ANNA UNIVERSITY, CHENNAI

AFFILIATED INSTITUTIONS

R - 2008

B.E. INSTRUMENTATION AND CONTROL ENGINEERING

II - VIII SEMESTERS CURRICULA AND SYLLABI

SEMESTER II

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	HS2161	Technical English – II*	3	1	0	4
2.	MA2161	Mathematics – II*	3	1	0	4
3.	PH2161	Engineering Physics – II*	3	0	0	3
4.	CY2161	Engineering Chemistry – II*	3	0	0	3
5. a	ME2151	Engineering Mechanics **(For non-circuit branches)**	3	1	0	4
5. b	EE2151	Circuit Theory **(For branches under Electrical Faculty)**	3	1	0	4
5. c	EC2151	Electric Circuits and Electron Devices **(For branches under I & C Faculty)**	3	1	0	4
6. a	GE2151	Basic Electrical & Electronics Engineering **(For non-circuit branches)**	4	0	0	4
6. b	GE2152	Basic Civil & Mechanical Engineering **(For circuit branches)**	4	0	0	4
PRACTICAL						
7.	GE2155	Computer Practice Laboratory-II*	0	1	2	2
8.	GS2165	Physics & Chemistry Laboratory - II*	0	0	3	2
9. a	ME2155	Computer Aided Drafting and Modeling Laboratory **(For non-circuits branches)**	0	1	2	2
9. b	EE2155	Electrical Circuits Laboratory **(For branches under Electrical Faculty)**	0	0	3	2
9. c	EC2155	Circuits and Devices Laboratory **(For branches under I & C Faculty)**	0	0	3	2
					TOTAL : 28 CREDITS	
10.	-	English Language Laboratory+	0	0	2	-

*** Common to all B.E. / B.Tech. Programmes**

+ Offering English Language Laboratory as an additional subject (with no marks) during 2nd semester may be decided by the respective Colleges affiliated to Anna University Chennai.

A. <u>CIRCUIT BRANCHES</u>

I Faculty of Electrical Engineering

1. B.E. Electrical and Electronics Engineering
2. B.E. Electronics and Instrumentation Engineering
3. B.E. Instrumentation and Control Engineering

II Faculty of Information and Communication Engineering

1. B.E. Computer Science and Engineering
2. B.E. Electronics and Communication Engineering
3. B.E. Bio Medical Engineering
4. B.Tech. Information Technology

B. <u>NON – CIRCUIT BRANCHES</u>

I Faculty of Civil Engineering

1. B.E. Civil Engineering

II Faculty of Mechanical Engineering

1. B.E. Aeronautical Engineering
2. B.E. Automobile Engineering
3. B.E. Marine Engineering
4. B.E. Mechanical Engineering
5. B.E. Production Engineering

III Faculty of Technology

1. B.Tech. Chemical Engineering
2. B.Tech. Biotechnology
3. B.Tech. Polymer Technology
4. B.Tech. Textile Technology
5. B.Tech. Textile Technology (Fashion Technology)
6. B.Tech. Petroleum Engineering
7. B.Tech. Plastics Technology

SEMESTER III

(Applicable to the students admitted from the Academic year 2008 – 2009 onwards)

THEORY			L	T	P	C
1.	MA 2211	Transforms and Partial Differential Equations	3	1	0	4
2.	GE 2021	Environmental Science and Engineering	3	0	0	3
3.	EI 2201	Electrical Machines	**3**	**1**	**0**	**4**
4.	EI 2203	Electronic Devices and Circuits	3	0	0	3
5.	EE2204	Data Structures and Algorithms	**3**	**1**	**0**	**4**
6.	EI 2202	Electrical Measurements	**3**	**1**	**0**	**4**
PRACTICAL						
1.	EE2207	**Electron Devices and Circuits Laboratory**	0	0	3	2
2.	**EI2208**	Electrical Machines Laboratory	0	0	3	2
3.	EE2209	Data Structures and Algorithms Laboratory	0	0	3	2
		TOTAL	**18**	**3**	**9**	**27**

