEMATICS', Third edition – Pearson education – 2007.
4. ERWIN KREYSZIG ' ADVANCED ENGINEERING MATHEMATICS' Eighth Edition – WILEY INDIA – 2007.

312EIT02 - ENVIRONMENTAL SCIENCE AND ENGINEERING
(Common to EEE, EIE, Biotech, Chemical,)

AIM

The aim of this course is to create awareness in every engineering graduate about the importance of environment, the effect of technology on the environment and ecological balance and make him/her sensitive to the environment problems in every professional endeavour that he/she participates.

OBJECTIVES

- At the end of this course the student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity.

INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES

Definition, Scope and Importance – Need For Public Awareness – Forest Resources:- Use and Over - Exploitation, Deforestation, Case Studies, Timber Extraction, Mining, Dams and their Ground Water, Floods, Drought, Conflicts Over Water, Dams - Benefits and Problems – Mineral Resources:- Use Effects on Forests and Tribal People – Water Resources:- Use and Over-Utilization of Surface 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 Lifestyles. Field Study of Local Area to Document Environmental assets – River/Forest/Grassland/Hill/ Mountain.

ECOSYSTEMS AND BIODIVERSITY

Concepts of an 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, Characteristic Features, Structure and Function of the (A) Forest Ecosystem (B) Grassland Ecosystem (C) Desert Ecosystem (D) Aquatic Ecosystems (Ponds, Streams, Lakes, Rivers, Oceans, Estuaries) – Introduction to Biodiversity – 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.

Field Study of Common Plants, Insects and Birds - Field Study of Simple Ecosystems – Pond, River, Hill Slopes, etc.

ENVIRONMENTAL POLLUTION

Definition – Causes, Effects and Control Measures of:- (A) Air Pollution (B) Water Pollution (C) Soil Pollution (D) Marine Pollution (E) Noise Pollution (F) Thermal Pollution (G) Nuclear Hazards – Soil Waste Management:- Causes, Effects and Control Measures of Urban and Industrial Wastes – Role of an Individual in Prevention of Pollution – Pollution Case Studies – disaster Management:- Floods, Earthquake, Cyclone and Landslides.

Field Study of Local Polluted Site – Urban/Rural/Industrial/Agricultural

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 – Environment Production Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and Control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues Involved in enforcement of Environmental Legislation – Public Awareness.

HUMAN POPULATION AND THE 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 BOOKS

1. Masters, G.M., "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., 2nd Edition, 2004.
2. Miller, T.G. Jr., "Environmental Science", Wadsworth Pub. Co.
3. Townsend C., Harper, J. and Begon, M., "Essentials of Ecology", Blackwell Science, 2003.
4. Trivedi, R.K., and Goel, P.K., "Introduction to Air Pollution", Techno- Science Publications.

REFERENCE BOOKS

1. Erach, B., "The Biodiversity of India", Mapin Publishing Pvt. Ltd., Ahmedabad, India.
2. Trivedi, R.K., "Handbook of Environmental Law's, Rules, Guidelines,Compliances and Standards", Vol - I and II, Envio Media.
3. Cunningham., Cooper, W.P. and Gorhani, T.H., "Environmental Encyclopedia", Jaico Publishing House, Mumbai, 2001.
4. Wages, K.D., "Environmental Management", W.B. Saunders Co., Philadelphia, USA, 1998.

312EIT03 - ELECTRICAL MACHINES

AIM

To impart basic knowledge on Electrical machines, principles and its behavior.

OBJECTIVES

At the end of this course, student would have been exposed to:

- Theory of structures, operating principle, characteristics, and applications of D.C and A.C rotating machines and transformers in detail.
- Introductory knowledge on Special Machines.

UNIT I D.C. MACHINES

Construction of D.C. Machines - Principle and theory of operation of D.C. generator - EMF equation - Characteristics of D.C. generators - Armature reaction – Commutation - Principle of operation of D.C. motor - Voltage equation - Torque equation - Types of D.C. motors and their characteristics –Starters - Speed control of D.C. motors - Applications.

UNIT II TRANSFORMERS

Principle - Theory of ideal transformer - EMF equation - Construction details of shell and core type transformers - Tests on transformers - Equivalent circuit - Phasor diagram - Regulation and efficiency of a transformer - Introduction to three - phase transformer connections.

UNIT III SYNCHRONOUS MACHINES

Principle of alternators:- Construction details, Equation of induced EMF and Vector diagram - Synchronous motor:- Starting methods, Torque, V curves, Speed control and Hunting.

UNIT IV INDUCTION MACHINES

Induction motor:- Construction and principle of operation, Classification of induction motor, Torque equation, Condition for maximum torque, Equivalent Circuit, Starting methods and Speed control of induction motors.

UNIT V SPECIAL MACHINES

Types of single phase motor –Double revolving field theory – Cross field theory – Capacitor start capacitor run motors – Shaded pole motor – Repulsion type motor – Universal motor – Hysteresis motor - Permanent magnet synchronous motor – Switched reluctance motor – Brushless D.C motor.

TEXT BOOKS

1. Nagrath, I.J., and Kothari, D.P., " Electrical Machines", Tata McGraw - Hill, 1997.
2. Fitzgerald A.E, Kingsley C., Umans, S. and Umans S.D., "Electric Machinery", McGraw-Hill, Singapore, 2000.

REFERENCE BOOKS

1. Theraja, B.L., "A Text book of Electrical Technology", Vol.II, S.C Chand and Co., New Delhi, 2007.
2. Del Toro, V., "Electrical Engineering Fundamentals", Prentice Hall of India, New Delhi, 1995.
3. Cotton, H., "Advanced Electrical Technology", Sir Isaac Pitman and Sons Ltd., London, 1999.

312EIT04 - ELECTRONIC DEVICES AND CIRCUITS

AIM

To provide an exposure to various electronic devices and electronic circuits.

OBJECTIVES

At the end of the course, students' will have the knowledge about functioning of various types of devices and design of various electronic circuits.

UNIT I SEMICONDUCTOR DIODE AND BJT

PN Junction – Current components in a PN diode – Junction capacitance – Junction diode switching time – Zener diode – Varactor diode – Tunnel diode – Schottky diode – Transistor Structure – Basic Transistor operation – Transistor characteristics and parameters – The transistor as a switch, as an amplifier – Transistor bias circuits:- Voltage divider bias circuits, base bias circuits, emitter bias circuits, collector feedback bias circuits – DC load line – AC load line- bias stabilization, thermal runaway and thermal stability.

UNIT II FET, UJT and SCR

JFET characteristics and parameters – JFET biasing, self bias, voltage divider bias – Q point, stability over temperature – MOSFET D-MOSFET, E-MOSFET – MOSFET characteristics and parameters – MOSFET biasing, zero bias, voltage divider bias method, drain feedback bias – Characteristics and applications of UJT, SCR, DIAC, TRIAC.

UNIT III AMPLIFIERS

CE, CC and CB amplifiers - Small signal low frequency transistor amplifier circuits - h parameter representation of a transistor - Analysis of single stage transistor amplifier using parameters voltage gain, current gain, input impedance and output impedance-frequency response - RC coupled amplifier.

Classification of Power amplifiers:- Class A, B, AB and C Power amplifiers-Push-Pull and Complementary Symmetry Push-Pull amplifiers - Design of power output, efficiency and cross-over distortion.

UNIT IV FEEDBACK AMPLIFIERS AND OSCILLATORS

Advantages of negative feedback - Voltage/current, series/shunt feedback-Positive feedback - Condition for oscillators - Phase shift - Wein Bridge – Hartley - Colpitts and crystal oscillators.

UNIT V PULSE CIRCUITS AND POWER SUPPLIES

RC wave shaping circuits - Diode clampers and clippers – Multivibrators -Schmitt triggers - UJT - Saw tooth oscillators - Single and polyphase rectifiers and analysis of filter circuits - Design of zener and transistor series voltage regulators - Switched mode power supplies.

TEXT BOOKS

1. Millman and Halkias, "Electronic Devices and Circuits", Tata McGraw– Hill, 2007.
2. Floyd, T.L, "Electronic Devices" 6th Edition, Pearson Education, 2003.
3. Millman and Halkias, "Integrated Electronics", McGraw-Hill, 2004.

REFERENCE BOOKS

1. Mottershead, A., "Electronic Devices and Circuits an Introduction",Prentice Hall of India, 2003.
2. Boylsted and Nashelsky, "Electronic Devices and Circuit Theory", Prentice Hall of India, 6th Edition, 1999.
3. Streetman, B. and Sanjay, B., "Solid State Electronic Devices", Prentice- Hall of India, 5th Edition, 2005.
4. Bell, D.A., "Electronic Devices and Circuits", Prentice Hall of India, 4th Edition, 1999.
5. Millman, J., Prakash Rao., M.S. and Taub, H., "Pulse Digital and Switching Wave Forms", McGraw-Hill, 2007.

312EIT05 - DATA STRUCTURES AND ALGORITHMS
(Common to EEE & EIE)

AIM: To master the design and applications of linear, tree, and graph structures. To understand various algorithm design and analysis techniques.

1. LINEAR STRUCTURES
Abstract Data Types (ADT) – List ADT – array-based implementation – linked list implementation – cursor-based linked lists – doubly-linked lists – applications of lists – Stack ADT – Queue ADT – circular queue implementation – Applications of stacks and queues

2. TREE STRUCTURES
Need for non-linear structures – Tree ADT – tree traversals – left child right sibling data structures for general trees – Binary Tree ADT – expression trees – applications of trees – binary search tree ADT

3. BALANCED SEARCH TREES AND INDEXING
AVL trees – Binary Heaps – B-Tree – Hashing – Separate chaining – open addressing – Linear probing

4. GRAPHS
Definitions – Topological sort – breadth-first traversal - shortest-path algorithms – minimum spanning tree – Prim's and Kruskal's algorithms – Depth-first traversal – biconnectivity – euler circuits – applications of graphs

5. ALGORITHM DESIGN AND ANALYSIS
Greedy algorithms – Divide and conquer – Dynamic programming – backtracking – branch and bound – Randomized algorithms – algorithm analysis – asymptotic notations – recurrences – NP-complete problems

TEXT BOOKS

1. M. A. Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education Asia, 2002.
2. ISRD Group, "Data Structures using C", Tata McGraw-Hill Publishing Company Ltd., 2006.

REFERENCES

1. V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
2. R. F. Gilberg, B. A. Forouzan, "Data Structures: A Pseudocode approach with C", Second Edition, Thomson India Edition, 2005.
3. Sara Baase and A. Van Gelder, "Computer Algorithms", Third Edition, Pearson Education, 2000.
4. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to algorithms", Second Edition, Prentice Hall of India Ltd, 2001.

308EIT06 - ELECTRICAL MEASUREMENTS

AIM

To provide adequate knowledge in electrical measurements and instrumentation.

OBJECTIVES

To make the students to gain a clear knowledge of the basic laws governing the operation of electrical instruments and the measurement techniques.

- Emphasis is laid on the meters used to measure current & voltage.
- To have an adequate knowledge in the measurement techniques for power and energy, power and energy meters are included.
- Elaborate discussion about potentiometer & instrument transformers.
- Detailed study of resistance measuring methods.
- Detailed study of inductance and capacitance measurement.

1. MEASUREMENT OF VOLTAGE AND CURRENT

Galvanometers – Ballistic, D'Arsonval galvanometer – Theory, calibration, application – Principle, construction, operation and comparison of moving coil, moving iron meters, dynamometer, induction type & thermal type meter, rectifier type – Extension of range and calibration of voltmeter and ammeter – Errors and compensation.

2. MEASUREMENT OF POWER AND ENERGY

Electrodynamometer type wattmeter – Theory & its errors – Methods of correction – LPF wattmeter – Phantom loading – Induction type kWh meter – Induction type energy meter – Calibration of wattmeter.

3. POTENTIOMETERS & INSTRUMENT TRANSFORMERS

DC potentiometer – Basic circuit, standardization – Laboratory type (Crompton's) – AC potentiometer – Drysdale (polar type) type – Gall-Tinsley (coordinate) type – Limitations & applications – C.T and P.T construction, theory, operation and characteristics.

4. RESISTANCE MEASUREMENT

Measurement of low, medium & high resistance – Ammeter, voltmeter method – Wheatstone bridge – Kelvin double bridge – Series and shunt type ohmmeter – High resistance measurement – Megger – Direct deflection methods – Price's guard-wire method – Earth resistance measurement.

5. IMPEDANCE MEASUREMENT

A.C bridges – Measurement of inductance, capacitance – Q of coil – Maxwell Bridge – Wein's bridge – Schering bridge – Anderson bridge – Campbell bridge to measure mutual inductance – Errors in A.C. bridge methods and their compensation – Detectors – Excited field – A.C. galvanometer – Vibration galvanometer

TEXT BOOKS

1. E.W. Golding & F.C.Widdis, 'Electrical Measurements & Measuring Instruments', A.H.Wheeler & Co, 2001
2. A.K. Sawhney, 'Electrical & Electronic Measurements and Instrumentation', Dhanpath Rai & Co (P) Ltd, 2004.

REFERENCE BOOKS

1. J.B.Gupta, 'A Course in Electronic and Electrical Measurements and Instrumentation', S.K. Kataria & Sons, Delhi, 2003.
2. S.K.Singh, 'Industrial Instrumentation and control', Tata McGraw Hill, 2nd edn.,2002.
3. H.S.Kalsi, 'Electronic Instrumentation', Tata McGraw Hill, 2004.
4. Martin U. Reissland, 'Electrical Measurement – Fundamental Concepts and Applications', New Age International (P) Ltd., 2001.

312EIP01 - ELECTRON DEVICES AND CIRCUITS LABORATORY
(EEE and E&I)

1. Characteristics of Semiconductor diode and Zener diode.
2. Characteristics of Transistor under common emitter, common collector and common base configurations.
3. Characteristic of FET
4. Characteristic of UJT.
5. Characteristics of SCR, DIAC and TRIAC.
6. Photo diode, phototransistor Characteristics and study of light activated relay circuit..
7. Static characteristics of Thermistors.
8. Single phase half wave and full wave rectifiers with inductive and capacitive filters.
9. Differential ampliers using FET.
10. Study of CRO
11. Series and Parallel reasonance circuits.
12. Realization of Passive filters.

REQUIREMENT FOR A BATCH OF 30 STUDENTS

S.No.	Description of Equipment	Quantity required	Quantity available	Deficiency %
	Regulated Power Supply	15		
	Dual Tree CRO (20 MHz)	15		
	Function Generator	15		
	$3^{1/2}$ Digit digital multimeter	10		
	Bread Boards	40		
	Transistor	25 Nos.		
	JFET	10 Nos.		
	Diode	10 Nos.		
	Zener Diode	5 Nos.		
	UJT	5 Nos.		
	Photo Diode	5 Nos.		
	Photo Transistor	5 Nos.		
	Thermistors	5 Nos.		
	OP-amp	10 Nos.		
	Milli Ammeter (0-100mA)	15 Nos.		
	Micro Ammeter (0-50μA)	10 Nos.		
	Low range voltmeter (0-30V)	10 Nos.		
	Resistor of various ranges	50 Nos.		
	Capacitors of various ranges	50 Nos.		
	Connecting wires	Sufficient Nos		

312EIP02 - DATA STRUCTURES AND ALGORITHMS LABORATORY
(Common to EEE & EIE)

Aim: To develop skills in design and implementation of data structures and their applications.

1. Implement singly and doubly linked lists.
2. Represent a polynomial as a linked list and write functions for polynomial addition.
3. Implement stack and use it to convert infix to postfix expression
4. Implement array-based circular queue and use it to simulate a producer-consumer problem.
5. Implement an expression tree. Produce its pre-order, in-order, and post-order traversals.
6. Implement binary search tree.
7. Implement insertion in AVL trees.
8. Implement priority queue using heaps
9. Implement hashing techniques
10. Perform topological sort on a directed graph to decide if it is acyclic.
11. Implement Dijkstra's algorithm using priority queues
12. Implement Prim's and Kruskal's algorithms
13. Implement a backtracking algorithm for Knapsack problem
14. Implement a branch and bound algorithm for traveling salesperson problem
15. Implement any randomized algorithm.

REQUIREMENT FOR A BATCH OF 30 STUDENTS

S.No.	Description of Equipment	Quantity required	Quantity available	Deficiency %
	Computer(Pentium 4)	40 Nos with one server		
	Dot matrix printer	3 Nos		
	Laser Printer	2 Nos		
	UPS (5 KVA)	2		
	Turbo C	40 Nodes		

312EIP03 ELECTRICAL MACHINES LABORATORY

1. Open circuit characteristic of DC Shunt Generator.
2. Load test on DC Shunt Generator.
3. Speed control of DC Shunt Motor.
4. Brake test on DC Shunt Motor.
5. Brake test on DC Series Motor.
6. Regulation characteristic of three - phase Alternator.
7. Open circuit and short circuit tests on Single - phase Transformer.
8. Load test on Single - phase Transformer
9. Load test on Three - phase Induction Motor.
10. Brake test on Single - phase Induction Motor.
11. 'V' curves of Synchronous Motor.
12. Power measurement in three - phase circuit using two - wattmeter method.

REQUIREMENT FOR A BATCH OF 30 STUDENTS

S.No.	Description of Equipment	Quantity required	Quantity available	Deficiency %
1.	D.C motor – Generator set D.C motor – Shunt Generator D.C motor – Compound Generator	 2 set 2 set		
2.	D.C. Shunt Motor	2 Nos.		
3.	D.C. Series Motor	1 No.		
4.	D.C. Compound Motor	1 No.		
5.	Single phase transformers	7 Nos.		
	Three phase transformers	2 Nos.		
	D.C. Motor – Alternator set	4 sets		
	Three phase Induction Motor (Squirrel cage)	3 Nos.		
	Three phase slip ring Induction Motor	1 No.		
	Single phase Induction Motor	2 Nos.		
	Resistive load 3 phase – 2 , single phase - 3	5 Nos.		
	Inductive load	1 No.		
	Single phase Auto transformer	5 Nos.		
	Three phase Auto transformer	3 Nos.		
	Moving Coil Ammeter of different ranges	20 Nos.		

	Moving Coil Voltmeter of different ranges	20 Nos.		
	Moving Iron Ammeter of different ranges	20 Nos.		
	Moving Iron voltmeter of different ranges	20 Nos.		
	Wire wound Rheostats of different ratings	30 Nos.		
	Tachometers	10 Nos.		
	Single element wattmeters of different ranges UPF / LPF	20 Nos.		
	Double element wattmeters of different ranges	4 Nos.		
	Power factor meter	2 Nos.		
	Digital multimeter	5 Nos.		
	Three point starter, four point starter,DOL starter, manual star / delta starter, semi automatic and fully automatic star / delta starter	1 No each for study experiment		
	SCR based semi and fully controlled rectifier module	2 Nos.		
	SCR based chopper module	2 Nos.		
	SCR based inverter module	2 Nos.		
	SCR based AC voltage regulation module	2 Nos.		
	SCR, MOSFET, IGBT Trainer module	Each 2 Nos.		

SEMESTER IV

412EIT01 - CONTROL SYSTEMS

AIM

To provide sound knowledge in the basic concepts of linear control theory and design of control system.

OBJECTIVES

- To understand the methods of representation of systems and to desire their transfer function models.
- To provide adequate knowledge in the time response of systems and steady state error analysis.
- To accord basic knowledge in obtaining the open loop and closed–loop frequency responses of systems.
- To understand the concept of stability of control system and methods of stability analysis.
- To study the three ways of designing compensation for a control system.

1. SYSTEMS AND THEIR REPRESENTATION

Basic elements in control systems – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – Synchros – AC and DC servomotors – Block diagram reduction techniques – Signal flow graphs.

2. TIME RESPONSE

Time response – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – P, PI, PID modes of feed back control.

3. FREQUENCY RESPONSE

Frequency response – Bode plot – Polar plot – Determination of closed loop response from open loop response – Correlation between frequency domain and time domain specifications.

4. STABILITY OF CONTROL SYSTEM

Characteristics equation – Location of roots in S plane for stability – Routh Hurwitz criterion – Root locus construction – Effect of pole, zero addition – Gain margin and phase margin – Nyquist stability criterion.

5. COMPENSATOR DESIGN

Performance criteria – Lag, lead and lag-lead networks – Compensator design using bode plots.

TEXT BOOKS

1. I.J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.
2. Benjamin C. Kuo, Automatic Control systems, Pearson Education, New Delhi, 2003.

REFERENCE BOOKS

1. K. Ogata, 'Modern Control Engineering', 4th edition, PHI, New Delhi, 2002.
2. Norman S. Nise, Control Systems Engineering, 4th Edition, John Wiley, New Delhi, 2007.
3. Samarajit Ghosh, Control systems, Pearson Education, New Delhi, 2004
4. M. Gopal, 'Control Systems, Principles and Design', Tata McGraw Hill, New Delhi, 2002.

412EIT02 - INDUSTRIAL INSTRUMENTATION – I

AIM

To equip the students with relevant knowledge to suit the industrial requirements.

OBJECTIVES

To provide sound knowledge about various techniques used for the measurement of industrial parameters.

- Discussion of load cells, torque meter and various velocity pick-ups.
- Exposure to various accelerometer pick-ups, vibrometers, density and viscosity pick-ups.
- To have an adequate knowledge about pressure transducers.
- To have an idea about the temperature standards, calibration and signal conditioning used in RTD's.
- To have a sound knowledge about thermocouples and pyrometry techniques.

1. MEASUREMENT OF FORCE, TORQUE AND VELOCITY

Electric balance – Different types of load cells – Hydraulic, pneumatic strain gauge- Magneto elastic and Piezo electric load cell – Different methods of torque measurements: strain gauge-Relative angular twist-Speed measurement:-Capacitive tacho-Dragcup type tacho-D.C and A.C tachogenerators – Stroboscope.

2. MEASUREMENT OF ACCELERATION, VIBRATION AND DENSITY

Accelerometers:- LVDT, Piezo-electric, Strain gauge and Variable reluctance type accelerometer – Mechanical type vibration instruments – Seismic instruments as an accelerometer – Vibrometers : Calibration of vibration pickups – Units of density and specific gravity – Baume scale, and API scale- Pressure head type densitometers- Float type densitometers – Ultrasonic densitometer-Bridge type gas densitometer.

3. PRESSURE MEASUREMENT

Units of pressure-Manometers-Different types –Elastic type pressure gauges: Bourdon tube, bellows and diaphragms-Electrical methods: Elastic elements with LVDT and strain gauges – Capacitive type pressure gauge –Piezo-resistive pressure sensor-Resonator pressure sensor-Measurement of vacuum:-McLeod gauge-Thermal conductivity gauges-Ionization gauges:– Cold cathode type and hot cathode type-Testing and calibration of pressure gauges-Dead weight tester.

4. TEMPERATURE MEASUREMENT

Definitions and standards-Primary and secondary fixed points –Calibration of thermometers - Different types of filled in system thermometer-Sources of errors in filled in systems and their compensation-Bimetallic thermometers – Electrical methods of temperature measurement-Signal conditioning of industrial RTDs and their characteristics-3 lead and 4 lead RTDs - Thermistors.

5. THERMOCOUPLES AND RADIATION PYROMETERS

Thermocouples-Laws of thermocouple –Fabrication of industrial thermocouples –Signal conditioning of thermocouple output-Isothermal block reference junctions – Commercial circuits for cold junction compensation-Response of thermocouple –Special techniques for measuring high temperature using thermocouples – Radiation fundamentals- Radiation methods of temperature measurement –- Total radiation pyrometers-Optical pyrometers-Two colour radiation pyrometers – Fiber optic temperature measurement.

TEXT BOOKS

1. Doebelin, E.O., "Measurement systems Application and Design", International Student Edition, 5th Edition, McGraw Hill Book Company,2004.

2. Jone's Instrument Technology, Vol.2, Butterworth-Heinemann, International Edition, 2003.
3. A.K. Sawhney, 'A course in Electrical & Electronic Measurements and Instrumentation', Dhanpath Rai & Co (P) Ltd, 2004.

REFERENCE BOOKS

1. Liptak, B.G., "Instrumentation Engineers Handbook (Measurement)", CRC Press, 2005
2. Patranabis,D., "Principles of Industrial Instrumentation", 2nd Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1999.
3. Holman,P., "Experimental methods for Engineers", 6th Edition, McGraw Hill Book Company, 2000.
4. Nakra, B.C., and Chaudry, K.K., "Instrumentation measurement and Analysis", TataMcGraw Hill publishing Company Limited, 2004.

412EIT03 - TRANSDUCER ENGINEERING

AIM

To provide adequate knowledge in sensors and transducers.

OBJECTIVES

- To impart knowledge about the principles and analysis of sensors.
- Discussion of errors and error analysis.
- Emphasis on characteristics and response of transducers.
- To have an adequate knowledge in resistance transducers.
- Basic knowledge in inductance and capacitance transducers and exposure to other transducers.

1. SCIENCE OF MEASUREMENTS AND INSTRUMENTATION OF TRANSDUCERS

Units and standards – Calibration methods – Static calibration – Classification of errors – Error analysis – Statistical methods – Odds and uncertainty – Classification of transducers – Selection of transducers.

2. CHARACTERISTICS OF TRANSDUCERS

Static characteristics – Accuracy, precision, resolution, sensitivity, linearity -Dynamic characteristics – Mathematical model of transducer – Zero, I and II order transducers. Response to impulse, step, ramp and sinusoidal inputs.

3. VARIABLE RESISTANCE TRANSDUCERS

Principle of operation, construction details, characteristics and application of potentiometer, strain gauge, resistance thermometer, Thermistor, hot-wire anemometer, piezoresistive sensor and humidity sensor.

4. VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS

Induction potentiometer – Variable reluctance transducers – EI pick up – Principle of operation, construction details, characteristics and application of LVDT –Capacitive transducer and types – Capacitor microphone – Frequency response.

5. OTHER TRANSDUCERS

Piezoelectric transducer, Hall Effect transducer – Different types of Photo detectors- Digital transducers – Smart sensors - Fibre optic sensors, SQUID sensors, Film sensors, MEMS – Nano sensors.

TEXT BOOKS

1. E.A. Doebelin, 'Measurement Systems – Applications and Design', Tata McGraw Hill, New York, 2000.
2. A.K. Sawhney, 'A course in Electrical & Electronic Measurement and Instrumentation', Dhanpat Rai and Co (P) Ltd., 2004.

REFERENCE BOOKS

1. D. Patranabis, 'Sensors and Transducers', Prentice Hall of India, 1999.
2. John P. Bentley, 'Principles of Measurement Systems', III Edition, Pearson Education,2000.

412EIT04 - DIGITAL LOGIC CIRCUITS

AIM

To introduce the fundamentals of digital circuits, combinational and sequential circuit.

OBJECTIVES

- To study various number systems and to simplify the mathematical expressions using Boolean functions – simple problems.
- To study implementation of combinational circuits
- To study the design of various synchronous and asynchronous circuits.
- To expose the students to various memory devices.

1. NUMBER SYSTEMS AND BOOLEAN ALGEBRA

Review of number systems; types and conversion, codes. Boolean algebra: De-Morgan's theorem, switching functions and simplification using K-maps and Quine McCluskey method.

2. COMBINATIONAL CIRCUITS

Design of Logic gates. Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers. Function realization using gates and multiplexers.

3. SYNCHRONOUS SEQUENTIAL CIRCUITS

Flip flops - SR, D, JK and T. Analysis of synchronous sequential circuits; design of synchronous sequential circuits – Completely and incompletely specified sequential circuits - state diagram; state reduction; state assignment, Counters – synchronous, a synchronous, updown and Johnson counters; shiftregisters.

4. ASYNCHRONOUS SEQUENCTIAL CIRCUITS

Analysis of asynchronous sequential machines, state assignment, asynchronous Design problem.

5. MEMORY DEVICES, PROGRAMMABLE LOGIC DEVICES AND LOGIC FAMILIES

Memories: ROM, PROM, EPROM, PLA, PLD, FPGA, digital logic families: TTL, ECL, CMOS.

TEXT BOOKS

1. M. Morris Mano, 'Digital Logic and Computer Design', Prentice Hall of India, 2002.
2. John M.Yarbrough, 'Digital Logic, Application & Design', Thomson, 2002.

REFERENCE BOOKS

1. Charles H.Roth, 'Fundamentals Logic Design', Jaico Publishing, IV edition, 2002.
2. Floyd, 'Digital Fundamentals', 8th edition, Pearson Education, 2003.
3. John F.Wakerly, 'Digital Design Principles and Practice', 3rd edition, Pearson Education, 2002.

412EIT05 - LINEAR INTEGRATED CIRCUITS AND APPLICATIONS
(Common to EEE & EIE)

AIM

To introduce the concepts for realizing functional building blocks in ICs, fabrications & application of ICs.

OBJECTIVES

- To study the IC fabrication procedure.
- To study characteristics; realize circuits; design for signal analysis using Op-amp ICs.
- To study the applications of Op-amp.
- To study internal functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits, ADCs.

1. IC FABRICATION

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging. Fabrication of diodes, capacitance, resistance and FETs.

2. CHARACTERISTICS OF OPAMP

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, offset voltage and current: voltage series feedback and shunt feedback amplifiers, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – summer, differentiator and integrator.

3. APPLICATIONS OF OPAMP

Instrumentation amplifier, first and second order active filters, V/I & I/V converters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter (R-2R ladder and weighted resistor types), A/D converter - Dual slope, successive approximation and flash types.

4. SPECIAL ICs

555 Timer circuit – Functional block, characteristics & applications; 566-voltage controlled oscillator circuit; 565-phase lock loop circuit functioning and applications, Analog multiplier ICs.

5. APPLICATION ICs

IC voltage regulators - LM317, 723 regulators, switching regulator, MA 7840, LM 380 power amplifier, ICL 8038 function generator IC, isolation amplifiers, opto coupler, opto electronic ICs.

TEXT BOOKS

1. Ramakant A.Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI. (2000)
2. D.Roy Choudhary, Sheil B.Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.

REFERENCE BOOKS

1. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', Tata McGraw Hill, 2003.
2. Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear ICs', Pearson Education, 4th edition, 2002 / PHI.
3. David A.Bell, 'Op-amp & Linear ICs', Prentice Hall of India, 2nd edition, 1997

412EIT06 - APPLIED THERMODYNAMICS

OBJECTIVES

- To expose the fundamentals of thermodynamics and to be able to use it in accounting for the bulk behaviour of the sample physical systems.
- To integrate the basic concepts into various thermal applications like IC engines, gas turbines, steam boiler, steam turbine, compressors, refrigeration and air conditioning.
- To enlighten the various modes of heat transfer and their engineering applications.

Use of standard steam tables, refrigeration tables and heat transfer data book are permitted)

1. BASIC CONCEPTS AND LAWS OF THERMODYNAMICS

Classical approach: Thermodynamic systems – Control volume - System and surroundings – Universe – Properties - State-process – Cycle – Equilibrium - Work and heat transfer – Point and path functions - First law of thermodynamics for open and closed systems - First law applied to a control volume - SFEE equations [steady flow energy equation] - Second law of thermodynamics - Heat engines - Refrigerators and heat pumps - Carnot cycle - Carnot theorem.

2. IC ENGINES

Air standard cycles: Otto, diesel and dual cycles and comparison of efficiency - Working Principle of four stroke and two stroke engines - Working principle of spark ignition and compression ignition engines - Application of IC engines.

3. STEAM BOILERS AND TURBINES

Formation of steam - Properties of steam – Use of steam tables and charts – Steam power cycle (Rankine) - Modern features of high-pressure boilers – Mountings and accessories – Testing of boilers.

Steam turbines: Impulse and reaction principle – Velocity diagrams – Compounding and governing methods of steam turbines (qualitative treatment only) - Layout and working principle of a steam power plant.

4. COMPRESSORS, REFRIGERATION AND AIR CONDITIONING

Positive displacement compressors – Reciprocating compressors – Indicated power – Clearance volume – Various efficiencies – Clearance ratio - Volume rate - Conditions for perfect and imperfect intercooling - Multi stage with intercooling – Rotary positive displacement compressors – Construction and working principle of centrifugal and axial flow compressors.

Refrigeration - Various methods of producing refrigerating effects (RE) – Vapour compression cycle: P-H and T-S diagram - Saturation cycles - Effect of subcooling and super heating - (qualitative treatment only) - Airconditioning systems – Basic psychrometry - Simple psychrometric processes - Types of airconditioning systems -Selection criteria for a particular application (qualitative treatment only).

5. HEAT TRANSFER

One-dimensional Heat Conduction: Plane wall – Cylinder – Sphere - Composite walls – Critical thickness of insulation –Heat transfer through extended surfaces (simple fins).
Convection: Free convection and forced convection - Internal and external flow –Simple Empirical relations.
Radiation: Black–Gray bodies - Radiation Shape Factor (RSF) - Cooling of electronic components - Thermoelectric cooling – Chip cooling.

TEXT BOOKS

1. R.S.Khurmi & J.K.Gupta, Thermal Engineering, S.Chand & Co. Ltd., 2006.
2. S.Domkundwar, C.P.Kothandaraman & A.V.Domkundwar, Thermal Engineering, Dhanpat Rai & Co.2002.

REFERENCE BOOKS

1. Rogers and Mayhew, 'Engineering Thermodynamics – Work and Heat Transfer', Pearson Education Pvt. Ltd. New Delhi, 2006.
2. Eastop and McConkey, 'Applied Thermodynamics', Pearson Education Pvt. Ltd. New Delhi, 2002.
3. P.K.Nag, 'Engineering Thermodynamics Tata McGraw Hill, New Delhi, 2003.
4. Rajput, B.K. Sankaar, Thermal Engineering, S.Chand & Co. Ltd., 2003.

412EIP01 - TRANSDUCERS AND MEASUREMENTS LABORATORY

OBJECTIVES

The aim of this lab is to train the students in handling the different kinds of transducers like LVDT, Hall effect, Thermocouple etc., which he often meets in his study and also to impart the students an adequate knowledge and work experience of the different types of AC and DC bridges, electronic measurement methods for different electronic instruments.

1. Displacement versus output voltage characteristics of a potentiometric transducer.
2. Characteristics of Strain gauge and Load cell.
3. Characteristics of LVDT, Hall effect transducer and Photoelectric tachometer.
4. Characteristic of LDR, thermistor and thermocouple.
5. Step response characteristic of RTD and thermocouple and Study of smart transducers.
6. Wheatstone and Kelvin's bridge for measurement of resistance.
7. Schering Bridge for capacitance measurement and Anderson Bridge
8. for inductance measurement.
9. Calibration of Single-phase Energy meter and wattmeter.
10. Calibration of Ammeter and Voltmeter using Student type potentiometer.
11. Design, Construction and calibration of series and shunt type
12. ohmmeters.

Detailed syllabus

1. Loading effect on potentiometer

Aim

To study the loading effect on potentiometer circuit.

Objectives

- To observe the output, input calibration curve using FET voltmeter has the output device.
- To observe the output, input characteristic with an voltmeter whose input
- impedance is finite.
- To observe the linearity which decreases with a decrease in the input impedance of the output meter.

Exercise

1. In the potentiometer circuit, displacement is given to the wiper arm and the corresponding output is observed with 2 meters (one is a FET voltmeter and the other is meter with a finite input impedance)
2. For various input displacements, output voltage from the two different meters are recorded and tabulated.
3. Plot the graph output Vs input displacement for both cases.

Equipment

1. Potentiometer – Linear displacement transducer kit – 1 No
2. Regulated power supply – 1 No
3. FET voltmeter, ordinary voltmeter – 1 No

2. Characteristics of Strain gauge and Load cell

Aim

To study the characteristics of strain guage and load cell.

Objectives

- To identify and study the characteristics of strain guage and load cell.
- To determine the sensitivity of strain guage and load cell.
- To determine the Young's modulus and hence the guage factor of the given strain guage.

Exercise

1. Load and Unload the load cell and strain guage.
2. Measure the corresponding voltages during both loading and unloading and plot the calibration curve.
3. Find the Young's Modulus and gauge factor from the graph.

Equipment

1. Strain guage and Load cell kit. – 1 No
2. Variable power supply – 1 No
3. Loads for measurement - A set

3. Characteristics of LVDT, Hall effect transducer and Photoelectric tachometer.

(a) Characteristics of LVDT

Aim

To study the operation and characteristics of LVDT

Objective

- To study the displacement of the core from its null position.
- To study the variation of output voltage with change in displacement.

Exercise

1. Adjust the potentiometer knob present in the LVDT kit to bring the core to Null position (set the output voltage to be '0' volts)
2. Rotate the knob in the positive direction such that the LVDT scale moves in steps of 1cm and measure the corresponding output voltage.
3. Tabulate the readings.
4. Repeat the above procedure for negative displacement.
5. Plot the characteristic curve between displacement and output voltage.

Equipments

1. LVDT trainer kit – 1 No
2. Power supply – 1 No

(b) Hall effect Transducer

Aim

To study the characteristics of Hall effect transducer.

Objective

- To determine the positive hall voltage at the bottom of the transducer.
- To determine the negative hall voltage.
- To identify and study the characteristics of hall effect transducer.
- To measure the displacement of a structural element .

Exercise

1. Study the internal configuration of Hall effect IC.
2. Patch the circuit diagram as per patching diagram.
3. Place the north pole of the magnet above the scale and take the reading air gap between hall IC and magnet to output voltage.
4. Place the south pole of the magnet above the scale and take the reading for different distances and plot the graph between air gap voltmeter readings.

Equipments

1. Hall effect characteristics trainer – 1 No
2. Power supply – 1 No
3. Voltmeter – 1 No

(c) Photoelectric tachometer

Aim

To study the characteristics of photoelectric tachometer using the servo motor speed control trainer kit.

Objective

1. To calculate the number of pulses generated in the photoelectric pick up.
2. To study the variation of speed with the variation of the input voltage.

Exercise

1. Connect the circuit as per instructions given in the manual.
2. Adjust the power supply.
3. Vary the speed of the motor by using rotary potentiometer and note down the readings.
4. Calculate number of pulses generated in the photoelectric pick up.
5. Draw the graph between voltage and speed.

Equipments

1. Speed control trainer kit – 1 No
2. Power supply – 1 No
3. Wires - Some
4. Multimeter – 1 No

4.Characteristic of LDR, thermistor and thermocouple.

(a) Characteristics of LDR

Aim

To determine the characteristics of LDR

Objectives

- To determine the change in resistance for corresponding change in light intensity.
- To determine the output voltage for corresponding change in voltage.

Exercise

1. The lamp for LDR is selected by using a select switch.
2. Initially the lamp is kept away from LDR.
3. Now the distance is decreased gradually and the corresponding values of voltages and resistances are taken.
4. Repeat the above steps for various positions of lamp.

Equipments

1. Photo conductive trainer kit – 1 No
2. Multimeter – 1 No
3. Connecting wires – 1 No

(b) Characteristics of thermistor

Aim

To determine the characteristics of thermistor

Objectives

- To measure the resistance value for the corresponding changes in temperature.

Exercise

1. Measure the initial temperature of water.
2. Take another vessel full of water and boil it to100^0C.
3. Note down the readings for every 5^0C fall of temperature in thermistor, thermometer and output voltage readings.
4. Plot the Thermistor characteristics.

Equipments

1. Thermistor Trainer kit – 1 No
2. Heater – 1 No
3. Thermistor – 1 No
4. Thermometer – 1 No
5. Voltmeter – 1 No

(c) Characteristics of Thermocouple

Aim

To determine the characteristics of thermocouple.

Objectives

- To determine the voltage for corresponding change in temperature.

Exercise

1. Measure the initial temperature and temperature of boiling water (100^0C)
2. Calibrate the thermocouple in the hot water and measure the 5^0C temperature fall in thermocouple.
3. The output voltage is noted for corresponding fall in temperature.

Equipment

1. Thermocouple trainer kit – 1 No
2. Thermocouple – 1 No
3. Voltmeter – 1 No
4. Heater – 1 No

5. Step response characteristic of RTD and thermocouple and Study of smart transducers.

(a).Step response characteristics of RTD and Thermocouple

Aim

To study the step response characteristic of RTD and thermocouple.

Objective

- To analyse the change in temperature due to change in emf in case of thermocouple.
- To analyse the change in temperature due to change in resistance in case of RTD.
- To observe the transients when step input [i.e sudden change in the input] is given.

Exercise

1. Calibrate the RTD and thermocouple at room temperature and 100^0C alternatively.
2. Bring down the sensor to room temperature and provide a sudden change of input temperature to boiling point (i.e) 100^0C.
3. Start the stop clock and tabulate the time taken for every 5^0C rise of temperature.
4. Plot the step response for both the sensors.

Equipment

1.	Thermocouple and RTD trainer kit	– 1 No
2.	Thermometer	– 1 No
3.	Heater	– 1 No
4.	Thermocouple and RTD sensors	– 1 No
5.	Voltmeters	– 1 No
6.	I/P trainer kit	– 1 No
7.	Pressure source	– 1 No
8.	Control valve etc	– 1 No

6. Wheatstone and Kelvin's bridge for measurement of resistance.

(a) Measurement Of Medium Resistance Using Wheatstone's Bridge

Aim

To measure the value of unknown resistance using Wheatstone's Bridge.

Exercise

Find the value of unknown resistance.

Procedure

1. Connections are given as per the circuit diagram.
2. Supply is switched on.
3. When the unknown resistance s connected, the bridge becomes unbalanced.
4. The bridge is balanced by varying standard resistance.
5. The value of unknown resistance is calculated by the given formula.
6. The above steps are repeated for different value of unknown resistances.

Equipment

1.	Resistors	– 1 No
2.	Galvanometer	– 1 No
3.	Regulated Power supply	– 1 No
4.	Bread board	– 1 No
5.	Decade resistance box	– 1 No
6.	Multimeter	– 1 No

(b) Kelvin's Double Bridge

Aim

To find the unknown value of low resistance using Kelvin's Double Bridge.

Exercise

Find the unknown value of low resistance.

Procedure

1. Connections are given as per the circuit diagram.
2. Supply is switched on.
3. The bridge becomes unbalanced when unknown resistance R is connected.
4. The bridge is balanced by varying standard resistance.
5. Unknown resistance is calculated using balance equation.
6. The above steps are repeated for various values of unknown resistance.