SEMESTER IV

(Applicable to the students admitted from the Academic year 2008 – 2009 onwards)

THEORY			L	T	P	C
1.	EE 2253	Control Systems	3	1	0	4
2.	EI 2252	Transducer Engineering	3	0	0	3
3.	IC 2251	Digital Principles and Design	3	0	0	3
4.	EE 2254	Linear Integrated Circuits and Applications	3	0	0	3
5.	EI 2251	Industrial Instrumentation - I	3	0	0	3
6.	EI 2254	Applied Thermodynamics	3	1	0	4
PRACTICAL						
1.	EI 2257	Transducers and Measurements Laboratory	0	0	3	2
2.	EE 2258	Linear and Digital Integrated Laboratory	0	0	3	2
3.	EI 2258	Thermodynamics Laboratory	0	0	3	2
		TOTAL	**18**	**2**	**9**	**26**

SEMESTER V

(Applicable to the students admitted from the Academic year 2008 – 2009 onwards)

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	EC2311	Microprocessor and Microcontroller	3	0	0	3
2.	CS2311	Object Oriented Programming	3	0	0	3
3.	EI2302	Analytical Instruments	3	0	0	3
4.	EI2303	Industrial Instrumentation – II	3	0	0	3
5.	IC2301	Power Electronics	3	0	0	3
6.	EI2311	Biomedical Instrumentation	3	0	0	3
PRACTICAL						
1.	EC2313	Microprocessor and Microcontroller Lab	0	0	3	2
2.	CS2312	Object Oriented Programming Laboratory	0	0	3	2
3.	GE2321	Communication Skills Laboratory	0	0	4	2
4.	EI2304	Industrial Instrumentation Laboratory	0	0	3	2

		TOTAL	**18**	**0**	**13**	**26**

SEMESTER VI

(Applicable to the students admitted from the Academic year 2008 – 2009 onwards)

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	EI2351	Modern Electronic Instrumentation	3	0	0	3
2.	EI2352	Process Control	3	1	0	4
3.	EI2404	Fiber Optics and Laser Instruments	3	0	0	3
4.	IC2351	Advanced Control System	3	0	0	3
5.	EC2361	Digital Signal Processing	3	1	0	4
6.	CS2364	Embedded System	3	0	0	3
PRACTICAL						
1.	IC2352	Control System Laboratory	0	0	3	2
2.	EI2356	Process Control System Laboratory	0	0	3	2
3.	EI2357	Virtual Instrumentation Lab	0	0	3	2
		TOTAL	**18**	**3**	**9**	**26**

SEMESTER VII

(Applicable to the students admitted from the Academic year 2008 – 2009 onwards)

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	IC2401	Digital Control System	3	0	0	3
2.	EI2402	Logic and Distributed Control System	3	0	0	3
3.	EI2401	Industrial Data Networks	3	0	0	3
4.	CS2461	Applied Soft Computing	3	0	0	3
5.		Elective – I	3	0	0	3
6.		Elective – II	3	0	0	3
PRACTICAL						
1.	IC2403	Advanced Control System Laboratory	0	0	3	2
2.	EI2406	Instrumenstation System Design Laboratory	0	0	3	2
3.	IC2404	Comprehension	0	0	2	1
		TOTAL	**18**	**0**	**8**	**23**

SEMESTER VIII

(Applicable to the students admitted from the Academic year 2008 – 2009 onwards)

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.						
	MG2351	Principles of Management	3	0	0	3
2.		Elective – III	3	0	0	3
3.		Elective – IV	3	0	0	3
PRACTICAL						
1.	IC2451	Project Work - Viva Voce	0	0	12	6
		TOTAL	**9**	**0**	**12**	**15**