Equipment

1.	Power supply	– 1 No
2.	Fixed resistance	– 1 No
3.	Unknown resistors	– 1 No
4.	Decade resistance box	– 1 No
5.	Multimeter	– 1 No
6.	Galvanometer	– 1 No
7.	Bred board	- 1 No

7. Schering Bridge for capacitance measurement and Anderson Bridge for inductance measurement.

(a) Schering's Bridge

Aim

To measure the unknown value of capacitance using Schering's bridge

Exercise

Measure the unknown value of capacitance.

Procedure

1. Connections are given as per the circuit.
2. Supply is witched on.
3. When unknown value of capacitance is connected, bridge becomes unbalanced.
4. The bridge is balanced by varying the standard.
5. The unknown value of capacitance is calculated using the balance equation.
6. The above steps are repeated for different values of unknown capacitances.

Equipment

1.	Resistors	- Some set.
2.	Capacitors	– Some set.
3.	Decade Resistance box	– 1 No.
4.	Decade Capacitance box	– 1 No.
5.	CRO	– 1 No.
6.	Function Generator	– 1 No.

(b) Anderson's Bridge

Aim

To measure the unknown value of inductance using Anderson's Bridge

Exercise

Measure the unknown value of inductance.

Procedure

1. Connections are given as per the circuit diagram.
2. Supply is switched on.
3. When unknown value of inductance is connected the bridge becomes unbalanced.
4. The unknown value of inductance is calculated by using the balance equation.
5. The above step are repeated for different values of unknown inductance.

Equipment

1.	Resistors – Some set	
2.	Decade Inductance box	– 1 No.
3.	Decade Condenser box	– 1 No.
4.	Regulated power supply	– 1 No.
5.	CRO	– 1 No.
6.	Bread board	- 1 No.

8. Calibration of Single-phase Energy meter and wattmeter.

(a) Calibration of Single Phase Energy Meter

Aim

To calibrate the given energy meter using two substandard wattmeters and to obtain percentage error.

Exercise

Calibrate the given energy meter and draw % error Vs load graph.

Procedure

1. Connections are given as per the circuit diagram.
2. The value of load current is adjusted to desire value.
3. When the red mark on the disk of the energy meter passes the observation point, the stopwatch is started and the number of revolution made by the disc is noted.
4. The load current is maintained by adjusting the load.
5. When the disc of the energy meter completes desired number of revolutions the stopwatch is stopped and the time taken is noted.
6. The procedure is repeated for different values of wattmeter reading and time taken, number of revolutions of the disc is noted down.
7. The graph is plotted between percentage error and load.

Equipment

1. Wattmeter – 2 No
2. Voltmeter – 1 No
3. Ammeter – 1 No
4. Resistive load – 1 No

(b) Calibration of Wattmeter

Aim

To calibrate the given wattmeter using direct loading.

Exercise

Calibrate the given wattmeter and draw the graph between % error and load current.

Procedure

1. Connections are given as per the circuit diagram.
2. Supply is given at no load condition.
3. Resistive load is applied in steps and the readings are tabulated.
4. Graph is drawn between % error and load current.

Equipment

1. Ammeter – 1 No
2. Voltmeter – 1 No
3. Wattmeter – 1 No
4. Load – 1 No

9. Calibration of Ammeter and Voltmeter using Student type potentiometer.

(a) Calibration of Ammeter

Aim

To calibrate the given ammeter using standard ammeter

Exercise

Calibrate the given ammeter and draw the graph between % error and A_s.

Procedure

1. Connections are given as per the circuit diagram.
2. The standard ammeter should be selected properly.
3. Supply is switched on.
4. At no load condition the readings of all the meters are noted.
5. By gradually increasing the load, the respective readings are taken from the meters.
6. The readings are tabulated and % error is calculated from the formula.
7. Graph is drawn between A_s and % error.
8. The procedure is repeated for both ac and dc supply.

Equipment

1. Standard ammeter – 1 No.
2. Ammeter – 1 No.
3. Variable resistive load – 1 No.
4. RPS – 1 No.

(b) Calibration of Voltmeter

Aim

To calibrate the given voltmeter using standard voltmeter.

Exercise

Calibrate the given voltmeter and draw the graph between % error and V_S.

Procedure

1. Connections are given as per the circuit diagram.
2. The standard voltmeter should be selected properly.
3. Supply is switched on.
4. At no load condition the readings of all the meters are noted.
5. By gradually increasing the voltage, the respective readings are taken from the meters.
6. The readings are tabulated and % error is calculated from the formula.
7. Graph is drawn between V_s and % error.
8. The procedure is repeated for both ac and dc supply.

Equipment

1. Standard voltmeter – 1 No.
2. Voltmeter – 1 No.
3. Auto transformer – 1 No.
4. RPS – 1 No.

10. Design and calibration of series and shunt type ohmmeters.

(a) SERIES TYPE OHMMETERS

AIM

To conduct a suitable experiment to measure an unknown medium resistance (1Ω - 0.1MΩ) with the series type ohmmeter.

OBJECTIVE

The instrument most commonly used to check the continuity (a complete circuit), or to measure the resistance of a circuit or circuit element, is the **OHMMETER.** The ohmmeter is widely used to measure resistance and check the continuity of electrical circuits and devices.

OHMMETER SAFETY PRECAUTIONS

The following safety precautions and operating procedures for ohmmeters are the MINIMUM necessary to prevent injury and damage.

- Be certain the circuit is deenergized and discharged before connecting an ohmmeter.
- Do not apply power to a circuit while measuring resistance.
- When you are finished using an ohmmeter, switch it to the OFF position if one is provided and remove the leads from the meter.
- Always adjust the ohmmeter for 0 (or □ in shunt ohmmeter) after you change ranges before making the resistance measurement.

Exercise

1. Place the resistance to be measured is in series with the internal resistors and the meter movement of the ohmmeter.
2. Note down the reading of the meter and calculate the practical value.
3. Calculate the theoretical value
4. Find the difference and error between the theoretical and practical values.
5. Measure the Resistor using Ammeter – Voltmeter method and compare the result with the Ohmmeter method.
6. Calculate the difference and %error.
7. To implement the continuity test, consider any one electronic circuit and check the continuity

Equipment

1. Ohmmeter (Analog Multimeter) – 1No
2. Voltmeter - 1 No
3. Ammeter - 1 No
4. Resistor - 1 No
5. RPS - 1 No

(b) SHUNT TYPE OHMMETER

AIM

- To conduct a suitable experiment to measure an unknown medium resistance (1Ω - 0.1MΩ) with the series type ohmmeter.
- To compare the result with the Ammeter – Voltmeter method

Exercise

1. Place the resistance to be measured in shunt (in parallel) with the meter movement of the ohmmeter.
2. Note down the reading of the meter and calculate the practical value.
3. Calculate the theoretical value
4. Find the difference and error between the theoretical and practical values.
5. Measure the Resistor using Ammeter – Voltmeter method and compare the result with the Ohmmeter method.
6. Calculate the difference and %error.
7. To implement the continuity test, consider any one electronic circuit and check the continuity

Equipment

1. Ohmmeter(Analog Multimeter) – 1No
2. Voltmeter - 1 No
3. Ammeter - 1 No
4. Resistor - 1 No
5. RPS - 1 No

412EIP02 - THERMODYNAMICS LABORATORY

THERMODYNAMICS LAB

1. Valve timing and port timing diagrams for IC Engines.
2. Performance test on a Petrol Engine.
3. Performance test on a Diesel Engine.
4. Heat Balance test on an IC Engine.
5. Boiler – performance and Heat Balance Test.
6. Performance test on a Refrigerator (Determination of COP)
7. Determination of heat transfer Coefficient (Free and forced convection)
8. Test to estimate frictional losses in pipe flow.
9. Test on reaction turbine for obtaining the characteristics curves and to design values of specific speed, discharge, output and efficiency.
10. Test on impulse turbine to obtain its characteristics curves and hydraulic design values.

LIST OF EQUIPMENTS

S.No	Apparatus	Quantity
1.	Engine – cut section models.	1 Set
2.	Single cylinder petrol engine with Mechanical dynamometer.	1 Set
3.	Multi cylinder petrol engine with hydraulic dynamometer.	1 Set
4.	Multi cylinder diesel engine with Electrical dynamometer.	1 Set
5.	Steam boilers with suitable mountings and accessories.	1 Set
6.	Refrigeration Test Rig.	1 No.
7.	Forced convection Heat transfer Test set up.	1 No.
8.	Free convection Heat transfer test set up.	1 No.
9.	Apparatus for measuring pipe friction	1 No.
10.	Francis turbine	1 No.
11.	Pelton wheel	1 No.
12.	Turgo impulse wheel	1 No.
13.	Stop watches	6 Nos.

412EIP03 - LINEAR AND DIGITAL INTEGRATED CIRCUITS LAB

AIM

To study various digital & linear integrated circuits used in simple system configuration.

1. Study of Basic Digital IC's. (Verification of truth table for AND, OR, EXOR, NOT, NOR, NAND, JK FF, RS FF,
   D FF)
2. Implementation of Boolean Functions, Adder/ Subtractor circuits.
3. (a) Code converters, Parity generator and parity checking, Excess-3, 2s Complement, Binary to Gray code using suitable IC's .
   (b) Encoders and Decoders: Decimal and Implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC's.
4. Counters: Design and implementation of 4-bit modulo counters as synchronous and Asynchronous types using FF IC's and specific counter IC.
5. Shift Registers:
   Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC's.
6. Multiplex/ De-multiplex:
   Study of 4:1; 8:1 multiplexer and Study of 1:4; 1:8 demultiplexer
7. Timer IC application:
   Study of NE/SE 555 timer in Astable, Monostable operation.
8. Application of Op-Amp:
   Slew rate verifications, inverting and non-inverting amplifier,
   Adder, comparator, Integrater and Differentiator.
9. Study of Analog to Digital Converter and Digital to Analog Converter: Verification of A/D conversion using dedicated IC's.
10. Study of VCO and PLL ICs:
    Voltage to frequency characteristics of NE/ SE 566 IC.
    Frequency multiplication using NE/SE 565 PLL IC.

Detailed Syllabus

1. Study of Basic Digital IC's.

(Verification of truth table for AND, OR, EXOR, NOT, NOR, NAND, JK FF, RS FF, D FF)

Aim

To test of ICs by using verification of truth table of basic ICs.

Exercise

Breadboard connection of ICs with truth table verification using LED's.

2. Implementation of Boolean Functions, Adder/ Subtractor circuits.

[Minimizations using K-map and implementing the same in POS, SOP from using basic gates]

Aim

Minimization of functions using K-map implementation and combination Circuit.

Exercise

1. Realization of functions using SOP, POS, form.
2. Addition, Subtraction of atleast 3 bit binary number using basic gate IC' s.

3. (a) Code converters, Parity genertor and parity checking, Excess 3, 2s Complement, Binary to grey code using suitable ICs .

Aim

Realizing code conversion of numbers of different bar.

Exercise

1. Conversion Binary to Grey, Grey to Binary;
   1's. 2's complement of numbers addition, subtraction,
2. Parity checking of numbers using Gates and with dedicated IC's

(b) Encoders and Decoders: Decimal and Implementation of 4-bit shift registers in SISO, SIPO,PISO,PIPO modes using suitable ICs.

Exercise

1. Decimal to binary Conversion using dedicated ICs.
2. BCD – 7 Segment display decoder using dedicated decoder IC& display.

4. Counters: Design and implementation of 4-bit modulo counters as synchronous and asynchronous types using FF IC's and specific counter IC.

Aim

Design and implementation of 4 bit modulo counters.

Exercise

1. Using flipflop for up-down count synchronous count.
2. Realization of counter function using dedicated ICs.

5. Shift Registers:

Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC's.

Aim

Design and implementation of shift register.

Exercise

1. Shift Register function realization of the above using dedicated IC's
   For SISO, SIPO, PISO, PIPO, modes of atleast 3 bit binary word.
2. Realization of the above using dedicated IC's.

6. Multiplex/ De-multiplex.

Study of 4:1; 8:1 multiplexer and Study of 1:4; 1:8 demultiplexer

Aim

To demonstrate the addressing way of data channel selection for multiplex De-multiplex operation.

Exercise

1. Realization of mux-demux functions using direct IC's.
2. Realization of mux-demux using dedicated IC's for 4:1, 8:1, and vice versa.

7. Timer IC application. Study of NE/SE 555 timer in Astable, Monostable operation.

Aim

To design a multi vibrater circuit for square wave and pulse generation.

Exercise

1. Realization of Astable multivibrater & monostable multivibrater circuit using Timer IC.
2. Variation of R, C, to vary the frequency, duty cycle for signal generator.

8. Application of Op-Amp-I

Slew rate verifications, inverting and non-inverting amplifier, Adder, comparator, Integrater and Differentiator.

Aim

Design and Realization of Op-Amp application.

Exercise

1. Verification of Op-Amp IC characteristics.
2. Op-Amp IC application for simple arithmetic circuit.
3. Op-Amp IC application for voltage comparator wave generator and wave shifting circuits.

9. Study of Analog to Digital Converter and Digital to Analog Converter: Verification of A/D conversion using dedicated IC's.

Aim

Realization of circuit for digital conversions.

Exercise

1. Design of circuit for analog to digital signal conversion using dedicated IC's.
2. Realization of circuit using dedicated IC for digital analog conversion.

10. Study of VCO and PLL ICs

- Voltage to frequency characteristics of NE/ SE 566 IC.
- Frequency multiplication using NE/SE 565 PLL IC.

Aim

Demonstration of circuit for communication application

Exercise

1. To realize V/F conversion using dedicated IC's vary the frequency of the generated signal.
2. To realize PLL IC based circuit for frequency multiplier, divider.

REQUIREMENT FOR A BATCH OF 30 STUDENTS

S.No.	Description of Equipment	Quantity required	Quantity available	Deficiency %
1.	Interface such as, A/D, D/A converter, DMA, PIC Serial, Interface, Temperatures controller, Stepper motor, Key board	4 each		
2.	CRO and function generator	3 each		
3.	IC trainer Kit	15		
4.	Analog AC trainer kit	4		
5.	Components and bread boards	10 each		
6.	Chips IC – 7400	10		
7.	Chips IC – 7402	10		
8.	Chips IC – 7408	10		
9.	Chips IC – 7432	10		
10.	Chips IC – 7410	25		
11.	Chips IC – 555	10		
12.	Chips IC – 741	10		
13.	Chips IC – 74153	10		
14.	Chips IC – 7474	10		
15.	Chips IC – 7490	10		
16.	Chips IC – 7447	10		
17.	Chips IC – 7476	10		
18.	Chips IC – 7420	10		
19.	Chips IC – 7404	15		
20.	Chips LM – 317	10		
21.	Chips LM – 723	10		
22.	Chips MA – 7840	10		
23.	Chips LM – 380	10		
24.	Chips ICL - 8038	10		
25.	Traffic light control kit	2		
26.	VDU	2		
27.	7 segment Display	5		
28.	Interfacing card such as keyboard etc.	3 each		
29.	Work tables	15		

FIFTH SEMESTER
512EIT01 - MICROPROCESSORS AND MICRO CONTROLLER

AIM

To introduce Microprocessor Intel 8085 and 8086 and the Micro Controller 8051

OBJECTIVES

- To study the Architecture of 8085 & 8086, 8051
- To study the addressing modes & instruction set of 8085 & 8051.
- To introduce the need & use of Interrupt structure 8085 & 8051.
- To develop skill in simple program writing for 8051 & 8085 and applications
- To introduce commonly used peripheral / interfacing ICs

UNIT I 8085 and 8086 PROCESSOR

Hardware Architecture pintouts - Signals – Memory interfacing – I/O ports and data transfer concepts – Timing Diagram – Interrupt structure.

UNIT II PROGRAMMING OF 8085 PROCESSOR

Instruction format and addressing modes – Assembly language format – Data transfer, data manipulation & control instructions – Programming: Loop structure with counting & Indexing - Look up table - Subroutine instructions - stack.

UNIT III PERIPHERAL INTERFACING FOR 8085

Study of Architecture and programming of ICs: 8255 PPI, 8259 PIC, 8251 USART, 8279 Key board display controller and 8253 Timer/ Counter – Interfacing with 8085 - A/D and D/A converter interfacing.

UNIT IV 8051 MICRO CONTROLLER

Functional block diagram - Instruction format and addressing modes – Timing Diagram Interrupt structure – Timer –I/O ports – Serial communication.

UNIT V MICRO CONTROLLER PROGRAMMING & APPLICATIONS

Data Transfer, Manipulation, Control & I/O instructions – Simple programming exercises key board and display interface – Closed loop control of servo motor- stepper motor control - Washing Machine Control.

TEXT BOOKS

1. "Microprocessor and Microcontrollers", Krishna Kant Eastern Company Edition, Prentice – Hall of India, New Delhi , 2007.
2. Muhammad Ali Mazidi & Janice Gilli Mazidi, R.D.Kinely 'The 8051 Micro Controller and Embedded Systems', PHI Pearson Education, 5th Indian reprint, 2003.

REFERENCES

1. R.S. Gaonkar, 'Microprocessor Architecture Programming and Application', Wiley Eastern Ltd., New Delhi.
2. Walter A Tribal & Avtar Singh, The 8088 & 8086 Microprocessors , Pearson, 2007, Fourth Edition.

512EIT02 - COMMUNICATION ENGINEERING

AIM

1. To introduce the fundamental techniques of analog, digital and data communication.
2. To explain satellite and fiber optic communication and Networking systems.

OBJECTIVES

- To understand basic signals, analog modulation, demodulation and radio receivers.
- To explain the characteristics and model of transmission medium.
- To understand source digitization, digital multiplexing and modulation.
- To understand data communication system and techniques.
- To learn the basics of satellite and optical fiber communication systems.

UNIT I INTRODUCTION

Transmission lines – Types, equivalent circuit, losses, standing waves, impedance matching, bandwidth; radio propagation – Ground wave and space wave propagation, critical frequency, maximum usable frequency, Path Loss, Gaussian white noise. Time and frequency domain representation of signals need for modulation.

UNIT II ANALOG MODULATION SYSTEMS

Amplitude modulation and demodulation, frequency modulation and demodulation, super heterodyne radio receiver. Frequency division multiplexing. Time Division mulltiplexing.

UNIT III DIGITAL COMMUNICATION

Pulse code modulation, digital T-carrier system. Digital radio system. Digital modulation: Amplitude Shift Key, Frequency and phase shift keying, Quadrature Phase Shift Key – Modulator and demodulator, bit error rate calculation.

UNIT IV DATA COMMUNICATION AND NETWORK PROTOCOL

Data Communication codes, error control, data modem, ISDN, LAN, ISO-OSI seven layer architecture for WAN.

UNIT V SATELLITE AND OPTICAL FIBRE COMMUNICATION SYSTEM

Introduction to satellite communication, Optical Fiber communication, Television Engineering, Microwave communication and Cellular communication

TEXT BOOKS

1. Wayne Tomasi, 'Electronic Communication Systems', Pearson Education, 3rd Edition, 2001.
2. Roy Blake, 'Electronic Communication Systems', Thomson Delmar, 2nd Edition, 2002.

REFERENCES

1. William Schweber, 'Electronic Communication Systems', Prentice Hall of India, 2002.
2. G. Kennedy, 'Electronic Communication Systems', McGraw Hill, 4th edition, 2002.
3. Miller, 'Modern Electronic Communication', Prentice Hall of India, 2003
4. Simon Haykins, Communication systems, John Wiley,4th Edition,2001

512EIT03 - OBJECT ORIENTED PROGRAMMING

AIM

To understand the concepts of object-oriented programming and master OOP using C++ and Java.

UNIT I

Object oriented programming concepts – objects-classes- methods and messagesabstraction and encapsulation-inheritance- abstract classes- polymorphism. Introduction to C++- objects-classes-constructors and destructors

UNIT II

Operator overloading - friend functions- type conversions- templates - Inheritance – virtual functions- runtime polymorphism.

UNIT III

Exception handling - Streams and formatted I/O – file handling – namespaces – String Objects - standard template library.

UNIT IV

Introduction to JAVA , bytecode, virtual machines – objects – classes – Javadoc – packages – Arrays - Strings

UNIT V

Inheritance – interfaces and inner classes - exception handling – threads - Streams and I/O.

TEXT BOOKS

1. B. Trivedi, "Programming with ANSI C++", Oxford University Press, 2007.
2. Cay S. Horstmann, Gary Cornell, "Core JAVA volume 1", Eighth Edition, Pearson Education, 2008.

REFERENCES

1. ISRD Group, "Introduction to Object-oriented Programming and C++", Tata McGraw-Hill Publishing Company Ltd., 2007.
2. ISRD Group, "Introduction to Object-oriented programming through Java", Tata McGraw-Hill Publishing Company Ltd., 2007.
3. S. B. Lippman, Josee Lajoie, Barbara E. Moo, "C++ Premier", Fourth Edition, Pearson Education, 2005.
4. D. S. Malik, "C++ Programming: From Problem Analysis to Program Design", Third Edition, Thomson Course Technology, 2007.
5. K. Arnold and J. Gosling, "The JAVA programming language", Third edition, Pearson Education, 2000.
6. C. Thomas Wu, "An introduction to Object-oriented programming with Java", Fourth Edition, Tata McGraw-Hill Publishing Company Ltd., 2006.

512EIT04 - INDUSTRIAL ELECTRONICS

AIM

To introduce the application of electronic devices for conversion, control and conditioning of electric power.

OBJECTIVES

- To get an overview of different types of power semi-conductor devices and their switching characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifiers.
- To study the characteristics of DC and AC drives
- To learn the different modulation techniques of pulse width modulated inverters and to understand the harmonic reduction methods.
- To know the practical application for power electronics converters in conditioning the power supply.

UNIT I POWER DEVICES

Power diode – Power transistor – Power MOSFET – SCR – TRIAC – GTO – IGBT – MCT – Protection of power devices.

UNIT II CONVERTERS

Introduction to half wave, full wave and bridge rectifiers – Single phase and three phase – Half controlled and fully controlled converters – Dual converters – Introduction to cyclo converters and ac controllers.

UNIT III INVERTER AND CHOPPER

Voltage, current and load commutation – Voltage Source Inverter (VSI) – Series and Parallel inverter – Bridge inverters – Single and three phase – Voltage control using PWM – Current Source Inverter (CSI) – Choppers – Step up and step down choppers – Chopper classification – Class A, B, C, D, E – AC choppers.

UNIT IV DC AND AC DRIVES

Steady state characteristic of dc motors – Control of DC motor using converters and choppers – Regenerative and dynamic braking – Closed loop control scheme – Speedtorque characteristic of induction motor – Static stator voltage control – V/f control – Static rotor resistance control – Slip power recovery scheme – Self control of synchronous motor.

UNIT V OTHER APPLICATIONS

Electronic timers – Digital counters – Voltage regulators – Online and offline ups – Switched mode power supply – Principle and application of induction and dielectric heating.

TEXT BOOKS

1. G. K. Mithal, "Industrial Electronics", Khanna Publishers, Delhi, 2000.
2. M. H. Rashid, "Power Electronics Circuits, Devices and Application", PHI, 3rd edition, 2004.

REFERENCES

1. G. M. Chute and R. D. Chute, "Electronics in Industry", McGraw Hill Ltd, Tokyo,1995.
2. F. D. Petruzulla, "Industrial Electronics", McGraw Hill, Singapore, 1996.

512EIT05 - ANALYTICAL INSTRUMENTS

AIM

The course is designed to equip the students with an adequate knowledge of a number of analytical tools which are useful for clinical analysis in hospitals, drugs and pharmaceutical laboratories and above all for environmental Pollution Monitoring.

OBJECTIVES

- To provide various techniques and methods of analysis which occur in the various regions of the spectrum. These are the powerful tools used in Clinical and Research laboratories.
- To give unique methods of separation of closely similar materials, the most powerful being gas chromatography.
- To study important methods of analysis of industrial gases. Awareness and control of pollution in the environment is of vital importance.
- To bring out the latest ideas on ion-selective electrodes as well as biosensors which have potential applications in medical field, food and beverage industries.
- To provide the important electromagnetic resonance and microscopic methods of analysis. Further they are both sensitive and specific and often are characterized by good accuracy. NMR & ESR and microscopic techniques are useful in structure determination.

UNIT I COLORIMETRY AND SPECTROPHOTOMETRY

Special methods of analysis – Beer-Lambert law – Colorimeters – UV-Visible spectrophotometers – Single and double beam instruments – Sources and detectors – IR Spectrophotometers – Types – Attenuated total reflectance flame photometers –
Atomic absorption spectrophotometers – Sources and detectors – FTIR spectrophotometers – Flame emission photometers – Fluorescence spectrophotometer.

UNIT II CHROMATOGRAPHY

Different techniques – Gas chromatography – Detectors – Liquid chromatographs – Applications – High-pressure liquid chromatographs – Applications.

UNIT III INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING INSTRUMENTS

Types of gas analyzers – Oxygen, NO2 and H2S types, IR analyzers, thermal conductivity analyzers, analysis based on ionization of gases. Air pollution due to carbon monoxide, hydrocarbons, nitrogen oxides, sulphur dioxide estimation - Dust and smoke measurements.

UNIT IV pH METERS AND DISSOLVED COMPONENT ANALYZERS

Principle of pH measurement, glass electrodes, hydrogen electrodes, reference electrodes, selective ion electrodes, ammonia electrodes, cyclic voltametry, biosensors, dissolved oxygen analyzer – Sodium analyzer – Silicon analyzer.

UNIT V ELECTRO MAGNETIC RESONANCE AND MICROSCOPIC TECHNIQUES

NMR – Basic principles – NMR spectrometer - Applications. Electron spin Resonance spectroscopy – Basic principles, Instrumentation and applications. Scanning Electron Microscope (SEM), - Basic principles, Instrumentation and applications. Transmission Electron Microscope (TEM) – Basic principles – Instrumentation and applications. Mass spectrometers – Different types – Applications.

TEXT BOOKS

1. G.W. Ewing, 'Instrumental Methods of Analysis', McGraw Hill, 1992.
2. R.K.Jain, Mechanical and Industrial Measurements, Khanna Publishers, New Delhi, 1999.
3. H.H. Willard, L.L. Merritt, J.A. Dean, F.A. Settle, 'Instrumental Methods of Analysis', CBS publishing & distribution, 1995.

REFERENCES

1. Robert D. Braun, 'Introduction to Instrumental Analysis', McGraw Hill, Singapore, 1987.
2. R.S. Khandpur, 'Handbook of Analytical Instruments', Tata McGraw Hill publishing Co. Ltd., 2003.
3. Liptak, B.G, 'Process Measurement and Analysis,' Chilton Book Company, 1995

512EIT06 - INDUSTRIAL INSTRUMENTATION – II

AIM

To equip the students with relevant knowledge to suit the industrial requirement.

OBJECTIVES

- To study about humidity and moisture measurements.
- To study about mechanical flow meters and their installation.
- To study about area flow meters, mass flow meters and calibration.
- To know elaborately about non-content type flow meters.
- To know about various types of level measurements adopted in industry environment.

UNIT I VARIABLE HEAD TYPE FLOWMETERS

Variable head type flow meters: – Orifice plate – Venturi tube – Flow nozzle – Dall tube – Installation of head flow meters – Pitot tube.

UNIT II QUANTITY METERS, AREA FLOW METERS AND MASS FLOW METERS

Positive displacement flow meters: – Nutating disc, Reciprocating piston, Oval gear and Helix type flow meters – Inferential meter – Turbine flow meter – Area flow meter: – Rotameter – Theory and installation – Mass flow meter: – Angular momentum – Thermal, Coriolis type mass flow meters – Calibration of flow meters – Dynamic weighing methods.

UNIT III ELECTRICAL TYPE FLOW METER

Principle and constructional details of electromagnetic flow meter – Ultrasonic flow meters – Laser Doppler anemometer – Vortex shedding flow meter – Target flow meter – Guidelines for selection of flow meter – Open channel flow measurement – Solid flow rate measurement.

UNIT IV LEVEL MEASUREMENT

Level measurement: – Float, Displacer type – Bubbler system – Electrical level gauge: – Resistance – Capacitance – Nuclear radiation and Ultrasonic type – Boiler drum level measurement: – Differential pressure method – Hydra step method.

UNIT V MEASUREMENT OF VISCOSITY, HUMIDITY AND MOISTURE

Viscosity: – Rotameter type viscometer – Consistency meters – Dry and wet bulb psychrometers – Hot wire electrode type hygrometer – Dew cell – Electrolysis type hygrometer – Commercial type dew point meter – Moisture measurement: – Different methods of Moisture measurement – Application of moisture measurement.

TEXT BOOKS

1. Doebelin, E.O., "Measurement systems Application and Design", International Student Edition, 5th Edition, McGraw Hill Book Company, 2004
2. Liptak, B.G., " Instrumentation Engineers Handbook (Measurement)", CRC Press, 2005
3. A.K. Sawhney, 'A course in Electrical & Electronic Measurement and Instrumentation', Dhanpat Rai and Co (P) Ltd., 2004.

REFERENCES

1. Jain, R.K., "Mechanical and Industrial Measurments", Khanna Publishers, Delhi, 1999.
2. Eckman, D.P., " Industrial Instrumentation", Wiley Eastern Limited, 1990.

512EIP01 - MICROPROCESSOR AND MICROCONTROLLER LABORATORY

AIM

To understand programming using instruction sets of processors and microcontroller.

8-bit Microprocessor

1. Simple arithmetic operations:
   - Addition / subtraction / multiplication / division.
2. Programming with control instructions:
   - Increment / Decrement.
   - Ascending / Descending order.
   - Maximum / Minimum of numbers.
   - Rotate instructions.
   - Hex / ASCII / BCD code conversions.
3. Peripheral Interface Experiments:
   - Simple experiments using 8251, 8279, 8254, 8259, 8255.
4. Interface Experiments:
   - A/D Interfacing.
   - D/A Interfacing.
   - Traffic light controller.
5. Programming practice on assembler and simulator tools.

8-bit Micro controller

6. Demonstration of basic instructions with 8051 Micro controller execution, including:
   - Conditional jumps, looping
   - Calling subroutines.
   - Stack parameter testing
7. Parallel port programming with 8051 using port 1 facility:
   - Stepper motor
   - D / A converter.
   - Programming Exercise on
   - RAM direct addressing
   - Bit addressing
8. Programming practice using simulation tools and C – compiler
   - Initialize timer
   - Enable interrupts.
9. Study of micro controllers with flash memory.

Detailed Syllabus

8-bit Microprocessor

1. Simple arithmetic operations

a. Addition / subtraction / multiplication / division.

Aim

To perform simple arithmetic operations using assembly language program.

Exercise

1. Write an assembly language program using 8085 instructions set to perform the following arithmetic operations
   - Addition of two 8 bit numbers
   - Subtraction of two 8 bit numbers
   - Multiplication of two 8 bit numbers
   - Division of two 8 bit numbers

2. Programming with control instructions

- Increment / Decrement.
- Ascending / Descending order.
- Maximum / Minimum of numbers.
- Rotate instructions.
- Hex / ASCII / BCD code conversions.

Aim

To write an assembly language program using the control instructions

Exercise

1. Using the control instructions of 8085 microprocessor write assembly language programs to perform the following
2. Arrange the given array of data in ascending and descending order
3. Find the maximum and minimum number in a group of data given.
4. Conversion of the following
   - ASCII to HEX code
   - Conversion of HEX to ASCII code
   - Conversion of BCD to HEX
   - Conversion of HEX to BCD

3 Peripheral Interface Experiments:

a. Simple experiments using 8251, 8279, 8254, 8259, 8255.

4. Interface Experiments:

A/D Interfacing.
D/A Interfacing.
Traffic light controller.

Aim

To write an assembly language program to convert Analog input to Digital output and Digital input to Analog output.

Exercise

1. Write an assembly language program (using 8085) to convert Analog input to Digital output
2. Write an assembly language programs to convert digital input into analog signal of following type.
3. Square wave
4. Triangular wave
5. Sawtooth wave

5. Programming practice on assembler and simulator tools.
8-bit Micro controller

6. Demonstration of basic instructions with 8051 Micro controller execution, including:

- Conditional jumps, looping
- Calling subroutines.
- Stack parameter testing

Aim

To demonstrate use of control logic instructors.

Exercise

1. To write programs which can include instruction sets for jump, loop, cell, return, stack.
2. To observe the change in status registers and various relevant registers.

7. Parallel port programming with 8051 using port 1 facility:

- Stepper motor
- D / A converter.

Aim

To demonstrate the access of parallel port.

Exercise

1. To develop command words on choice of port, addressing of port pins.
2. To vary timing cycle of speed of motor, direction of motor.
3. To demonstrate generation of sine wave saw tooth, triangular wave of various frequency, amplitude.

8 Programming Exercise on

- RAM direct addressing
- Bit addressing

Aim

To write the program to check the content of memory locations using READ / WRITE instructions using different addressing modes.

Exercise

To READ / WRITE the content of RAM registers, bits and the RAM from location 1 to N and check the display with say LEDs.

9 Programming practice using simulation tools and C – compiler

- Initialize timer
- Enable interrupts.

Aim

To use the facility of popular Micro controller programming tools like KEIL or RIDE software.

Exercise

1. To study the initializing of timer interrupt with context saving like increasing or decreasing the counter count.
2. To demonstrate use of instruction like cjne, djnz, jb etc.

10. Study of micro controllers with flash memory.

Aim

To familiarize of loading and executing on flash memory.

Exercise

1. To write the program to generate sine wave, square wave etc.
2. To vary the frequency, amplitude of the signal.

REQUIREMENT FOR A BATCH OF 30 STUDENTS

S. No.	Description of Equipment	Quantity required
1.	8085 Microprocessor Trainer with Power supply	10
2.	8051 Micro controller Trainer Kit with power supply	10
3.	8255 Interface board	5
4.	8251 Interface board	5
5.	8259 Interface board	5
6.	8279 Keyboard/Display Interface Board	5
7.	8253 timer counter	5
8.	ADC and DAC card	5 each
9.	Stepper motor with Controller	1
10.	Traffic Light Control System	1
11.	Regulation power supply	1
12.	Universal ADD-ON modules	3
13.	8 Digit Multiplexed Display Card	2
14.	Function Generator	3
15.	Multimeter	3
16.	C Compliers	2
17.	KEIL or RIDE software	2 licenses
18.	8051 Microcontroller trainer kit with flash memory	2
19.	AT89C51 Microcontroller Kit	2

512EIP02 - OBJECT ORIENTED PROGRAMMING LAB

Aim: To develop object-oriented programming skills using C++ and Java

1. Function overloading, default arguments in C++
2. Simple class design in C++, namespaces, objects creations
3. Class design in C++ using dynamic memory allocation, destructor, copy constructor
4. Operator overloading, friend functions
5. Overloading assignment operator, type conversions
6. Inheritance, run-time polymorphism
7. Template design in C++
8. I/O, Throwing and Catching exceptions
9. Program development using STL
10. Simple class designs in Java with Javadoc
11. Designing Packages with Javadoc comments
12. Interfaces and Inheritance in Java
13. Exceptions handling in Java
14. Java I/O
15. Design of multi-threaded programs in Java

REQUIREMENT FOR A BATCH OF 30 STUDENTS

S. No.	Description of Equipment	Quantity required
	Hardware Required	
1.	Computers (Pentium-4)	40 Nos. with one server
2.	Dot matrix printer	3 Nos.
3.	Laser Printer	2 Nos.
4.	UPS (5 KVA)	2
	Software Required	
5.	Turbo C++	40 Nodes.
6.	(Java 2 SDK) JDK 5.0 update 6 (1.5.0 - Internal Version No.)	40 Nos.

512EIP03 - INDUSTRIAL INSTRUMENTATION LABORATORY

OBJECTIVE

The training gained by the student in this area will be of immense help and ease for him in any industrial establishment.

1. Discharge coefficient of orifice plate
2. Calibration of pressure gauge
3. Torque measurement
4. Viscosity measurement
5. Vacuum pressure measurement
6. Level measurement using d/p transmitter
7. UV – Visible spectrophotometer
8. IR spectrophotometer
9. pH meter standardization and measurement of pH values of solutions
10. Measurements of conductivity of test solutions.

Detailed syllabus:

1. Discharge coefficient of orifice plate

Aim

To find the discharge co-efficient of orifice plate.

Exercise

Find the discharge co-efficient Cd.

Procedure

1. Open the outlet value completely and switch on the motor.
2. Now open the inlet value.
3. With a particular operating a the inlet value note the reading on two time of manometer and computer the value of x.
4. Compute the actual discharge using the collecting task and stop watch and the theoretical discharge.
5. Now change the opening of the inlet values and note the reading of monometer and compare and discharge.
6. Calculate the value of Cd.

Equipment

1. Orifice meter – 1 No
2. 2 Stopwatch – 1 No

2. Calibration of Pressure Gauge

Aim

To calibrate the given pressure gauge using dead weight tester.

Exercise

Calibrate the pressure gauge and discuss the graphs

(i) Actual pressure Vs true pressure

(ii) Actual pressure Vs Error

Procedure

1. A standard weight of 0.5 Kg/cm2 is kept on the piston plate form.
2. Pressure is applied to the chamber containing oil by rotating the hand operated wheel in the anti clock wise direction.
3. This is continued until piston carrying weight shows a list.
4. In the movement the pressure acts equally on the piston as well as on the gauge.
5. The reading shown by the gauge is taken as actual reading.
6. The same procedure is repeated for increasing weights on the platform in steps of 0.5 Kg/cm2 and actual reading shown by the gauge is noted down.
7. Graphs are drawn between
    - Actual pressure Vs true pressure.
    - Actual pressure Vs Error.

Equipment

1. Dead weight tester - 1 No
2. Pressure gauge and standard weight - 1 No

3. Torque Measurement

Aim

To determine the due to dead weights using strain torsion meter and to determine the unknown weight.

Exercise

Find the % error of the torque measurement.

Procedure

1. Connect the strain gauge torsion meter to the power supply.
2. Now change or hanger is fixed to the shift, the torque is to subject.
3. Now keep the dead weights in the hanger gently.
4. Note the indicated torque value from the strain gauge torsion indicator.
5. Repeat the same for different weights (say 1Kg, 2Kg,) and tabulate the readings.
6. Now repeat the same procedure for the given unknown weight.
7. The unknown weight is interpreted from graph.

Equipment

1. Strain gauge torsion meter – 1 No
2. Dead weight – 1 No

4. Measurement of Viscosity Using Saybolt Viscometer

Aim

To measure the viscosity using saybolt viscometer.

Exercise

Measure the viscosity using saybolt viscometer and draw the graph between voltage on x-axis and dynamo viscosity on y-axis.

Procedure

1. Viscosity determination shall be done in room free from dust rapid changes in temperature.
2. The oil in the cup and allow it to drain.
3. Pour oil in the cup and allow it to drain.
4. The cark stopper should be installed at the lower and of thetube.
5. The cark should be tight enough to prevent escape of oil.
6. Since the oil should be stirred well until a constant temperature is maintained both in the water and the oil.
7. After thermal equilibrium has been obtained.
8. Remove the thermometer from the oil bath.
9. 60ml of flask should be kept in position to collect oil from the tube.
10. Open the cork and start the stopwatch.
11. Record the time for the fall of 60mm of oil.
12. Vary the temperature of oil using temperature controller record the actual temperature.
13. Draw the graph between voltage on x-axis and dynamo viscosity on y-axis.

Equipment

1. Thermometer – 1 No
2. Stop watch – 1 No
3. 60ml flask – 1 No
4. Water – 1 No

5. Vacuum pressure measurement

Aim

To study the vacuum pressure gauge setup and measure the unknown vacuum pressure.

Exercise

i. Maintain the vacuum pressure in the cylinderand switch on the vacuum pressure transmitter setup.
ii. Measure the output voltage in Volts for the corresponding vacuum ppressure in mbars.
iii. Vary the vacuum pressure in cylinder and follow the step 2 for different values.
iv. Draw the graph between ouput voltage Vs. vacuum pressure in mbars.

Equipment

1. Vacuum presuure setup
2. Vacuum pressure transmitter
3. Voltmeter

6. Level Measurement Using DPT

Aim

To measure the level of liquid in the tank with the differential pressure transmitter and to calibrate the zero and span of the level interns of 4-20 mA.

Exercise

Measure the liquid level and calibrate it interms of 4-20 mA.

Procedure

a) Weight the empty container and calibrate the daters level to 4mA.
b) Fill the container with the water and calibrate the full level to 20mA.
c) Now perform the experiment in the ascending order in steps of 5cms.
d) Repeat the same procedure for the descending order.
e) Tabulate the readings.
f) Draw the hastenis

Equipment

1. DPT - 1 No
2. Container - 1 No

7. UV-Visible Spectrophotometer

Aim

To find out the absorbance, % of transmittance and concentration for a given test solution, using UV spectrophotometer.

Exercise

Find out the absorbance, % of transmittance and concentration of the given Test solutions.

Procedure

1. Switch on the UV-spectrophotometer.
2. Switch on the lamp by electing the names of rating disc.
3. Place the reference solution in the first column of rotating disc.
4. Use any other column to place the test solution.
5. Select the operating mode. There are 4 types of operating modes:
    - Single wavelength
    - Multiple wavelength
    - Scanning mode
    - Time scan mode
6. Select the mode. The 3 parameters to be measures are absorbance, % of transmittance and concentration for a given test solution.
   Note down the result from the 1st parameter.

Equipment

1. UV spectrophotometer – 1 No.
2. Curettes

8. IR – Spectrophotometer

Aim

To measure and analyze the absorbance, percentage transmission concentration of the given samples using IR spectroscopy

Exercise

*wait for 3o minutes for IR source to be operated, then take the readings.
For IR wavelength is ABOVE 300nm :
Place reference sample in CELL No 2.
Place the sample to be analyzed in cell NO 1 or 3 or 4 or 5

Single wave length:

As the name suggests, this mode is used t take readings at one wave length. Depends on the absorbance mode, transmittance mode, concentration mode the data will be displayed on the monitor. Each subsequent data can be transferred just by pressing Key of 117.After completion of the data transfer, Press ESC key to stop the reception.

Multi wavelength analysis:
This mode is similar to single wave length except that it takes readings at more than one wavelength. With this mode, readings can be taken at minimum 2 discrete readings and maximum 8 discrete wavelength. Any 8 wavelength can be selected in the range 200nm to 1000nm.Note the maximum wavelength of absorption .