B.E INSTRUMENTATION AND CONTROL ENGINEERING
LIST OF ELECTIVES - R 2008

ELECTIVE I

SL.NO	CODE NO.	COURSE TITLE	L	T	P	C
1.	CS2351	Artificial Intelligence	3	0	0	3
2.	CS2071	Computer Architecture	3	0	0	3
3.	CS2411	Operating Systems	3	0	0	3
4.	CS2070	Visual Languages and Applications	3	0	0	3

ELECTIVE II

5.	***EI2021***	Power Plant Instrumentation	3	0	0	3
6.	EI2022	Instrumentation in Petrochemical Industries	3	0	0	3
7.	EI2023	Micro Electro Mechanical Systems	3	0	0	3
8.	GE2023	Fundamentals in NanoScience	3	0	0	3

ELECTIVE III

9.	IC2021	Optimal Control	3	0	0	3
10.	EE2029	System Identification and Adaptive Control	3	0	0	3
11.	EE2023	Robotics and Automation	3	0	0	3

ELECTIVE IV

12.	GE2022	Total Quality Management	3	0	0	3
13.	GE2025	Professional Ethics in Engineering	3	0	0	3
14.	EI2403	VLSI Design	3	0	0	3
15.	EC2057	Advanced Digital Signal Processing	3	0	0	3

HS2161 **TECHNICAL ENGLISH II** **L T P C**
3 1 0 4

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 **12**

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 **12**

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:

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.

1. Listening comprehension exercises to categorise data in tables.
2. Writing formal letters, quotations, clarification, complaint – Letter seeking permission for Industrial visits– Writing analytical paragraphs on different debatable issues.

UNIT III **12**

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:

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)

1. Speaking exercises involving the use of stress and intonation – Group discussions– analysis of problems and offering solutions.
2. Reading comprehension exercises with critical questions, Multiple choice question.
3. Sequencing of jumbled sentences using connectives – Writing different types of reports like industrial accident report and survey report – Writing recommendations.

UNIT IV **12**

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 **9**

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.

TOTAL : 60 PERIODS

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.

MA2161 MATHEMATICS – II L T P C
3 1 0 4

UNIT I ORDINARY DIFFERENTIAL EQUATIONS 12

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 12

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 parallelepipeds.

UNIT III ANALYTIC FUNCTIONS 12

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 12

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 12

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.

TOTAL : 60 PERIODS

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).

PH2161 ENGINEERING PHYSICS – II L T P C
3 0 0 3

UNIT I CONDUCTING MATERIALS 9

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

UNIT II SEMICONDUCTING MATERIALS 9

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors – carrier concentration derivation in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration – compound semiconductors – Hall effect –Determination of Hall coefficient – Applications.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Origin of magnetic moment – Bohr magneton – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti – ferromagnetic materials – Ferrites – applications – magnetic recording and readout – storage of magnetic data – tapes, floppy and magnetic disc drives.

Superconductivity : properties - Types of super conductors – BCS theory of superconductivity(Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV DIELECTRIC MATERIALS 9

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

UNIT V MODERN ENGINEERING MATERIALS 9

Metallic glasses: preparation, properties and applications.

Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, advantages and disadvantages of SMA

Nanomaterials: synthesis –plasma arcing – chemical vapour deposition – sol-gels – electrodeposition – ball milling - properties of nanoparticles and applications.

Carbon nanotubes: fabrication – arc method – pulsed laser deposition – chemical vapour deposition - structure – properties and applications.

TOTAL : 45 PERIODS

TEXT BOOKS:

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)

REFERENCES:

1. Rajendran, V, and Marikani A, 'Materials science'Tata McGraw Hill publications, (2004) New delhi.
2. Jayakumar, S. 'Materials science', R.K. Publishers, Coimbatore, (2008).
3. Palanisamy P.K, 'Materials science', Scitech publications(India) Pvt. LTd., Chennai, second Edition(2007)
4. M. Arumugam, 'Materials Science' Anuradha publications, Kumbakonam, (2006)

CY2161 ENGINEERING CHEMISTRY – II L T P C
3 0 0 3

AIM

To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

OBJECTIVES

- The student should be conversant with the principles electrochemistry, electrochemical cells, emf and applications of emf measurements.
- Principles of corrosion control
- Chemistry of Fuels and combustion
- Industrial importance of Phase rule and alloys
- Analytical techniques and their importance.