Equipment

1. IR spectrophotometer sl-117
2. cuvette
3. Solution
4. Printer

9. pH – Meter Measurement of pH - value of Test Solutions

Aim
To measure the PH values of the test solutions using pH-meter.

Exercise
Find the pH values of the test solutions.

Procedure

1. Switch on the PH meter
2. Connect the glass electrode to the PH-meter
3. Take distilled water in a beaker and insert electrode in the beaker
4. The PH meter should show approximately test solutions. If Acidic than the PH is < 7 and if alkaline than the PH >7

Equipment

1. pH meter – 1 No.
2. Test solutions – few types
3. Beaker – 2 Nos.
4. Stand – 1 No.

10. Measurements of conductivity of test solutions.
Aim
To measure the conductivity of the given solution.

Exercise

(i) Solution under test is taken in a beaker.
(ii) Electrode is immersed into the solution
(iii) The electrode terminal is connected to display unit.
(iv) Digital display shows the conductivity of the given solution in mho
(v) Repeat the procedure fro different samples.
(vi) Switch on the supply.

Equipment

(i) Solution under test.
(ii) Conductivity electrode
(iii) Conductivity meter setup with display.

SIXTH SEMESTER
612EIT01 - MODERN ELECTRONIC INSTRUMENTATION

AIM

To provide adequate knowledge in digital instruments, display devices and virtual instrumentation.

OBJECTIVES

- To make the students to gain a clear knowledge of the basics of digital instruments and measurement techniques.
- To have an adequate knowledge in various display and recording devices.
- To have an elaborate study of communication standards
- To have a detailed study of virtual instrumentation and its applications.

UNIT I DIGITAL INSTRUMENTS

Digital voltmeters and multimeters –Microprocessor based DMM with auto ranging and self diagnostic features – Digital IC tester –Frequeny, period, time interval and pulse width measurement.

UNIT II DISPLAY AND RECORDING DEVICES

Cathode ray oscilloscope – General purpose and advanced types – Sampling and storage scopes – Wave analyzers – Signal and function generators – Distortion factor meter – Q meter – Seven segment and dot matrix display – X-Y recorders – Magnetic tape recorders – Digital recording and data loggers.

UNIT III RS 232 AND RS 485

Modern instrumentation and control systems – OSI model – EIA 232 Interface standard - EIA 485 Interface standard - EIA 422 Interface standard – 20 mA current loop – Serial Interface converters.

UNIT IV VIRTUAL INSTRUMENTATION

Virtual instrumentation – Definition, flexibility – Block diagram and architecture of virtual instruments – Virtual instruments versus traditional instruments – Review of software in virtual instrumentation - VI programming techniques – VI , sub VI,loops and charts ,arrays, clusters and graphs, case and sequence structures, formula nodes, string and file input / output.

UNIT V DATA ACQUISITION CARDS

DAQ cards for VI applications – Requirements – DAQ modules with serial communication – Design of digital voltmeters with transducer input – Design of ON/OFF controller for temperature control applications.

TEXT BOOKS

1. Chris Nadovich, 'Synthetic Instruments Concepts and Applications', Elsevier, 2005.
2. Rick Bitter, Taqi Mohiuddin and Matt Nawrocki, 'Labview Advanced Programming Techniques', CRC Press, Second Edition, 2007.
3. S. Gupta and J.P. Gupta, 'PC interfacing for data acquisition and process Control', second Edition, Instrument Society of America, 1994.
4. Kalsi H.S., "Electronic Instrumentation", Second Edition, Tata Mc Graw Hill Company, New Delhi, 2004.
5. Sawhney A.K., "A course in Electrical and Electronic Measurement and Instrumentation", Dhanpat Rai and sons, New Delhi, 2003.

REFERENCES

1. Rahman Jamal and Herbert Picklik, LabVIEW – Applications and Solutions, National Instruments Release ISBN 0130964239.Rah
2. William Buchanan 'Computer Busses', CRC Press, 2000.
3. Rangan C.S., Sharma G.R., Mani V.S.V., "Instrumentation devices and Systems", Tata Mc Graw Hill Company, New Delhi,.2002.
4. Joseph J Carr, "Elements of Electronic Instrumentation and Measurement", Third Edition, Pearson Education, 2003.
5. David A. Bell, "Electronic Instrumentation and measurements", Second Edition, Prentice Hall of India, New Delhi, 2003.
6. Gupta J.B., "A course in Electrical and Electronic Measurement and Instrumentation", 12th Edition, Katson Publishing House, 2003.

612EIT02 - PROCESS CONTROL

AIM

To provide basic knowledge of controllers, find control elements and the processes.

OBJECTIVES

- To study the basic characteristics of first order and higher order processes.
- To get adequate knowledge about the characteristics of various controller modes and methods of tuning of controller.
- To study about various complex control schemes.
- To study about the construction, characteristics and application of control valves.
- To study the five selected unit operations and a case study of distillation column control.

UNIT I INTRODUCTION

Need for process control – mathematical model of first order level, pressure and thermal processes – higher order process – interacting and non-interacting systems – continuous and batch processes – self-regulation – servo and regulator operations.

UNIT II CONTROL ACTIONS AND CONTROLLERS

Basic control actions – characteristics of on-off, proportional, single-speed floating, integral and derivative control modes – P+I, P+D and P+I+D control modes – pneumatic and electronic controllers to realize various control actions.

UNIT III OPTIMUM CONTROLLER SETTINGS

Evaluation criteria – IAE, ISE, ITAE and ¼ decay ratio – determination of optimum settings for mathematically described processes using time response and frequency response – Tuning – Process reaction curve method – Ziegler Nichols method – Damped oscillation method.

UNIT IV MULTILOOP CONTROL

Feed-forward control – ratio control- cascade control – inferential control – split-range control – introduction to multivariable control – examples from distillation column and boiler systems.

UNIT V FINAL CONTROL ELEMENT

I/P converter – pneumatic and electric actuators – valve positioner – control valves – characteristics of control valves – inherent and installed characteristics – valve body – commercial valve bodies – control valve sizing – cavitation and flashing – selection criteria.

TEXT BOOKS

1. Stephanopoulis, G, 'Chemical Process Control,' Prentice Hall of India, New Delhi, 1990.
2. Eckman. D.P., Automatic Process Control, Wiley Eastern Ltd., New Delhi, 1993.

REFERENCES

1. Pollard A.'Process Control', Heinemann educational books, London, 1971.
2. Harriott. P., 'Process Control,' Tata McGraw-Hill Publishing Co., New Delhi, 1991.

612EIT03 - DIGITAL SYSTEM DESIGN

AIM

The course is designed to introduce the fundamental concepts and design of digital system.

OBJECTIVES

- To introduce the most common digital logic families.
- To provide introduction to programmable logic devices such as PLA, PAL, FPGA, CPLD etc.
- To provide introduction to Digital Memories. Such as ROM, RAM, SRAM, etc.
- To discuss case studies on Digital System design.

UNIT I DIGITAL LOGIC FAMILIES

TTL, CMOS, NMOS, Dynamic MOS , ECL, I2L, Operating conditions, Parameters, Interpreting data sheets. Power supply grounding considerations for digital ICs, TTL – to – CMOS Interface, CMOS – to – TTL interface.

UNIT II PROGRAMMABLE LOGIC DEVICES

Programmable logic Arrays, Programmable array logic, Realizing logic function using Multiplexers, Decoders, ROM, PLA, PAL. Design of sequential Networks using PAL, PLA – Programmable Gate arrays – FPGA – CPLD.

UNIT III DIGITAL MEMORIES

The role of Memory in a system – memory types and terminology – ROM – types of ROM – RAM – SRAM – DRAM – Expanding word size and capacity – Applications.

UNIT IV DIGITAL SYSTEM DESIGN CASE STUDIES

Multiplexing displays – Frequency counters – Time measurement – Digital voltmeter – PRBS generator – Interfacing with flash memory.

UNIT V DESIGN FOR TESTABILITY

Teatability – Ad hoc design for testing techniques – controllability and observability by means of scan registers – Generic scan based designa – Board level and system level DFT approaches.

TEXT BOOKS

1. Charles H.Roth, 'Fundamentals Logic Design', Jaico Publishing, IV edition, 2002.
2. Donald. P. Leach, Albert paul Malvino, Goutam Suha,'Digital Principles and Applications' Tata McGraw – Hill , Sixth edition .
3. Miron Abramonici, Melvin. A. Rrewer, Arthur.D. Friedman,'Digital system testing and testable design', Jaico publishing house.

REFERENCES

1. Theodore. F. Bogart,' Introduction to Digital Circuits', McGraw – Hill International edn.1992
2. Ronald J.Tocci, Neal .S. Widmer,'Digital System Principles and Applications', Pearson Education, 8th edition, Asia, 2002.

612EIT04 - DIGITAL SIGNAL PROCESSING

AIM

To introduce the concept of analyzing discrete time signals & systems in the time and frequency domain.

OBJECTIVES

- To classify signals and systems & their mathematical representation.
- To analyse the discrete time systems.
- To study various transformation techniques & their computation.
- To study about filters and their design for digital implementation.
- To study about a programmable digital signal processor & quantization effects.

UNIT I INTRODUCTION

Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect. Digital signal representation.

UNIT II DISCRETE TIME SYSTEM ANALYSIS

Z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform, application to discrete systems - Stability analysis, frequency response – Convolution – Fourier transform of discrete sequence – Discrete Fourier series.

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION

DFT properties, magnitude and phase representation - Computation of DFT using FFT algorithm – DIT & DIF - FFT using radix 2 – Butterfly structure.

UNIT IV DESIGN OF DIGITAL FILTERS

FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. IIR design: Analog filter design - Butterworth and Chebyshev approximations; digital design using impulse invariant and bilinear transformation - Warping, prewarping – Frequency transformation.

UNIT V DIGITAL SIGNAL PROCESSORS

Introduction – Architecture – Features – Addressing Formats – Functional modes - Introduction to Commercial Processors

TEXT BOOKS

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, 2003 / PHI.
2. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', Tata McGraw Hill, New Delhi, 2001.

REFERENCES

1. Alan V. Oppenheim, Ronald W. Schafer and John R. Buck, 'Discrete – Time Signal Processing', Pearson Education, New Delhi, 2003.
2. Emmanuel C Ifeachor and Barrie W Jervis ,"Digital Signal Processing – A Practical approach" Pearson Education, Second edition, 2002.
3. Steven W. Smith, "The Scientist and Engineer's Guide to Digital Signal Processing", Second Edition, California Technical Publishing San Diego, lifornia.(www.DSPguide.com)
4. B. Venkataramani, M. Bhaskar, 'Digital Signal Processors, Architecture, Programming and Applications', Tata McGraw Hill, New Delhi, 2003.

612EIT05 - EMBEDDED SYSTEM

AIM

To understand the basic concepts of embedded system design and its applications to various fields.

OBJECTIVES

- To provide a clear understanding of Embedded system terminologies and its devices.
- Various Embedded software Tools
- Design and architecture of Memories.
- Architecture of processor and memory organizations.
- Input/output interfacing
- Various processor scheduling algorithms.
- Basics of Real time operating systems.
- Introduction to PIC and its applications

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS

Introduction to embedded real time systems – The build process for embedded systems – Embedded system design process-Embedded computory applications-Types of memory – Memory management methods.

UNIT II EMBEDDED SYSTEM ORGANIZATION

Structural units in processor , selection of processor & memory devices – DMA – I/O devices : timer & counting devices – Serial communication using I2C , CAN USB buses – Parallel communication using ISA , PCI ,PCI/X buses – Device drivers.

UNIT III PROGRAMMING AND SCHEDULING

Intel I/O instructions – Synchronization - Transfer rate, latency; interrupt driven input and output - Nonmaskable interrupts, software interrupts, Preventing interrupts overrun - Disability interrupts. Multithreaded programming –Context Switching, Preemptive and non-preemptive multitasking, semaphores. Scheduling-thread states, pending threads, context switching.

UNIT IV REAL-TIME OPERATING SYSTEMS

Introduction to basic concepts of RTOS, Unix as a Real Time Operating system – Unix based Real Time operating system - Windows as a Real time operating system – POSIX – RTOS-Interrupt handling - A Survey of contemporary Real time Operating systems:PSOS, VRTX, VxWorks, QNX, ЧC/OS-II, RT Linux – Benchmarking Real time systems – Basics.

UNIT V PIC MICROCONTROLLER BASED EMBEDDED SYSTEM DESIGN

PIC microcontroller – MBasic compiler and Development boards – The Basic Output and digital input – Applications.

TEXT BOOKS

1. Rajkamal, 'Embedded system-Architecture, Programming, Design', Tatamcgraw Hill, 2003.
2. Daniel W. Lewis, 'Fundamentals of Embedded Software', Prentice Hall of India, 2004.

REFERENCES

1. Jack R Smith "Programming the PIC microcontroller with MBasic" Elsevier, 2007
2. Tammy Noergaard, "Embedded Systems Architecture", Elsevier, 2006
3. Rajib Mall "Real-Time systems Theory and Practice" Pearson Education 2007
4. Sriram. V.Iyer & Pankaj Gupta, 'Embedded real time systems Programming', Tata McGraw Hill, 2004.
5. Wayne Wolf, 'Computer as Components ', Pearson Education

612EIT06 - BIO–MEDICAL INSTRUMENTATION

AIM

The course is designed to make the student acquire an adequate knowledge of the physiological systems of the human body and relate them to the parameters that have clinical importance. The fundamental principles of equipment that are actually in use at the present day are introduced.

OBJECTIVES

- To provide an acquaintance of the physiology of the heart, lung, blood circulation and circulation respiration. Biomedical applications of different transducers used.
- To introduce the student to the various sensing and measurement devices of electrical origin. To provide awareness of electrical safety of medical equipments
- To provide the latest ideas on devices of non-electrical devices.
- To bring out the important and modern methods of imaging techniques.
- To provide latest knowledge of medical assistance / techniques and therapeutic equipments.

UNIT I PHYSIOLOGY AND TRANSDUCERS

Cell and its structure – Resting and Action Potential – Nervous system: Functional organisation of the nervous system – Structure of nervous system, neurons - synapse – transmitters and neural communication – Cardiovascular system – respiratory system – Basic components of a biomedical system - Transducers – selection criteria – Piezo electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors.

UNIT II ELECTRO – PHYSIOLOGICAL MEASUREMENTS

Electrodes –Limb electrodes –floating electrodes – pregelled disposable electrodes - Micro, needle and surface electrodes – Amplifiers: Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier. ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms. Electrical safety in medical environment: shock hazards – leakage current- Instruments for checking safety parameters of biomedical equipments.

UNIT III NON-ELECTRICAL PARAMETER MEASUREMENTS

Measurement of blood pressure – Cardiac output – Heart rate – Heart sound – Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analysers : pH of blood –measurement of blood pCO_2, pO_2, finger-tip oxymeter - ESR, GSR measurements .

UNIT IV MEDICAL IMAGING

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography – Different types of biotelemetry systems and patient monitoring – Introduction to Biometric systems.

UNIT V ASSISTING AND THERAPEUTIC EQUIPMENTS

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialysers – Lithotripsy.

TEXT BOOKS

1. R.S.Khandpur, 'Hand Book of Bio-Medical instrumentation', Tata McGraw Hill Publishing Co Ltd., 2003.
2. Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, 'Bio-Medical Instrumentation and Measurements', II edition, Pearson Education, 2002 / PHI.

REFERENCES

1. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.
2. L.A. Geddes and L.E.Baker, 'Principles of Applied Bio-Medical Instrumentation', John Wiley & Sons, 1975.
3. J.Webster, 'Medical Instrumentation', John Wiley & Sons, 1995.
4. C.Rajarao and S.K. Guha, 'Principles of Medical Electronics and Bio-medical Instrumentation', Universities press (India) Ltd, Orient Longman ltd, 2000.

612EIP01 - COMMUNICATION AND DSP LABORATORY

OBJECTIVE

To understand the concepts of various modulation techniques and to have an in-depth knowledge of various signal processing techniques.

1. Generation and Detection of Amplitude Modulation
2. Generation of Frequency Modulation and its Detection
3. Generation and Detection of PAM
4. Generation of BFSK and its Detection
5. Generation of standard inputs using simulation package
6. Analysis of Linear Systems [with Convolution and Deconvolution Operation]
7. FIR Filter Design (any one Technique)
8. IIR Filter Design (any one Technique)
9. Implementation of FFT algorithm
10 Implementation of Interpolation and Decimation function

Detailed Syllabus

1. Generation and Detection of Amplitude Modulation

Aim:

To study the working concept of Amplitude Modulation and detection

Objective:

1. To study the modulation of message signal using high frequency carrier
2. To study the detection of message signal from the modulated signal

Exercise

Modulation

1. Construct a modulation circuit using discrete components.
2. Using signal generators, give message signal and high frequency carrier.
3. Using CRO, observe Emax and Emin of modulated wave and find out modulation index

Detection

1. Construct demodulated circuit
2. Give modulated wave as input
3. Measure the amplitude and frequency of modulating signal

Equipments Required

1. Signal Generators
2. Power supply
3. CRO

2. Generation of Frequency Modulation and its Detection

Aim:

To understand the working concept of Frequency Modulation and Detection

Objective:

1. To study Frequency Modulation for the given modulated signal
2. To study Frequency Detection from the Frequency Modulated signal

Exercise

Modulation

1. Construct a Frequency Modulation Circuit
2. Give Modulating Signal and Carrier using Signal Generators
3. Using CRO, Observe Frequency Deviation and calculate Modulation Index

Detection

1. Give Frequency Modulated Signal as input to the detector circuit
2. Using CRO, Observe Frequency and Amplitude of modulating signal.

Equipments Required

1. Signal Generators
2. CRO
3. Power Supply

3. Generation and Detection of PAM

Aim:
To study the working concept of PAM and its detection

Objective

1. To study PAM for the given Message Signal using Pulse train
2. To study the detection of message signal from the PAM Signal

Exercise
Modulation

1. Construct a circuit using discrete components
2. Give analog message signal, pulse train carrier using signal generators
3. Using CRO, Observe the amplitude of the pulses of PAM Signal

Detection

1. Give PAM Signal to the detection circuit
2. Observe the Amplitude and Frequency of Message signal

Equipments Required

1. CRO
2. Signal Generators
3. Power Supply

4. Generation and Detection of BFSK

Aim:
To study the concept of BFSK Generation and its Detection

Objective

1. To study BFSK Concept for the given analog modulating Signal.
2. To Study the retrieved Modulating Signal from the BFSK Signal.

Exercise
Modulation

1. Construct BFSK Circuit using discrete components
2. Using Signal Generators, Give Message input Pulse Carrier to the circuit
3. Observe the amplitude and difference frequencies of output pulse train

Detection

1. Construct a Detection Circuit
2. Give BFSK Signal to the circuit and observe the amplitude and frequency of Output

Equipments Required

1. CRO
2. Signal Generators
3. Power supply

5. Generation of standard test inputs using simulate package

Aim:
To generate different signals (Signals and Sequences) Using MATLAB

Objective:

1. To Generate Signals (Sine Wave, Exponential Wave, Sawtooth Wave)
2. To generate sequences (Impulse sequence, Step Sequence)

Exercise

1. Generate Signals using Sine, Exponential, Step Functions
2. Generate Sequences such as Impulse Sequences, Step Sequences using Expression Ex. Cos (2*pi*t)

Software Required:

MATLAB

6. Analysis of Linear System [With Convolution and Deconvolution Operation]

Aim:
To Study Linear Convolution of two sequences

Objective:

1. To analyze Convolution and deconvolution of two sequences using CONV, DECONV Functions

Exercise:

1. Generate Convolved Sequences using CONV function
2. Generate Convolved output using FFT.

7. FIR Filter Design

Aim:
To Design FIR Low Pass, High Pass, Band Pass filters using MATLAB

Objective:

1. To design FIR Low Pass, High Pass, Band Pass filters using Windowing Technique (Rectangular Window)

Exercise

1. Get the Passband and Stopband ripples
2. Get the Passband and Stopband edge frequencies
3. Get the sampling Frequency
4. Calculate the order of the filter
5. Find the window coefficients
6. Draw the magnitude and phase responses

MATLAB Functions

fir1, freqz

8. IIR Filter Design (any one technique)

Aim:
To design a IIR Filter
Objective
To design Butterworth IIR Filter using MATLAB

Exercise:

1. Get the Passband and Stopband ripples
2. Get the Passband and Stopband edge Frequencies
3. Get the sampling Frequency
4. Calculate the order of the filter
5. Find the filter coefficients
6. Draw the magnitude and phase responses

MATLAB Functions
buttord, butter, freqz

9. Implementation of FFT algorithm

Aim:
To find out FFT of the given sequence

Objective

1. To find out FFT of the given Sequence using FFT function

Exercise

1. Find out FFT of the sequence using FFT function

MATLAB FUNCTION
FFT

10 Implementation of Interpolation and Decimation function

Aim:
To implementation of interpolate and decimate the given Signal

Objective
To interpolate and decimate the given signal

Exercise
Find out interpolation and Decimation of given signal using interpolate and decimate function

MATLAB FUNCTION
Interpolate, Decimate

612EIP02 - PROCESS CONTROL SYSTEM LABORATORY

OBJECTIVE
To experimentally verify the process control concepts on the selected process control loops.