UNIT I ELECTROCHEMISTRY 9

Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – Single electrode potential – Nernst equation (problem) – reference electrodes –Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series – significance – potentiometer titrations (redox - Fe^{2+} vs dichromate and precipitation – Ag^{+} vs Cl^{-} titrations) and conduct metric titrations (acid-base – HCI vs, NaOH) titrations,

UNIT II CORROSION AND CORROSION CONTROL 9

Chemical corrosion – Pilling – Bedworth rule – electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – factors influencing corrosion – corrosion control – sacrificial anode and impressed cathodic current methods – corrosion inhibitors – protective coatings – paints – constituents and functions – metallic coatings – electroplating (Au) and electroless (Ni) plating.

UNIT III FUELS AND COMBUSTION 9

Calorific value – classification – Coal – proximate and ultimate analysis metallurgical coke – manufacture by Otto-Hoffmann method – Petroleum processing and fractions –

cracking – catalytic cracking and methods-knocking – octane number and cetane number – synthetic petrol – Fischer Tropsch and Bergius processes – Gaseous fuels- water gas, producer gas, CNG and LPG, Flue gas analysis – Orsat apparatus – theoretical air for combustion.

UNIT IV PHASE RULE AND ALLOYS 9

condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic systems (lead-silver system only) – alloys – importance, ferrous alloys – nichrome and stainless steel – heat treatment of steel, non-ferrous alloys – brass and bronze.

UNIT V ANALYTICAL TECHNIQUES 9

Beer-Lambert's law (problem) – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (problem) (block diagram only) – estimation of iron by colorimetry – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – estimation of nickel by atomic absorption spectroscopy.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2002).
2. S.S.Dara "A text book of Engineering Chemistry" S.Chand & Co.Ltd., New Delhi (2006).

REFERENCES:

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

ME2151 ENGINEERING MECHANICS L T P C
3 1 0 4

OBJECTIVE

At the end of this course the student should be able to understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions. Further, he should understand the principle of work and energy. He should be able to comprehend the effect of friction on equilibrium. He should be able to understand the laws of motion, the kinematics of motion and the interrelationship. He should also be able to write the dynamic equilibrium equation. All these should be achieved both conceptually and through solved examples.

UNIT I BASICS & STATICS OF PARTICLES 12

Introduction – Units and Dimensions – Laws of Mechanics – Lame's theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments – Vector operations: additions, subtraction, dot product, cross product – Coplanar Forces – Resolution and Composition of forces – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility – Single equivalent force.

UNIT II EQUILIBRIUM OF RIGID BODIES 12

Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions – Examples

UNIT III PROPERTIES OF SURFACES AND SOLIDS 12

Determination of Areas and Volumes – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section, - Angle section, Hollow section by using standard formula – second and product moments of plane area – Rectangle, triangle, circle from integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia – Mass moment of inertia – Derivation of mass moment of inertia for rectangular section, prism, sphere from first principle – Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES 12

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's law – Work Energy Equation of particles – Impulse and Momentum – Impact of elastic bodies.

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 12

Frictional force – Laws of Coloumb friction – simple contact friction – Rolling resistance – Belt friction.

Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion.

TOTAL: 60 PERIODS

TEXT BOOK:

1. Beer, F.P and Johnson Jr. E.R. "Vector Mechanics for Engineers", Vol. 1 Statics and Vol. 2 Dynamics, McGraw-Hill International Edition, (1997).

REFERENCES:

Rajasekaran, S, Sankarasubramanian, G., "Fundamentals of Engineering Mechanics", Vikas Publishing House Pvt. Ltd., (2000).