1. Operation of interacting and non-interacting systems
2. Responses of different order processes with and without transportation lag
3. Response of on-off controller
4. Response of P+I+D controller
5. Characteristics of control valve with and without positioner
6. Operation of on-off controlled thermal process
7. Closed loop response of flow control loop
8. Closed loop response of level control loop
9. Closed loop response of temperature control loop
10. Closed loop response of pressure control loop
11. Tuning of controllers
12. Study of complex control system (ratio / cascade / feed forward)

1. Study of interacting and non- interacting systems

Aim
To study the operation of interacting and non- interacting systems

Exercise
1. Connect the two tank system (Level process) in series (as non- interacting system)
2. Check whether level in tank is affected due to changes made in the second tank.
3. Connect the two tank system in series (as interfacing as system).
4. Check whether level in tank 1 is affected due to changes made in the second tank.
5. Determine the transfer function of individual and overall system.

Equipment
1. Two tank system with provision for making them as interfacing and noninterfacing – 1 No
2. Level transmitters – 1 No
3. Recorder – 1 No

2. Response of different order processes with and without transportation delay

Aim
To determine the transient response of a first order process with and without transportation delay and second order process with and without transportation delay to step change in input.

Exercise
1. Record the transient response to a step change of first order process and second order process (Level or thermal (or) any process) with and without transportation lag.
2. Calculate the process gain, time constant and dead time of the process from the step response.

Equipment

1. Two tank system with provision for transportation delay (Non – interacting process)
2. Level transmitter – 1 No
3. Recorder – 1 No

3. Response of P+I+D controller

Aim

To investigate the operation of an electronic controllers with P, P+I and P+I+D action.

Exercise

1. Plot the response of P, P+I, P+D and P+I+D controllers to step and ramp inputs.
2. Determine the calibration of the proportional, Integral and derivative adjustments.

Equipment

1. Electronic PID controller – 1 No
2. Source for generating step and ramp inputs – 1 No
3. Recorder – 1 No
4. Digital Multimeter – 1 No

4. Characteristics of control valve with and without valve positioner

Aim

To determine the flow – lift characteristics (Internet / Installed) of a control valve equipped with and without valve positioner.

Exercise

1. Plot the flow – lift characteristics of the given valve without positioner keeping
   (i) Constant ΔP
   (ii) Variable ΔP
2. Compute the valve gain at different operating points.
3. Plot the flow – lift characteristics of the given with positioner keeping.
   i. Constant ΔP
   ii. Variable ΔP
4. Compute the valve gain at different operating points.

Equipment

1. Control valve trainer (with position for varying ΔP across the valve) - 1 No
2. Flowmeter - 1No

5. Closed loop response of flow control loop

Aim

To obtain the closed loop response of flow control loop for servo and regulator Operation.

Exercise

1. Closed – loop connection is made in the flow process station.
2. The flow controller (P+I) is tuned using any one of the tuning techniques.
3. The response of the control loop is obtained for changes in the set point.

4. The response of the control loop is obtained for changes in the load variable.
5. The step 3 and 4 are repeated for different controller modes and settings.

Equipment

1. Flow process station with all accessories - 1 No
2. Analog / Digital PID controller - 1 No
3. Recorder - 1 No

6. Closed loop response of level control loop

Aim

To obtain the closed loop response of level control loop for servo and regulator operation.

Exercise

1. Closed loop connection is made in the level process station.
2. The level controller (P+I) is tuned using any one of the tuning techniques.
3. The response of the control loop is obtained for changes in the set point.
4. The response of the control loop is obtained for changes in the load variable.
5. The step 3 and step 4 are repeated for different controller modes and settings.

Equipment

1. Level process station with all accessories - 1 No
2. Analog / Digital PID controller - 1 No
3. Recorder - 1 No

7. Closed loop response of temperature control loop

Aim

To obtain the closed loop response of temperature control loop for servo and regulator operation.

Exercise

1. Closed-loop connection is made in the temperature process station.
2. The temperature controller (P+I+D) is tuned using any one of the tuning techniques.
3. The response of the control loop is obtained for changes in the set point.
4. The response of the control loop is obtained for changes in the load variable.
5. The step 3 and 4 are repeated for different controller modes and settings.

Equipment

1. Temperature process station with all accessories - 1 No
2. Analog / Digital PID controller - 1 No
3. Recorder - 1 No

8. Closed loop response of pressure control loop

Aim

To obtain the closed loop response of pressure control loop for servo and regulator operation.

Exercise

1. Closed – loop connection is made in the pressure process station.
2. The pressure controller (P+I) is tuned using any one of the tuning techniques.
3. The response of the control loop is obtained for changes in the set point.

4. The response of the control loop is obtained for changes in the load variable.
5. The step 3 and 4 are repeated for different controller modes and settings.

Equipment

1. Pressure process station with all accessories - 1 No
2. Analog / Digital PID controller - 1 No
3. Recorder - 1 No

9. Tuning of PID controller

Aim

To determine the controller settings of a given process using two popular tuning techniques.

Exercise

1. Plot the process reaction curve for the given process (higher order process)
2. From the reaction curve, calculate the process gain, time constant and dead time using the above process parameters calculate the Kc, Ti, Td valves using the appropriate thumb rules.
3. Conduct the closed loop test as per Z-N method [continuous cycling method] and determine the ultimate gain (Ku) and ultimate period (Pu), calculate the controller parameters (Kc, Ti, Td) using Ziegler Nichol's closed loop tuning approach.

Equipment

1. Process control trainer / real time process (level / thermal process) - 1 No
2. Recorder - 1 No
3. PID controller - 1 No

10. Response of cascade control system

Aim

To determine the closed loop performance of a cascade control system and compare it with that of conventional control system.

Exercise

1. The secondary and primary controllers are tuned using any one of the tuning techniques.
2. Obtain the closed loop response of cascade control system with the load variable entering the inner loop.
3. Obtain the closed loop regulating response with conventional control system.
4. Compare the performance of conventional control system and cascade control system internal of peak overshoot, setting time, I&E etc

Equipment

1. Cascade control system with flow as inner variable and liquid level as outer variable with following accessories.
2. Level transmitter - 1 No
3. Flow transmitter - 1 No
4. Control valve - 1 No
5. Analog / Digital PID controller - 1 No
6. Recorder - 1 No

612EIP03 - VIRTUAL INSTRUMENTATION LAB

1. Creating Virtual Instrumentation for simple applications
2. Programming exercises for loops and charts
3. Programming exercises for clusters and graphs.
4. Programming exercises on case and sequence structures, file Input / Output.
5. Data acquisition through Virtual Instrumentation.
6. Developing voltmeter using DAQ cards.
7. Developing signal generator using DAQ cards.
8. Simulating reactor control using Virtual Instrumentation.
9. Real time temperature control using Virtual Instrumentation.
10. Real time sequential control of any batch process.

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS

S. No.	Specifications	Quantity
1.	Laboratory Virtual Instrumentation Engineering Software Package	30 users license
2.	PCI /USB DAQ Boards	2 Nos.
3.	Temperature Control Test Rig using Laboratory Virtual Instrumentation Engineering Software Package and Hardware Models	1 No.
4.	Sequential Control using Laboratory Virtual Instrumentation Engineering Software Package and Hardware Models.	1 No.

SEVENTH SEMESTER
712EIT01 - INDUSTRIAL DATA NETWORKS

AIM
To learn more about the industrial data communication protocols.

OBJECTIVES
- To understand basic data networks
- To learn the basic of inter networking
- To have adequate knowledge in various communication protocol.
- To study industrial data communication.

UNIT I DATA NETWORK FUNDAMENTALS
Network hierarchy and switching – Open System Interconnection model of ISO– Data link control protocol: - HDLC – Media access protocol – Command/response – Token passing – CSMA/CD, TCP/IP

UNIT II INTER NETWORKING
Bridges – Routers – Gateways –Standard ETHERNET and ARCNET configurationspecial requirement for networks used for control.

UNIT III HART AND FIELDBUS
Introduction- Evolution of signal standard – HART communication protocol – Communication modes – HART networks – HART commands – HART applications. Fieldbus: – Introduction – General Fieldbus architecture – Basic requirements of Field bus standard – Fieldbus topology – Interoperability – Interchangeability – Introduction to OLE for process control (OPC).

UNIT IV MODBUS and PROFIBUS PA/DP/FMS AND FF
MODBUS protocol structure – function codes – troubleshooting Profibus: Introduction – profibus protocol stack – profibus communication model – communication objects – system operation – troubleshooting – review of foundation field bus.

UNIT V INDUSTRIAL ETHERNET AND WIRELESS COMMUNICATION
Industrial Ethernet : Introduction – 10Mbps Ethernet, 100Mbps Ethernet. Radio and wireless communication : Introduction – components of radio link – the radio spectrum and frequency allocation – radio modems.

TEXT BOOKS

1. Steve Mackay, Edwin Wrijut, Deon Reynders, John Park, 'Practical Industrial Data networks Design, Installation and Troubleshooting', Newnes publication, Elsevier First edition, 2004.
2. William Buchanan 'Computer Busses', CRC Press, 2000.

REFERENCES

1. Andrew S. Tanenbaum, 'Modern Operating Systems', Prentice Hall of India Pvt. LTD, 2003.
2. Theodore S. Rappaport, 'Wireless communication: Principles & Practice', 2nd Edition, 2001 Prentice Hall of India
3. Willam Stallings, ' Wireless Communiction & Networks' 2nd Edition, 2005, Prentice Hall of India.

712EIT02 - LOGIC AND DISTRIBUTED CONTROL SYSTEM

AIM

To illustrate the concept of programmable logic controllers and distributed control system.

OBJECTIVES

- To give an introductory knowledge about PLC and the programming languages.
- To give adequate knowledge about of application of PLC.
- To give basic knowledge in the architecture and local control unit of distributed control system.
- To give adequate information in the interfaces used in DCS.
- To give basic knowledge about Computer Controlled Systems.

UNIT I PROGRAMMABLE LOGIC CONTROLLER

Evolution of PLC's – Components of PLC – Advantages over relay logic – Architecture of PLC– Programming devices - Discrete and Analog I/O modules – Programming languages –– Ladder diagram – Programming timers and counters – Design of PLC.

UNIT II APPLICATIONS OF PLC

Instructions in PLC – Program control instructions, math instructions, sequencer instructions – Use of PC as PLC – Application of PLC – Case study of bottle filling system.

UNIT III COMPUTER CONTROLLED SYSTEMS

Basic building blocks of Computer controlled systems – SCADA – data Acquisition System – supervisory Control – Direct digital Control.

UNIT IV DISTRIBUTED CONTROL SYSTEM

DCS - Architectures – Comparison – Local control unit – Process interfacing issues – Communication facilities.

UNIT V INTERFACES IN DCS

Operator interfaces - Low level and high level operator interfaces – Operator displays - Engineering interfaces – Low level and high level engineering interfaces – General purpose computers in DCS.

TEXT BOOKS

1. Petruzella, 'Industrial Electronics', McGraw Hill, Second edition, 1997.
2. Michael P. Lukas, 'Distributed Control System', Van Nostrand Reinhold Co., Canada, 1986.
3. John. W. Webb Ronald A Reis - Programmable Logic Controllers - Principles and Applications, Fourth edition, Prentice Hall Inc., New Jersey, 1998.

REFERENCES

1. T. Hughes, 'Programmable Logic Controllers', ISA press,2007.
2. Krishna Kant – 'Computer based Industrial Control', Prentice Hall, New Delhi, 1997.

712EIT03 - VLSI DESIGN

AIM

To introduce the technology and concepts of VLSI.

OBJECTIVES

- To introduce MOS theory / Manufacturing Technology.
- To study inverter / counter logic / stick / machine diagram / sequential circuits.
- To study address / memory / arithmetic circuits.
- To introduce FPGA architecture / principles / system design.
- To get familiarised with VHDL programming behavioural/Structural/concurrent/ process.

UNIT I BASIC MOS TRANSISTOR

Enhancement mode and Depletion mode – Fabrication (NMOS, PMOS, CMOS, BiCMOS) Technology – NMOS transistor current equation – Second order effects – MOS Transistor Model.

UNIT II NMOS AND CMOS INVERTER AND GATES

NMOS and CMOS inverter – Determination of pull up / pull down ratios – Stick diagram – lambda based rules – Super buffers – BiCMOS & steering logic.

UNIT III SUB-SYSTEM DESIGN AND LAYOUT

Structured design of combinational circuits – Dynamic CMOS & clocking – Tally circuits – (NAND-NAND, NOR-NOR and AOI logic) – EXOR structure – Multiplexer structures – Barrel shifter, high speed adder and multiplier circuits.

UNIT IV DESIGN OF COMBINATIONAL ELEMENTS AND REGULAR ARRAY LOGIC

NMOS PLA – Programmable Logic Devices - Finite State Machine PLA – Introduction to FPGA.

UNIT V VHDL PROGRAMMING

RTL Design – simulation and synthesis - Combinational logic – Types – Operators – Packages – Sequential circuit – Sub-programs – Test benches. (Examples: adders, counters, flipflops, FSM, Multiplexers / Demultiplexers).

TEXT BOOKS

1. D.A.Pucknell, K.Eshraghian, 'Basic VLSI Design', 3rd Edition, Prentice Hall of India, New Delhi, 2003.
2. Rabey, J.M., 'Digital Integrated Circuits: A Design Perspective', Prentice Hall, 1955
3. Bhasker, J., VHDL Primer, Prentice Hall 1995

REFERENCES

1. Eugene D.Fabricius, 'Introduction to VLSI Design', Tata McGraw Hill, 1990.
2. N.H.Weste, 'Principles of CMOS VLSI Design', Pearson Eduction, India, 2002.
3. Zainalatsedin Navabi, 'VHDL Analysis and Modelling of Digital Systems', 2nd Edition, Tata McGraw Hill, 1998.
4. Douglas Perry, 'VHDL Programming by example', Tata McGraw Hill, 3rd Edition, 2003.

712EIT04 - FIBRE OPTICS AND LASER INSTRUMENTS

AIM

To contribute to the knowledge of Fibre optics and Laser Instrumentation and its Industrial and Medical Application.

OBJECTIVES

- To expose the students to the basic concepts of optical fibres and their properties.
- To provide adequate knowledge about the Industrial applications of optical fibres.
- To expose the students to the Laser fundamentals.
- To provide adequate knowledge about Industrial application of lasers.
- To provide adequate knowledge about holography and Medical applications of Lasers.

UNIT I OPTICAL FIBRES AND THEIR PROPERTIES

Principles of light propagation through a fibre - Different types of fibres and their properties, fibre characteristics – Absorption losses – Scattering losses – Dispersion – Connectors and splicers – Fibre termination – Optical sources – Optical detectors.

UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBRES

Fibre optic sensors – Fibre optic instrumentation system – Different types of modulators – Interferometric method of measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain.

UNIT III LASER FUNDAMENTALS

Fundamental characteristics of lasers – Three level and four level lasers – Properties of laser – Laser modes – Resonator configuration – Q-switching and mode locking – Cavity damping – Types of lasers – Gas lasers, solid lasers, liquid lasers, semiconductor lasers.

UNIT IV INDUSTRIAL APPLICATION OF LASERS

Laser for measurement of distance, length, velocity, acceleration, current, voltage and Atmospheric effect – Material processing – Laser heating, welding, melting and trimming of material – Removal and vaporization.

UNIT V HOLOGRAM AND MEDICAL APPLICATIONS

Holography – Basic principle - Methods – Holographic interferometry and application, Holography for non-destructive testing – Holographic components – Medical applications of lasers, laser and tissue interactive – Laser instruments for surgery, removal of tumors of vocal cards, brain surgery, plastic surgery, gynaecology and oncology.

TEXT BOOKS

1. J.M. Senior, 'Optical Fibre Communication – Principles and Practice', Prentice Hall of India, 1985.
2. J. Wilson and J.F.B. Hawkes, 'Introduction to Opto Electronics', Prentice Hall of India, 2001.

REFERENCES

1. G. Keiser, 'Optical Fibre Communication', McGraw Hill, 1995.
2. M. Arumugam, 'Optical Fibre Communication and Sensors', Anuradha Agencies, 2002.
3. John F. Read, 'Industrial Applications of Lasers', Academic Press, 1978.
4. Monte Ross, 'Laser Applications', McGraw Hill, 1968

ELECTIVE I & II
712EIT05 - ARTIFICIAL INTELLIGENCE

UNIT I PROBLEM SOLVING
Introduction – Agents – Problem formulation – uninformed search strategies – heuristics – informed search strategies – constraint satisfaction

UNIT II KNOWLEDGE AND REASONING
Logical agents – propositional logic – inferences – first-order logic – inference in firstorder logic – forward chaining – backward chaining – resolution

UNIT III PLANNING
Planning with state-space search – partial-order planning – planning graphs – planning and acting in the real world.

UNIT IV UNCERTAIN KNOWLEDGE AND REASONING
Uncertainty – review of probability - probabilistic Reasoning – Bayesian networks – inferences in Bayesian networks – Temporal models – Hidden Markov models

UNIT V LEARNING
Learning from observation - Inductive learning – Decision trees – Explanation based learning – Statistical Learning methods - Reinforcement Learning.

TEXT BOOKS

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education, 2003.

REFERENCES

1. David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence : a logical approach", Oxford University Press, 1998.
2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education, 2002.
3. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers, 1998.

712EIT06 - COMPUTER ARCHITECTURE

UNIT I INSTRUCTION SET ARCHITECTURE

Introduction to computer architecture - Review of digital design – Instructions and addressing – procedures and data – assembly language programs – instruction set variations.

UNIT II ARITHMETIC/LOGIC UNIT

Number representation – design of adders – design of simple ALUs – design of Multipliers and dividers – design of floating point arithmetic unit.

UNIT III DATA PATH AND CONTROL

Instruction execution steps – control unit synthesis – microprogramming – pipelining – pipeline performance.

UNIT IV MEMORY SYSTEM

Main Memory concepts – types of memory – cache memory organization – secondary storage – virtual memory – paging.

UNIT V I/O AND INTERFACES

I/O devices – I/O programming – polling – interrupts – DMA – buses – links – interfacing – context switching – threads and multithreading.

TEXT BOOKS

1. B. Parhami, "Computer Architecture", Oxford University Press, 2005.
2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", Fifth Edition, Tata McGraw Hill, 2002.

REFERENCES

1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software interface", Third Edition, Elsevier, 2004.
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Seventh Edition, Pearson Education, 2006.
3. Miles Murdocca "Computers Architecture and Organization An Integrated approach", Wiley India pvt Ltd, 2007
4. John D. Carpinelli, "Computer systems organization and Architecture", Pearson Education, 2001.

712EIT07 - OPERATING SYSTEM

AIM

To learn the various aspects of operating systems such as process management, memory management, file systems, and I/O management

UNIT I PROCESSES AND THREADS

Introduction to operating systems – review of computer organization – operating system structures – system calls – system programs – system structure – virtual machines. Processes: Process concept – Process scheduling – Operations on processes – Cooperating processes – Interprocess communication – Communication in client-server systems. Case study: IPC in Linux. Threads: Multi-threading models – Threading issues. Case Study: Pthreads library.

UNIT II PROCESS SCHEDULING AND SYNCHRONIZATION

CPU Scheduling: Scheduling criteria – Scheduling algorithms – Multiple-processor scheduling – Real time scheduling – Algorithm Evaluation. Case study: Process scheduling in Linux. Process Synchronization: The critical-section problem – Synchronization hardware – Semaphores – Classic problems of synchronization – critical regions – Monitors. Deadlock: System model – Deadlock characterization – Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance – Deadlock detection – Recovery from deadlock.

UNIT III STORAGE MANAGEMENT

Memory Management: Background – Swapping – Contiguous memory allocation – Paging – Segmentation – Segmentation with paging. Virtual Memory: Background – Demand paging – Process creation – Page replacement – Allocation of frames – Thrashing. Case Study: Memory management in Linux.

UNIT IV FILE SYSTEMS

File-System Interface: File concept – Access methods – Directory structure – File - system mounting – Protection. File-System Implementation : Directory implementation – Allocation methods – Free-space management – efficiency and performance – recovery – log-structured file systems. Case studies: File system in Linux – file system in Windows XP.

UNIT V I/O SYSTEMS

I/O Systems – I/O Hardware – Application I/O interface – kernel I/O subsystem – Streams – performance. Mass-Storage Structure: Disk scheduling – Disk management – Swap-space management – RAID – disk attachment – stable storage – tertiary storage. Case study: I/O in Linux.

TEXT BOOKS

1. Silberschatz, Galvin, and Gagne, "Operating System Concepts", Sixth Edition, Wiley India Pvt Ltd, 2003.
2. D. M. Dhamdhere, "Operating Systems: A concepts based approach", Second Edition, Tata McGraw-Hill Publishing Company Ltd., 2006.

REFERENCES

1. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Pearson Education/PHI, 2001.
2. Harvey M. Deital, "Operating Systems", Third Edition, Pearson Education, 2004.

712EIT08 - VISUAL PROGRAMMING

AIM

To study the principles and techniques of windows programming using MFC, procedures, resources, controls and database programming through the visual languages, Visual C++ and Visual Basic.