1. Hibbeller, R.C., "Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., (2000).
2. Palanichamy, M.S., Nagam, S., "Engineering Mechanics – Statics & Dynamics", Tata McGraw-Hill, (2001).
3. Irving H. Shames, "Engineering Mechanics – Statics and Dynamics", IV Edition – Pearson Education Asia Pvt. Ltd., (2003).
4. Ashok Gupta, "Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM)", Pearson Education Asia Pvt., Ltd., (2002).

EE2151 CIRCUIT THEORY L T P C

(Common to EEE, EIE and ICE Branches) **3 1 0 4**

UNIT I BASIC CIRCUITS ANALYSIS 12

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: 12

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 12

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 12

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 12

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.

TOTAL: PERIODS

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).

EC2151 ELECTRIC CIRCUITS AND ELECTRON DEVICES L T P C

(For ECE, CSE, IT and Biomedical Engg. Branches) **3 1 0 4**

UNIT I CIRCUIT ANALYSIS TECHNIQUES 12

Kirchoff's current and voltage laws – series and parallel connection of independent sources – R, L and C – Network Theorems – Thevenin, Superposition, Norton, Maximum power transfer and duality – Star-delta conversion.

UNIT II TRANSIENT RESONANCE IN RLC CIRCUITS 12

Basic RL, RC and RLC circuits and their responses to pulse and sinusoidal inputs – frequency response – Parallel and series resonances – Q factor – single tuned and double tuned circuits.

UNIT III SEMI CONDUCTOR DIODES 12

Review of intrinsic & extrinsic semiconductors – Theory of PN junction diode – Energy band structure – current equation – space charge and diffusion capacitances – effect of temperature and breakdown mechanism – Zener diode and its characteristics.

UNIT IV TRANSISTORS 12

Principle of operation of PNP and NPN transistors – study of CE, CB and CC configurations and comparison of their characteristics – Breakdown in transistors – operation and comparison of N-Channel and P-Channel JFET – drain current equation – MOSFET – Enhancement and depletion types – structure and operation – comparison of BJT with MOSFET – thermal effect on MOSFET.

UNIT V SPECIAL SEMICONDUCTOR DEVICES (Qualitative Treatment only) 12

Tunnel diodes – PIN diode, varactor diode – SCR characteristics and two transistor equivalent model – UJT – Diac and Triac – Laser, CCD, Photodiode, Phototransistor, Photoconductive and Photovoltaic cells – LED, LCD.

TOTAL : 60 PERIODS

TEXT BOOKS:

1. Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Shaum series, Tata McGraw Hill, (2001)
2. S.Salivahanan, N. Suresh kumar and A. Vallavanraj, "Electronic Devices and Circuits",Tata McGraw Hill, 2nd Edition, (2008).
3. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition, (2008).

REFERENCES:

1. Robert T. Paynter, "Introducing Electronics Devices and Circuits", Pearson Education, 7th Education, (2006).
2. William H. Hayt, J.V. Jack, E. Kemmebly and steven M. Durbin, "Engineering Circuit Analysis",Tata McGraw Hill, 6th Edition, 2002.
3. J. Millman & Halkins, Satyebranta Jit, "Electronic Devices & Circuits",Tata McGraw Hill, 2nd Edition, 2008.

GE2151 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING L T P C

(Common to branches under Civil, Mechanical and Technology faculty) **3 0 0 3**

UNIT I ELECTRICAL CIRCUITS & MEASURMENTS 12

Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase Balanced Circuits.

Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT II ELECTRICAL MECHANICS 12

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 12

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation.
Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier.

UNIT IV DIGITAL ELECTRONICS 12

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts)

UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING 12

Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations.
Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

TOTAL : 60 PERIODS

TEXT BOOKS:

1. .N. Mittle "Basic Electrical Engineering",Tata McGraw Hill Edition, New Delhi, 1990.
2. R.S. Sedha, "Applied Electronics" S. Chand & Co., 2006.

REFERENCES:

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics and Computer Engineering",Tata McGraw Hill, Second Edition, (2006).
2. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford press (2005).
3. Mehta V K, "Principles of Electronics", S.Chand & Company Ltd, (1994).
4. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, (2002).
5. Premkumar N, "Basic Electrical Engineering", Anuradha Publishers, (2003).

GE2152 BASIC CIVIL & MECHANICAL ENGINEERING L T P C
(Common to branches under Electrical and I & C Faculty) **4 0 0 4**

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 15

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 15

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.

TOTAL : 30 PERIODS

B – MECHANICAL ENGINEERING

UNIT III POWER PLANT ENGINEERING 10

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 IC ENGINES 10

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 10

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.

TOTAL: 30 PERIODS

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).

GE2155 COMPUTER PRACTICE LABORATORY – II L T P C
0 1 2 2

LIST OF EXPERIMENTS

1. UNIX COMMANDS 15

Study of Unix OS - Basic Shell Commands - Unix Editor

2. SHELL PROGRAMMING 15

Simple Shell program - Conditional Statements - Testing and Loops

3. C PROGRAMMING ON UNIX 15

Dynamic Storage Allocation-Pointers-Functions-File Handling

TOTAL : 45 PERIODS

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

GS2165 PHYSICS LABORATORY – II L T P C
0 0 3 2

LIST OF EXPERIMENTS

1. Determination of Young's modulus of the material – non uniform bending.
2. Determination of Band Gap of a semiconductor material.
3. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.
4. Determination of viscosity of liquid – Poiseuille's method.
5. Spectrometer dispersive power of a prism.
6. Determination of Young's modulus of the material – uniform bending.
7. Torsional pendulum – Determination of rigidity modulus.

- **A minimum of FIVE experiments shall be offered.**
- **Laboratory classes on alternate weeks for Physics and Chemistry.**
- **The lab examinations will be held only in the second semester.**

GS2165 CHEMISTRY LABORATORY – II L T P C
0 0 3 2

LIST OF EXPERIMENTS

1. Conduct metric titration (Simple acid base)
2. Conduct metric titration (Mixture of weak and strong acids)
3. Conduct metric titration using $BaCl_2$ vs Na_2SO_4
4. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$)
5. PH titration (acid & base)
6. Determination of water of crystallization of a crystalline salt (Copper sulphate)
7. Estimation of Ferric iron by spectrophotometry.

- **A minimum of FIVE experiments shall be offered.**
- **Laboratory classes on alternate weeks for Physics and Chemistry.**
- **The lab examinations will be held only in the second semester.**

ME2155 COMPUTER AIDED DRAFTING AND MODELING LABORATORY L T P C
0 1 2 2

List of Exercises using software capable of Drafting and Modeling

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, spiral, involute using Bspline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial

views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).
6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
7. Drawing of a simple steel truss.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
9. Drawing isometric projection of simple objects.
10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

Note: Plotting of drawings must be made for each exercise and attached to the records written by students.

List of Equipments for a batch of 30 students:

1. Pentium IV computer or better hardware, with suitable graphics facility -30 No.
2. Licensed software for Drafting and Modeling. – 30 Licenses
3. Laser Printer or Plotter to print / plot drawings – 2 No.

EE2155 ELECTRICAL CIRCUIT LABORATORY L T P C
(Common to EEE, EIE and ICE) **0 0 3 2**

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.

TOTAL: 45 PERIODS

EC2155 CIRCUITS AND DEVICES LABORATORY L T P C
0 0 3 2

1. Verification of KVL and KCL
2. Verification of Thevenin and Norton Theorems.
3. Verification of superposition Theorem.
4. Verification of Maximum power transfer and reciprocity theorems.
5. Frequency response of series and parallel resonance circuits.
6. Characteristics of PN and Zener diode
7. Characteristics of CE configuration
8. Characteristics of CB configuration
9. Characteristics of UJT and SCR
10. Characteristics of JFET and MOSFET
11. Characteristics of Diac and Triac.
12. Characteristics of Photodiode and Phototransistor.