OBJECTIVES

- To study about the concepts of windows programming models, MFC applications, drawing with the GDI, getting inputs from Mouse and the Keyboard.
- To study the concepts of Menu basics, menu magic and classic controls of the windows programming using VC++.
- To study the concept of Document/View Architecture with single & multiple document interface, toolbars, status bars and File I/O Serialization.
- To study about the integrated development programming event driven programming, variables, constants, procedures and basic ActiveX controls in visual basic.
- To understand the database and the database management system, visual data manager, data bound controls and ADO controls in VB.

UNIT I FUNDAMENTALS OF WINDOWS AND MFC

Messages - Windows programming - SDK style - Hungarian notation and windows data types - SDK programming in perspective.The benefits of C++ and MFC - MFC design philosophy - Document/View architecture - MFC class hierarchy - AFX functions. Application object - Frame window object - Message map. Drawing the lines – Curves – Ellipse – Polygons and other shapes. GDI pens – Brushes - GDI fonts - Deleting GDI objects and deselecting GDI objects. Getting input from the mouse: Client & Non-client - Area mouse messages - Mouse wheel - Cursor. Getting input from the keyboard: Input focus - Keystroke messages - Virtual key codes - Character & dead key messages.

UNIT II RESOURCES AND CONTROLS

Creating a menu – Loading and displaying a menu – Responding to menu commands – Command ranges - Updating the items in menu, update ranges – Keyboard accelerators. Creating menus programmatically - Modifying menus programmatically - The system menu - Owner draw menus – Cascading menus - Context menus. The C button class – C list box class – C static class - The font view application – C edit class – C combo box class – C scrollbar class. Model dialog boxes – Modeless dialog boxes.

UNIT III DOCUMENT / VIEW ARCHITECTURE

The inexistence function revisited – Document object – View object – Frame window object – Dynamic object creation. SDI document template - Command routing. Synchronizing multiple views of a document – Mid squares application – Supporting multiple document types – Alternatives to MDI. Splitter Windows: Dynamic splitter window – Static splitter windows. Creating & initializing a toolbar - Controlling the toolbar's visibility – Creating & initializing a status bar - Creating custom status bar panes – Status bar support in appwizard. Opening, closing and creating the files - Reading & Writing – C file derivatives – Serialization basics - Writing serializable classes.

UNIT IV FUNDAMENTALS OF VISUAL BASIC

Menu bar – Tool bar – Project explorer – Toolbox – Properties window – Form designer – Form layout – Intermediate window. Designing the user interface: Aligning the controls – Running the application – Visual development and event driven programming. Variables: Declaration – Types – Converting variable types – User defined data types - Lifetime of a variable. Constants - Arrays – Types of arrays. Procedures: Subroutines – Functions – Calling procedures. Text box controls – List box & Combo box controls – Scroll bar and slider controls – File controls.

UNIT V DATABASE PROGRAMMING WITH VB

Record sets – Data control – Data control properties, methods. Visual data manager:
Specifying indices with the visual data manager – Entering data with the visual data manager. Data bound list control – Data bound combo box – Data bound grid control.
Mapping databases: Database object – Table def object, Query def object. Programming the active database objects – ADO object model – Establishing a connection - Executing SQL statements – Cursor types and locking mechanism – Manipulating the record set object – Simple record editing and updating.

TEXT BOOKS

1. Jeff Prosise, 'Programming Windows With MFC', Second Edition, WP Publishers & Distributors [P] Ltd, Reprinted 2002.
2. Evangelos Petroutsos, 'Mastering Visual Basic 6.0', BPB Publications, 2002.

REFENENCES

1. Herbert Schildt, 'MFC Programming From the Ground Up', Second Edition, Tata McGraw Hill, reprinted 2002.
2. John Paul Muller, 'Visual C++ 6 From the Ground Up Second Edition', Tata McGraw Hill, Reprinted 2002.
3. Curtis Smith & Micheal Amundsen, 'Teach Yourself Database Programming with Visual Basic 6 in 21 days', Techmedia Pub, 1999.

712EIT09 - POWER PLANT INSTRUMENTATION

AIM

The course is designed to familiarize the student with the functions and instrumentation available in a modern power generation plant.

OBJECTIVES

- To provide an overview of different methods of power generation with a particular stress on thermal power generation.
- To bring out the various measurements involved in power generation plants.
- To provide knowledge about the different types of devices used for analysis.
- To inpart knowledge about the different types of controls and control loops.
- To familiarize the student with the methods of monitoring different parameters like speed, vibration of turbines and their control

UNIT I OVERVIEW OF POWER GENERATION

Brief survey of methods of power generation – hydro, thermal, nuclear, solar and wind power – importance of instrumentation in power generation – thermal power plants – building blocks – details of boiler processes UP&I diagram of boiler – cogeneration.

UNIT II MEASUREMENTS IN POWER PLANTS

Electrical measurements – current, voltage, power, frequency, power – factor etc. – non electrical parameters – flow of feed water, fuel, air and steam with correction factor for temperature – steam pressure and steam temperature – drum level measurement – radiation detector – smoke density measurement – dust monitor.

UNIT III ANALYZERS IN POWER PLANTS

Flue gas oxygen analyser – analysis of impurities in feed water and steam – dissolved oxygen analyser – chromatography – PH meter – fuel analyser – pollution monitoring instruments.

UNIT IV CONTROL LOOPS IN BOILER

Combustion control – air/fuel ratio control – furnace draft control – drum level control – main stem and reheat steam temperature control – superheater control – attemperator – deaerator control – distributed control system in power plants – interlocks in boiler operation.

UNIT V TURBINE – MONITORING AND CONTROL

Speed, vibration, shell temperature monitoring and control – steam pressure control – lubricant oil temperature control – cooling system.

TEXT BOOKS

1. Sam G. Dukelow, 'The control of Boilers', Instrument Society of America, 1991.
2. Modern Power Station Practice, Vol.6, Instrumentation, Controls and Testing, Pergamon Press, Oxford, 1971.

REFERENCES

1. Elonka,S.M.and Kohal A.L.Standard Boiler Operations, McGraw-Hill, New Delhi, 1994.
2. R.K.Jain, Mechanical and industrial Measurements, Khanna Publishers, New Delhi, 1995.

712EIT10 - INSTRUMENTATION IN PETRO CHEMICAL INDUSTRIES

AIM

To expose the students to the Instrumentation applied in petrochemical industries.

OBJECTIVES

- To expose the students to the basic processing in petroleum industry.
- To provide adequate knowledge about the unit operations.
- To impart knowledge pertaining to the petroleum products and the chemicals obtained from them.
- To provide adequate knowledge about the measurement of various parameters in petrochemical industry.
- To expose the students to the various control loops in Petrochemical Industry.

UNIT I PETROLEUM PROCESSING

Petroleum exploration – Recovery techniques – Oil – Gas separation - Processing wet gases – Refining of crude oil.

UNIT II OPERATIONS IN PETROLEUM INDUSTRY

Thermal cracking – Catalytic cracking – Catalytic reforming – Polymerisation – Alkylation – Isomerization – Production of ethylene, acetylene and propylene from petroleum.

UNIT III CHEMICALS FROM PETROLEUM PRODUCTS

Chemicals from petroleum – Methane derivatives – Acetylene derivatives – Ethylene derivatives – Propylene derivatives – Other products.

UNIT IV MEASUREMENTS IN PETROCHEMICAL INDUSTRY

Parameters to be measured in refinery and petrochemical industry – Selection and maintenance of measuring instruments – Intrinsic safety of Instruments.

UNIT V CONTROL LOOPS IN PETROCHEMICAL INDUSTRY

Process control in refinery and petrochemical industry – Control of distillation column – Control of catalytic crackers and pyrolysis unit – Automatic control of polyethylene production – Control of vinyl chloride and PVC production.

TEXT BOOKS

1. A.L. Waddams, 'Chemicals from Petroleum', Butter and Janner Ltd., 1968.
2. J.G. Balchan. and K.I. Mumme, 'Process Control Structures and Applications', Van Nostrand Reinhold Company, New York, 1988.

REFERENCES

1. Austin G.T. Shreeves, 'Chemical Process Industries', McGraw Hill International Student edition, Singapore, 1985.
2. B.G Liptak, 'Instrumentation in Process Industries', Chilton Book Company, 1994.

712EIT11 - MICRO ELECTRO MECHANICAL SYSTEMS

AIM

The course is designed to familiarize the student with the functions and applications of MEMS.

OBJECTIVES

- To study about MEMS and parts of MEMS
- To study the design methodalogy of MEMS for various mechanics.
- To study about actuators in MEMS.
- To study about MEMS based circuits.
- To study about optical and RF based MEMS.

UNIT I INTRODUCTION TO MEMS

MEMS and Microsystems, Miniaturization, Typical products, Micro Sensors,Micro actuation, MEMS with micro actuators, Microaccelorometers and Micro fluidics, MEMS materials, Micro Fabrication

UNIT II MECHANICS FOR MEMS DESIGN

Elasticity, Stress, strain and material properties, Bending of thin plates, Spring configurations, torsional deflection, Mechanical vibration, Resonance, Thermo mechanics – actuators, force and response time, Fracture and thin film mechanics, material, physical vapor deposition (PVD), chemical mechanical polishing (CMP)

UNIT III ELECTRO STATIC DESIGN

Electrostatics: basic theory, electro static instability, Surface tension, gap and finger pull up, Electro static actuators, Comb generators, gap closers, rotary motors, inch worms, Electromagnetic actuators, bistable actuators.

UNIT IV CIRCUIT AND SYSTEM ISSUES

Electronic interfaces, Feed back systems, Noise, Circuit and system issues, Case studies – Capacitive accelerometer, Peizo electric pressure sensor, Thermal sensors, radiation sensors, mechanical sensors, bio-chemical sensors Modeling of MEMS systems, CAD for MEMS.

UNIT V INTRODUCTION TO OPTICAL AND RF MEMS

Optical MEMS, system design basics – Gaussian optics, matrix operations, Resolution, Case studies, MEMS scanners and retinal scanning, display, Digital Micro mirror devices, RF Memes – design basics, case study – Capacitive RF MEMS switch, Performance issues.

TEXT BOOKS

1. Stephen Santeria, "Microsystems Design ", Kluwer publishers, 2000.
2. James J.Allen, "Micro electro mechanical system design', CRC Press published in 2005.

REFERENCES

1. Nadim Maluf, " An introduction to Micro electro mechanical system design", Artech House, 2000.
2. Mohamed Gad-el-Hak, editor, " The MEMS Handbook", CRC press Baco Raton, 2000.
3. Tai Ran Hsu, "MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002.
4. Julian w. Gardner, Vijay k. varadan, Osama O.Awadelkarim,'Micro sensors MEMS and smart devices', John Wiley & son LTD,2002

712EIT12 - FUNDAMENTAL OF NANOSCIENCE

UNIT I INTRODUCTION

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II PREPARATION METHODS

Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III PATTERNING AND LITHOGRAPHY FOR NANOSCALE DEVICES

Introduction to optical/UV electron beam and X-ray Lithography systems and processes, Wet etching, dry (Plasma /reactive ion) etching, Etch resists-dip pen lithography.

UNIT IV PREPARATION ENVIRONMENTS

Clean rooms: specifications and design, air and water purity, requirements for particular processes, Vibration free environments: Services and facilities required. Working practices, sample cleaning, Chemical purification, chemical and biological contamination, Safety issues, flammable and toxic hazards, biohazards.

UNIT V CHARECTERISATION TECHNIQUES

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques-AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation.

TEXT BOOKS

1. A.S. Edelstein and R.C. Cammearata, eds., Nanomaterials: Synthesis, Properties and Applications, (Institute of Physics Publishing, Bristol and Philadelphia, 1996)
2. N John Dinardo, Nanoscale charecterisation of surfaces & Interfaces, Second edition, Weinheim Cambridge, Wiley-VCH, 2000

REFERENCES

1. G Timp (Editor), Nanotechnology, AIP press/Springer, 1999
2. Akhlesh Lakhtakia (Editor) The Hand Book of Nano Technology, "Nanometer Structure", Theory, Modeling and Simulations. Prentice-Hall of India (P) Ltd, New Delhi, 2007.

712EIP01 - VLSI LABORATORY

OBJECTIVE

To study synthesis, simulation and schematic of various digital combinational circuits using FPGA on Xilink simulator.

1. Study of Synthesis tools
   - Half and full adder.
   - Decoder – 2 x 4, 3 x 8
   - Priority encoder.
   - Ripple adder.
   - 4 – Bit ripple counter.
   - Code conversion.

   All the above synthesis in three modeling styles - data flow, structural and behavioral

2. Study of Simulation using tools
   - Half adder.
   - Multiplexer – 2 x 1, 4 x 1
   - Demultiplexer – 1 x 2, 1 x 4

   All the above synthesis in three modeling styles - data flow, structural and behavioral

3. Study of Simulation using tools
   - Flipflop – D, T
   - Priority encoder.
   - Ripple adder.
   - 4 – Bit ripple counter.

   All the above synthesis in three modeling styles - data flow, structural and behavioral

4. Study of development tool for FPGAs for schematic entry and verilog
   - Full adder, half adder.
   - Demultiplexer – 1 x 2, 1 x 4.

5. Design and simulation of pipelined serial and parallel adder to add/ subtract 8 number of size, 12 bits each in 2's complement.
6. Place and Root and Back annotation for FPGAs
7. Design and simulation of back annotated verilog files for multiplying two signed, 8 bit numbers in 2's complement.
8. Study of FPGA board and testing on board LEDs and switches using verilog code.
9. Design a Realtime Clock (2 digits, 7 segments LED displays each for HRS., MTS, and SECS.) and demonstrate its working on the FPGA board.
   - To display binary number on the FPGA.

   10. Design of traffic light controller using verilog tools .
   - Movement of vehicles in any direction or pedestrian in any direction.

Detailed Syllabus

1. Study of Synthesis tools
Adder/encoder/decoder/counter/converter.
Aim
To study the synthesis of various combinational circuits on Xilink(ISE9.1) tool usingHardware Descriptive Language(HDL).

Exercise

Write a HDL program in three modeling styles - data flow, structural and behavioral. using verilog and perform the synthesis of following combinational circuits

- Half and full adder.
- Decoder – 2 x 4, 3 x 8
- Priority encoder.
- Ripple adder.
- 4 – Bit ripple counter.
- Code conversion.

2. Study of Simulation using tools
Adder/encoder/decoder/counter/multiplexer.

Aim
To study the simulation of various combinational circuits on Xilink(ISE9.1) tool using Hardware Descriptive Language(HDL).

Exercise

Write a HDL program in three modeling styles - data flow, structural and behavioral.
using verilog and simulate the following combinational circuits

- Half adder.
- Multiplexer – 2 x 1, 4 x 1
- Demultiplexer – 1 x 2, 1 x 4

3. Study of Simulation using tools
Adder/encoder/decoder/counter/multiplexer.
Aim
To study the simulation of various combinational circuits on Xilink(ISE9.1) tool using Hardware Descriptive Language(HDL).

Exercise

Write a HDL program in three modeling styles - data flow, structural and behavioral.using verilog and simulate the following combinational circuits

- Flipflop – D, T
- Priority encoder.
- Ripple adder.
- 4– Bit ripple counter

4. Study of development tool for FPGAs for schematic entry and verilog.
Adder /demultiplexer.
Aim
To draw the schematic and generate the verilog code.

Exercise

Draw the schematic using Xilink(ISE9.1) tool and generate the verilog code for the following digital circuits and observe the simulated output

- Full adder, half adder.
- Demultiplexer – 1 x 2, 1 x 4.

5. Design and simulation of pipelined serial and parallel adder to add/ subtract 8 number of size, 12 bits each in 2's complement.

Aim

To design and simulate the pipelined 12 bit serial/parallel adder/subtractor.

Exercise

1. Write a verilog code to add/subtract 8 numbers of 12 bits each and verify the result after addition of every 2 numbers
2. Verify the result after adding all 8 numbers and simulate the output.

6. Place and Root and Back annotation for FPGAs

Aim

To calculate the propagation delay produced by back annotated circuit from the already software designed circuit..

Exercise

Write the verilog code and develop the following combinational circuit using s/w in the design layout that is produced. Make the required changes in the rooting as per the required propagation delay.

- Multiplexer/Demultiplexer
- Encoder/Decoder.

7. Design and simulation of back annotated verilog files for multiplying two signed, 8 bit numbers in 2's complement. Design must be pipelined and completely RTL compliant

Aim

To design and simulate back annotated circuit using verilog code.

Exercise

Write the verilog code and develop the following combinational circuit using s/w in the design layout that is produced.

- Pipelined structure of multiplication of two signed 8 bit numbers.
- View RTL model

8. Study of FPGA board and testing on board LEDs and switches using verilog code.

Aim

To study the FPGA board and testing on-board LED’s and switches using ISE9.1 simulator.

Exercise

- Write the verilog code in three modeling styles - data flow, structural and behavioral to accept the input from switches and display the output in LEDs.
- Synthesis the program and view RTL model.
- Download the program into FPGA for testing on board LED’s and switches.

9. Design a Realtime Clock (2 digits, 7 segments LED displays each for HRS., MTS, and SECS.) and demonstrate its working on the FPGA board. An expansion card is required for the displays.
c. to display binary number on the FPGA.

Aim

To design and test the real time clock on FPGA board.

Exercise

- Write the verilog code to display hrs, mts and secs.
- Synthesis, simulate and download the program on the RTC board.

10. Design of traffic light controller using verilog tools .
Movement of vehicles in any direction or pedestrian in any direction.

Aim

To design and test the traffic light controller using FPGA board.

Exercise

- Write the verilog code to implement different sequences of traffic light.
- Synthesis, simulate and download the program on the traffic light controller board.

REQUIREMENT FOR A BATCH OF 30 STUDENTS

S.No.	Name of Equipments	Quantity
1.	**Software – Simulation, Synthesis, back annotation, place & route** Xlinx ISE (latest version)	5 User License (minimum)
2.	Spartan 2E boards	5 Nos.
3.	Spartan 3 AN boards	1 No.
4.	**Add – on boards** 1. Real - time clock 2. 2. Traffic light control 3. 3. LED displays with switches 4. 4. I/O boards	 1 1 1 1
5.	Multimeter	2 Nos.

712EIP02 - INSTRUMENTATION SYSTEM DESIGN LABORATORY

OBJECTIVE

To have adequate knowledge in design of various signal conditioning circuits.

1. Design of Instrumentation amplifier.
2. Design of active filters.
3. Design of regulated power supply and design of V/I and I/V converters.
4. Design of linearizing circuits and cold – junction compensation circuit for thermocouples.
5. Design of signal conditioning circuit for strain gauge and RTD.
6. Design of orifice plate and rotameter.
7. Control valve sizing.
8. Design of PID controller (using operational amplifier and microprocessor)
9. Piping and Instrumentation Diagram – case study.
10. Preparation of documentation of instrumentation project and project scheduling (process flow sheet, instrument index sheet and instrument specifications sheet, job scheduling, installation procedures and safety regulations).

Detailed Syllabus

1. Design of instrumentation amplifier

Aim

To design an instrumentation amplifier based on the three operational amplifier configuration with a differential gain of 100.

Exercise

1. Develop the instrumentation amplifier with differential gain of 100 and draw the input Vs output characteristics of the three operational amplifier based instrumentation amplifier and make a comment on the response.
2. Compare the performance characteristics of Instrumentation amplifiers with commercial Monolithic Instrumentation amplifier.

Equipment

1. Dual power supply – 1 No
2. Digital Multimeters – 1 No
3. Resistors – 10 No
4. Operational Amplifiers – 4 No
5. Any commercial Monolithic Instrumentation amplifier - 2 No

2. Design of Active filters

Aim

To design an active first order / second order Butterworth type Low – Pass / High Pass / Band-pass filter with the following specifications.
Low pass filter: Cut – off frequency: 1 KHz
High pass filter: Cut – off frequency: 1 KHz
Band pass filter: Cut off frequency: 1 KHz < fc <5 KHz

Exercise

Develop an active Butterworth first order (or) second order low pass and / or high – pass, band pass filter and determine experimentally the frequency response.

Equipment

1. Dual power supply - 1 No
2. Operational amplifiers - 2 Nos
3. Resistors - 10 Nos
4. Capacitors - 10 Nos
5. Signal generator - 1 No
6. C.R.O - No

3. Design of regulated power supply and design of V/I and I/V converters

(a) Aim:-

To Design a Regulated Power Supply.

Equipment

1. Diodes IN4007
2. 100 µF, 10 µF
3. IC 7805
4. Potentiometer
5. Ammeter and Voltmeter

Exercise

Line Regulation

1. Varying the Input Voltage (0 -15)V.
2. Note down the output voltage

Load Regulation

1. Connect a variable Potentiometer across the output of the RPS.
2. Vary the potentiometer and note down the corresponding output current and voltage.

(b) Aim

To design a voltage to current converter and a current to voltage converter and verify the characteristics experimentally.

Objectives

1. To design a voltage to current converter (grounded load) with the following specification
   Input voltage range : (0 – 5) V
   Output current range : (4-20) mA (should be independent of load)
2. To design a current to voltage converter with the following specification
   Input current range : (4-20) mA
   Output voltage range : (0-5) V

Exercise

1. Determine experimentally the characteristics of voltage and current converter an plot output current versus input voltage and comment on the response.
2. Determine experimentally the characteristics of current to voltage converter and plot output voltageVs input current and comment on the response.