TOTAL : 45 PERIODS

10 ENGLISH LANGUAGE LABORATORY (Optional) L T P C
0 0 2 -

1. Listening: **5**

Listening & answering questions – gap filling – Listening and Note taking- Listening to telephone conversations

2. Speaking: **5**

Pronouncing words & sentences correctly – word stress – Conversation practice.

Classroom Session **20**

1. Speaking: Introducing oneself, Introducing others, Role play, Debate- Presentations: Body language, gestures, postures.
   Group Discussions etc
2. Goal setting – interviews – stress time management – situational reasons

Evaluation

(1) Lab Session – 40 marks
- Listening – 10 marks
- Speaking – 10 marks
- Reading – 10 marks
- Writing – 10 marks

(2) Classroom Session – 60 marks
- Role play activities giving real life context – 30 marks
- Presentation – 30 marks

NOTE ON EVALUATION

1.. Examples for role play situations:
   a. Marketing engineer convincing a customer to buy his product.
   b. Telephone conversation – Fixing an official appointment / Enquiry on availabilityof flight or train tickets / placing an order. etc.

2. Presentations could be just a Minute (JAM activity) or an Extempore on simple topics or visuals could be provided and students could be asked to talk about it.

REFERENCES:

1. Hartley, Peter, Group Communication, London: Routledge, (2004).
2. Doff, Adrian and Christopher Jones, Language in Use – (Intermediate level), Cambridge University Press, (1994).
3. Gammidge, Mick, Speaking Extra – A resource book of multi-level skills activities , Cambridge University Press, (2004).
4. Craven, Miles, Listening Extra - A resource book of multi-level skills activities, Cambridge, Cambridge University Press, (2004).
5. Naterop, Jean & Rod Revell, Telephoning in English, Cambridge University Press, (1987).

LAB REQUIREMENTS

1. Teacher – Console and systems for students
2. English Language Lab Software
3. Tape Recorders.

MA2211 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS L T P C
(Common of all branches) 3 1 0 4

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.

UNIT I FOURIER SERIES 9

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.

UNIT II FOURIER TRANSFORM 9

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

UNIT III PARTIAL DIFFERENTIAL EQUATIONS 9

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.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9

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.

UNIT V Z -TRANSFORM AND DIFFERENCE EQUATIONS 9

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

TUTORIALS= 15 TOTAL = 60 PERIODS

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.

GE2021 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C

(Common to EEE, EIE, ICE, Biotech, Chemical, Fashion, Plastic, Polymer & Textile) **3 0 0 3**

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.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

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.

UNIT II ECOSYSTEMS AND BIODIVERSITY 9

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.

UNIT III ENVIRONMENTAL POLLUTION 9

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

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 9

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.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 9

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.

L = 45 TOTAL = 45 PERIODS

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.

EI2201 ELECTRICAL MACHINES L T P C
(Common to EIE & ICE) 3 1 0 4

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 12

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 9

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 8

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 9

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 7

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.

L = 45 TOTAL = 45 PERIODS

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.

REFERENCES

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.

EI2203 ELECTRONIC DEVICES AND CIRCUITS L T P C
(Common to EIE & ICE) 3 0 0 3

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 9

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 9

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 9

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 9

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 9

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.

L = 45 TOTAL = 45 PERIODS

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.

REFERENCES

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.

EE2204 DATA STRUCTURES AND ALGORITHMS L T P C
(Common to EEE, EIE & ICE) 3 1 0 4

AIM:

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

UNIT I LINEAR STRUCTURES 9

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

UNIT II TREE STRUCTURES 9

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

UNIT III BALANCED SEARCH TREES AND INDEXING 9

AVL trees – Binary Heaps – B-Tree – Hashing – Separate chaining – open addressing – Linear probing

UNIT IV GRAPHS 9

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

UNIT V ALGORITHM DESIGN AND ANALYSIS 9

Greedy algorithms – Divide and conquer – Dynamic programming – backtracking – branch and bound – Randomized algorithms – algorithm analysis – asymptotic notations – recurrences – NP-complete problems

L = 45 TOTAL = 45PERIODS

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. A. 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.