Equipment

1. Resistors - 10 No
2. Operational amplifiers - 5 No
3. Transistor (NPN / PNP) - 2 No
4. Dual power supply - 1 No
5. Digital Multimeters - 2 No
6. Loop analyzer - 1 No

4. Design of linearizing circuit and cold-junction compensation circuit for thermocouple

Aim
To design a cold – junction compensation circuit for thermocouple.

Objective
To design a automatic reference correction circuit for thermocouple. (A solid – state temperature sensor or RTD can be used for the cold function measurement)

Exercise
1. Develop the circuit for reference junction compensation.
2. Keep the hot junction temperature at say 4000C.
3. Vary the cold – junction temperature from 30 – 900C and observe the output voltage for with and without cold-junction compensation.
4. Plot the output voltage versus cold-junction temperature and comment on the response.

Equipment
1. Thermocouple - 1 Nos
2. Operational amplifier - 3 Nos
3. AD – 590 or RTD - 1 Nos
4. Resistors - 10 Nos
5. Dual power supply - 1 No
6. Multimeters - 1 No

5. Design of signal conditioning circuit for strain gauges and RTD
(a) Aim:
To design Signal Conditioning Circuit for Strain Gauge.
Specification as follows
1. Input Range 0 to 1 Kg
2. Output Voltage 0 to 5 V
3. Device -Bourdon Strain Gauge (350 Ohm)

Equipment
1. Bonded Strain Gauge
2. Loads (100 gm to 1 Kg)
3. Operational Amplifier
4. RPS
5. Resistors

Exercise:
Develop Signal Conditioning Circuits for different loads and plot output voltage versus Load. Comment on Linearity

(b) Aim
To design a signal conditioning circuit to RTD. The specification are as follows
Temperature Range : 300 C – 1000C (Approximately)
Output voltage : 0 – 5 V DC
Sensor : RTD (Pt 100)
Current through RTD : Not to exceed 10mA

Equipment

1. RTD (Pt 100) - 1 No
2. Resistors - ?
3. Operational amplifiers - 4 Nos
3. Dual power supply - 1 No
4. Temperature bath - 1 No
5. Multimeter - 1 No
6. Trim Pot - 3 Nos

Exercise

1. Develop the signal conditioning circuit and plot the output voltage versus temperature and comment on the linearity.

7. Design of Orifice Plate and Rotameter
Design of Orifice Plate

Aim:
To Design an Orifice Plate for the given Specification.

Equipment

1. Pump and Reservoir
2. Pipeline with Orifice plate
3. Collecting Tank

Exercise:

1. Convert Electrical Signal to Differential Pressure
2. Determine the interval data
3. Calculate D/d
4. Calculate sizing factor

Design of Rotameter
Aim:
To Design a Rotameter for given Specification
Equipment

1. Pump and Reservoir
2. Pipeline with Orifice plate
3. Collecting Tank

Exercise

1. Swithch On the Motor
2. Adjust the Rotameter to read the required flow rate.
3. Start the Timer
4, After 5 Min Note the Head in the tank.
5. Drain the tank.
6. Repeat the Procedure and Calculate Cd in each case

8. Control Valve Sizing

Aim:
To design a Control Valve and Study the flow lift Characteristics

Equipment:

1. Linear Control Valve
2. On/OFF Control Valve
3. Air Regulator
4. Rotameter
5. Pump

Exercise

1. By varying the inlet pressure note down the stem moment value and the flow rate.
2. Draw the Graph for pressure Vs Flow rate, Stem Moment Vs Flow rate

9. Design of PID Controller
Design of PID Controller using Op-Amp

Aim:
1.To the study the response of P,PI,PD ,PID Controllers using Op-Amp

Equipment

1. Signal Generator
2. IC 741
3. Resistors and Capacitors
4. CRO
5. Bread Board

Exercise

1. Design a Analog PID Controller for various values of Kp, Ki, Kd
2. Apply the error Signal from signal Generator (Square, Sine)
3. Note down the response from the CRO.

Design of PID Controller using Microprocessor
Aim:
To the study the response of P, PI, PD ,PID Controllers using Microprocessor.

Equipment

1. Signal Generator
2. Microprocessor based kit with ADC and DAC Section
3. CRO

Exercise:

1. Enter the PID Algorithm in Microprocessor
2. Give the Error Signal to ADC Section of Microprocessor Kit.
3. Execute the Microprocessor Program
4. Note down the output response of PID Controller in the DAC Section Microprocessor Kit

EIGHTH SEMESTER
812EIT01 - PRINCIPLES OF MANAGEMENT

UNIT I OVERVIEW OF MANAGEMENT
Definition - Management - Role of managers - Evolution of Management thought - Organization and the environmental factors – Trends and Challenges of Management in Global Scenario.

UNIT II PLANNING
Nature and purpose of planning - Planning process - Types of plans – Objectives - Managing by objective (MBO) Strategies - Types of strategies - Policies – Decision Making - Types of decision - Decision Making Process - Rational Decision Making Process - Decision Making under different conditions.

UNIT III ORGANIZING
Nature and purpose of organizing - Organization structure - Formal and informal groups *I* organization - Line and Staff authority - Departmentation - Span of control -
Centralization and Decentralization - Delegation of authority - Staffing - Selection and Recruitment - Orientation - Career Development - Career stages – Training - - Performance Appraisal.

UNIT IV DIRECTING
Creativity and Innovation - Motivation and Satisfaction - Motivation Theories - Leadership Styles - Leadership theories - Communication - Barriers to effective communication - Organization Culture - Elements and types of culture – Managing cultural diversity.

UNIT V CONTROLLING
Process of controlling - Types of control - Budgetary and non-budgetary control techniques - Managing Productivity - Cost Control - Purchase Control – Maintenance Control - Quality Control - Planning operations.

TEXT BOOKS:

1. Stephen P. Robbins and Mary Coulter, 'Management', Prentice Hall of India, 8th edition.
2. Charles W L Hill, Steven L McShane, 'Principles of Management', Mcgraw Hill Education, Special Indian Edition, 2007.

REFERENCES:

1. Hellriegel, Slocum & Jackson, ' Management - A Competency Based Approach', Thomson South Western, 10th edition, 2007.
2. Harold Koontz, Heinz Weihrich and Mark V Cannice, 'Management - A global & Entrepreneurial Perspective', Tata Mcgraw Hill, 12th edition, 2007.
3. Andrew J. Dubrin, 'Essentials of Management', Thomson Southwestern, 7th edition, 2007.

ELECTIVE III & IV
812EIT02 - DIGITAL IMAGE PROCESSING

AIM

To introduce the concept of analyzing the digital image fundamentals and digital image processing.

OBJECTIVES

- To study the digital image fundamentals and its applications.
- To study various filters used in digital image processing.
- To study about the segmentation & representation schemes.
- To study about recognition & interpretation methods.
- To study about imagecompression.

UNIT I DIGITAL IMAGE FUNDAMENTALS

Elements of visual perception, psycho visual model, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals -RGB,HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical formulation.

UNIT II IMAGE TRANSFORMS

1D DFT, 2D transforms – DFT, DCT, Discrete Sine, Walsh, Hadamard, Slant, Haar, KLT, SVD, Wavelet Transform.

UNIT III IMAGE ENHANCEMENT AND RESTORATION

Histogram modification and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median and filters, Homomorphic filtering, Color image enhancement. Image Restoration – degradation model, Inverse filtering – removal of blur, Wiener filtering, Geometric transformations – spatial transformations, Gray-Level interpolation.

UNIT IV IMAGE SEGMENTATION AND RECOGNITION

Edge detection. Image segmentation by region growing, region splitting and merging, edge linking.. Image Recognition – Patterns and pattern classes, Matching by minimum distance classifier, Matching by correlation, Image classification using neural network.

UNIT V IMAGE COMPRESSION

Need for data compression, Huffman,. Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Block Truncation Coding. Transform Coding – DCT and Wavelet. JPEG, MPEG. Standards, principles of Context based Compression.

TEXT BOOKS

1. William K.Pratt, ' Digital Image Processing', John Wiley, NewYork,2002.
2. Anil K. Jain, 'Fundamentals of Digital Image Processing', Prentice Hall of India, 2002.

REFERENCES

1. David Salomon : Data Compression – The Complete Reference, Springer Verlag New York Inc., 2nd Edition, 2001
2. Rafael C. Gonzalez, Richard E.Woods, Steven Eddins, ' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.
3. Rafael C. Gonzalez, Richard E.Woods, 'Digital Image Processing', Pearson Education, Inc., Second Edition, 2004
4. Milman Sonka, Vaclav Hlavac, Roger Boyle, 'Image Processing, Analysis, and Machine Vision', Brooks/Cole, Vikas Publishing House, II ed., 1999.
5. Sid Ahmed, M.A., 'Image Processing Theory, Algorithms and Architectures', McGraw-Hill, 1995.

812EIT03 - ADVANCED COMMUNICATION ENGINEERING

AIM

To understand the advanved communication engineering concepts.

OBJECTIVES

- To have a detailed knowledge of various spread spectrum techniques.
- To understand the basic principles of mobile communication and bluetooth technology.
- To have an exposure towards the high performance communication networks – ATM and ISDN
- To understand the operation of Radar and Navigationational aids.

UNIT I SPREAD SPECTRUM COMMUNICATION

Spread spectrum techniques-spreading techniques-PN sequences-DSSS, RHSS-use of spread spectrum with CDMA

UNIT II MOBILE COMMUNICATION

Basic cellular system-performance criteria-operation of cellular system-cell splittinginterference GSM, GPRS, Blue tooth-the link controller, the link manager, the host controller interface, LLCAP, WLL, Multiple access techniques

UNIT III ATM

ATM's position in OSL model-B-ISDN protocol reference model-ATM functions and layers-ATM signaling principles, TM operation and maintenance-ATM protocol stack: lower layers, fibre based networks and its advantages-ATM physical layer media

UNIT IV ISDN

ISDN standards, ISDN interface and functions-UNI-ISDN proctol architecture, ISDN physical layer, ISDN dataline layer-Network interface

UNIT V RADAR AND NAVIGATIONAL AIDS

Radar block diagram and operation-Radar range equation-Prediction of range performance-Minimum detectable signal-Pulse repetition frequency and range ambiguities-CW and FM CW radar-Synthetic aperature and air surveillance radar-ECCM and bistatic radar.

TEXT BOOKS

1. M.I. SKOLNIK, Introduction toRadar-Mc Graw Hill and Edition
2. William C.Y.Lee, Mobile Cellular Telecommunications system-Mc Graw Hill International Ed. 1990.
3. Simon Haykin, 'Digital communications', John Wiley and Sons, 1988
4. William Stallings,'ISDN and BISDN' Macmillan Publishers, 1995

REFERENCES

1. Jennifer Bray and Charles F. Sturman, 'Bluetooth', Pearson EducationAsia, 2001.

812EIT04 - ADVANCED DIGITAL SIGNAL PROCESSING

[Review of discrete-time signals and systems- DFT and FFT, Z-Transform, Digital Filters is recommended]

AIM

To provide adequate knowledge in Random signal processing.

OBJECTIVES

- Detail study of time averaging , ensamble averaging & study of power spectral density.
- Detail study of parametric & non – parametric estimation
- Detail study of adaptive filters & its applications
- Introduction study of multivariable digital signal processing.

UNIT I DISCRETE RANDOM SIGNAL PROCESSING

Discrete Random Processes- Ensemble averages, stationary processes, Autocorrelation and Auto covariance matrices. Parseval's Theorem, Wiener-Khintchine Relation- Power Spectral Density- Periodogram Spectral Factorization, Filtering random processes. Low Pass Filtering of White Noise. Parameter estimation: Bias and consistency.

UNIT II SPECTRUM ESTIMATION

Estimation of spectra from finite duration signals, Non-Parametric Methods-Correlation Method , Periodogram Estimator, Performance Analysis of Estimators -Unbiased, Consistent Estimators- Modified periodogram, Bartlett and Welch methods, Blackman – Tukey method. Parametric Methods - AR, MA, ARMA model based spectral estimation. Parameter Estimation -Yule-Walker equations, solutions using Durbin's algorithm.

UNIT III LINEAR ESTIMATION AND PREDICTION

Linear prediction- Forward and backward predictions, Solutions of the Normal equations- Levinson-Durbin algorithms. Least mean squared error criterion -Wiener filter for filtering and prediction , FIR Wiener filter and Wiener IIR filters.

UNIT IV ADAPTIVE FILTERS

FIR adaptive filters -adaptive filter based on steepest descent method-Widrow-Hoff LMS adaptive algorithm, Normalized LMS. Adaptive channel equalization-Adaptive echo cancellation-Adaptive noise cancellation- Adaptive recursive filters (IIR).

UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING

Mathematical description of change of sampling rate - Interpolation and Decimation , Decimation by an integer factor - Interpolation by an integer factor, Sampling rate conversion by a rational factor, Filter implementation for sampling rate conversion- direct form FIR structures, Polyphase filter structures, time-variant structures. Multistage implementation of multirate system.

TEXT BOOKS

1. Monson H.Hayes, 'Statistical Digital Signal Processing and Modeling', John Wiley and Sons, Inc., Singapore, 2002.
2. John G. Proakis, Dimitris G.Manolakis, 'Digital Signal Processing', Pearson Education, 2002.

REFERENCES

1. John G. Proakis et.al.'Algorithms for Statistical Signal Processing', Pearson Education, 2002.
2. Dimitris G.Manolakis et.al.' Statistical and adaptive signal Processing', McGraw Hill, Newyork, 2000.
3. Rafael C. Gonzalez, Richard E.Woods, 'Digital Image Processing', Pearson Education, Inc., Second Edition, 2004.(For Wavelet Transform Topic)

812EIT05 - ROBOTICS AND AUTOMATION

AIM

To provide comprehensive knowledge of robotics in the design, analysis and control point of view.

OBJECTIVES

- To study the various parts of robots and fields of robotics.
- To study the various kinematics and inverse kinematics of robots.
- To study the Euler, Lagrangian formulation of Robot dynamics.
- To study the trajectory planning for robot.
- To study the control of robots for some specific applications.

UNIT I BASIC CONCEPTS

Definition and origin of robotics – different types of robotics – various generations of robots – degrees of freedom – Asimov's laws of robotics – dynamic stabilization of robots.

UNIT II POWER SOURCES AND SENSORS

Hydraulic, pneumatic and electric drives – determination of HP of motor and gearing ratio – variable speed arrangements – path determination – micro machines in robotics – machine vision – ranging – laser – acoustic – magnetic, fiber optic and tactile sensors.

UNIT III MANIPULATORS, ACTUATORS AND GRIPPERS

Construction of manipulators – manipulator dynamics and force control – electronic and pneumatic manipulator control circuits – end effectors – U various types of grippers – design considerations.

UNIT IV KINEMATICS AND PATH PLANNING

Solution of inverse kinematics problem – multiple solution jacobian work envelop – hill climbing techniques – robot programming languages.

UNIT V CASE STUDIES

Mutiple robots – machine interface – robots in manufacturing and non- manufacturing applications – robot cell design – selection of robot.

TEXT BOOKS

1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., 'Industrial Robotics', McGraw-Hill Singapore, 1996.
2. Ghosh, 'Control in Robotics and Automation: Sensor Based Integration,' Allied Publishers, Chennai, 1998.

REFERENCES

1. Deb.S.R., Robotics technology and flexible Automation, John Wiley, USA 1992.
2. Asfahl C.R., Robots and manufacturing Automation, John Wiley, USA 1992.
3. Klafter R.D., Chimielewski T.A., Negin M., Robotic Engineering – An integrated approach, Prentice Hall of India, New Delhi, 1994.
4. Mc Kerrow P.J.' Introduction to Robotics', Addison Wesley, USA, 1991.

812EIT06 - TOTAL QUALITY MANAGEMENT

UNIT I INTRODUCTION

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

UNIT II TQM PRINCIPLES

Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I

The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.

UNIT V QUALITY SYSTEMS

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies of TQM implementation in manufacturing and service sectors including IT.

TEXT BOOKS

1. Dale H.Besterfiled, et at., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint (2006).
2. Suganthi,L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd. (2006)

REFERENCES

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", (6th Edition), South-Western (Thomson Learning), 2005.
2. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, Third Edition (2003).
3. Janakiraman,B and Gopal, R.K, "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd. (2006)

812EIT07 - PROFESSIONAL ETHICS IN ENGINEERING

UNIT I ENGINEERING ETHICS

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study.

UNIT III ENGINEER'S RESPONSIBILITY FOR SAFETY

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Chernobyl Case Studies and Bhopal.

UNIT IV RESPONSIBILITIES AND RIGHTS

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct.

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Thompson Learning, (2000).

REFERENCES

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999).
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, (2003)
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, (2001)
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, (2004)
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003)

812EIT08 - DIGITAL CONTROL SYSTEM

AIM

To provide sound knowledge on the principles of discrete data control system

OBJECTIVES

- To study the importance of sample data control system.
- To give adequate knowledge about signal processing in digital control.
- To study the importance of modeling of discrete systems and stability analysis of discrete data system.
- To study the importance of state space representation for discrete data system.
- To introduce the design concept for digital controllers.

UNIT I COMPUTER CONTROLLED SYSTEM

Configuration of the basic digital control scheme – general sampled data system variables – signal classifications – why use digital control system – Advantages – disadvantages – examples of discrete data and digital control systems.

UNIT II SIGNAL PROCESSING IN DIGITAL CONTROL

Sampling process – Frequency domain analysis – ideal samples – Shanon's sampling theorem – generation and solution of process – linear difference equations – data reconstruction process – frequency domain characteristics.

UNIT III DISCRETE SYSTEM MODELLING

Determination of the ☐ transform – mapping between s and ☐ domains - ☐ transform of system equations – open loop Hybrid sampled Data Control Systems – open loop discrete Input Data Control System – closed loop sampled data control system – modified ☐ transform method – response between sampling instants – stability on the ☐ - plane and jury's stability test – steady state error analysis for stable systems.

UNIT IV STATE VARIABLE ANALYSIS OF DIGITAL CONTROL SYSTEMS

State descriptions of digital processors – conversion of state variable models to transfer functions – conversion of transfer functions to canonical state variable models – first comparison form – second companion form – Jordon Canonical form – state description of sampled continuous time plants – solution of state difference equations – closed form solution – state transition matrix – Caley Hamilton Technique – concept of controllability and absorbability – loss of controllability and absorbability due to sampling.

UNIT V DESIGN OF DIGITAL CONTROL

Digital PI, PD and PID Controller – Position and velocity forms – state regulator design – design of state observers – dead beat control by state feedback and dead beat observers.

TEXT BOOKS

1. C.M. Houpis, G.B. Lamount, 'Digital Control Systems-Theory, Hardware, Software', International Student Edition, McGraw Hill Book Co., 1985.
2. M.Gopal, 'Digital Control and State Variables Methods', Tata McGraw HILL, 2nd Edition, 2003.

REFERENCES

1. B.C. Kuo, "Digital control systems", Second Edition, Oxford University press, 1992.
2. P.B. Deshpande and R.H. Ash, 'Computer Process Control', ISA Publication, USA, 1995.

812EIT09 – APPLIED SOFT COMPUTING

AIM

To cater the knowledge of Neural Networks, Fuzzy Logic Control, Genetic Algorithm and Evolutionary Programming and their applications for controlling real time systems.

OBJECTIVES

- To expose the concepts of feed forward neural networks.
- To provide adequate knowledge about feedback neural networks.
- To teach about the concept of fuzziness involved in various systems.
- To provide adequate knowledge about fuzzy set theory.
- To expose the ideas of GA and EP in optimization and control.

UNIT I ANN – INTRODUCTION

Introduction – Biological neuron – Artificial neuron – Neuron modeling – Learning rules – Single layer – Multi layer feed forward network – Back propagation – Learning factors.

UNIT II ANN – ARCHITECTURE AND APPLICATIONS

Feedback networks – Discrete time Hopfield networks – Transient response of continuous time networks – Process modeling using ANN- Neuro controller for inverted pendulum.

UNIT III FUZZY SYSTEMS

Classical sets – Fuzzy sets – Fuzzy relations **–** Fuzzification – Membership functions – Defuzzification – Methods of defuzzification – Fuzzy rules.

UNIT IV FUZZY LOGIC CONTROL

Membership function – Knowledge base – Decision-making logic – Optimisation of membership function using neural networks – Adaptive fuzzy system.- FLC for inverted pendulum- Home heating system- Introduction to Neuro-fuzzy systems.

UNIT V OPTIMIZATION TECHNIQUES

Gradient Search – Non-gradient search – Genetic Algorithms: Operators, search algorithm, penalty – Evolutionary Programming: Operators, Search Algorithms.

TEXT BOOKS

1. Laurance Fausett, 'Fundamentals of Neural Networks', Pearson Education, 2004.
2. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', McGraw Hill, 1997.
3. David Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning', Pearson Education, 2007.

REFERENCES

1 J.S.R.Jang, C.T.Sun and E.Mizutani, ' Neuro- Fuzzy and Soft Computing' Pearson Education, New Delhi, 2004
2. Jacek M. Zurada, 'Introduction to Artificial Neural Systems', Jaico Publishing home, 2002.
3. John Yen and Reza Langari, 'Fuzzy Logic – Intelligence, Control and Information', Pearson Education, New Delhi, 2003.
4. Robert J.Schalkoff, ' Artifical Neural Networks', McGraw Hill, 1997.

Registrar