EI2202 ELECTRICAL MEASUREMENTS L T P C
(Common to EIE & ICE) 3 1 0 4

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.

i. Emphasis is laid on the meters used to measure current & voltage.

ii. To have an adequate knowledge in the measurement techniques for power and energy, power and energy meters are included.
iii. Elaborate discussion about potentiometer & instrument transformers.
iv. Detailed study of resistance measuring methods.
v. Detailed study of inductance and capacitance measurement.

UNIT I MEASUREMENT OF VOLTAGE AND CURRENT 9

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.

UNIT II MEASUREMENT OF POWER AND ENERGY 9

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

UNIT III POTENTIOMETERS & INSTRUMENT TRANSFORMERS 9

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.

UNIT IV RESISTANCE MEASUREMENT 9

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.

UNIT V IMPEDANCE MEASUREMENT 9

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

L = 45 T = 15 TOTAL = 60 PERIODS

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

REFERENCES

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 edition.,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.

EE2207 ELECTRON DEVICES AND CIRCUITS LABORATORY L T PC
(B.E. (EEE), B.E. (E&I) and B.E. (I & C) 0 0 3 2
(Revised)

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.

P: 45 TOTAL : 45PERIODS

REQUIREMENT FOR A BATCH OF 30 STUDENTS

S.No.	Description of Equipment	Quantity required	Quantity available	Deficiency %
1.	Regulated Power Supply	15		
2.	Dual Tree CRO (20 MHz)	15		
3.	Function Generator	15		
4.	$3^{1/2}$ Digit digital multimeter	10		
5.	Bread Boards	40		
6.	Transistor	25 Nos.		
7.	JFET	10 Nos.		
8.	Diode	10 Nos.		
9.	Zener Diode	5 Nos.		
10.	UJT	5 Nos.		
11.	Photo Diode	5 Nos.		
12.	Photo Transistor	5 Nos.		
13.	Thermistors	5 Nos.		
14.	OP-amp	10 Nos.		
15.	Milli Ammeter (0-100mA)	15 Nos.		
16.	Micro Ammeter (0-50µA)	10 Nos.		
17.	Low range voltmeter (0-30V)	10 Nos.		
18.	Resistor of various ranges	50 Nos.		
19.	Capacitors of various ranges	50 Nos.		
20.	Connecting wires	Sufficient Nos		

EI2208	ELECTRICAL MACHINES LABORATORY (Common to EIE & ICE)	L T PC 0 0 3 2

OBJECTIVE

To impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics and simulation of time response.
To expose the students to the basic operation of electrical machines and help them to develop experimental skills.
Verification of Kirchoff's voltage and current laws, Thevenin's and Norton's Theorems.

Measurement of time constant of series R-C electric circuits and frequency response of a series RLC circuit.

Study of the effect of Q on frequency response and bandwidth of series and parallel resonant circuits

Open circuit and load characteristics of self-excited D.C. generator.
Load test on D.C. shunt motor.
Load test on D.C. series motor.
Swinburne's test and speed control of D.C. shunt motor.
Load test on single phase transformer and open circuit and short circuit test on single phase transformer
Load test on single phase induction motor.
No load and blocked rotor tests on three phase induction motor (Determination of equivalent circuit parameters)

P = 45 TOTAL = 45 PERIODS

Detailed Syllabus

1. Verification of Kirchoff's voltage and current laws, Thevenin's and Norton's Theorems

Aim

To verify Kirchchoff's voltage and current laws, Thevenin's and Norton's Theorems.

Exercises

a) Verify the Kirchoff's voltage and current law in a series circuit and in a circuit with series and parallel combination.
b) Determine the Thevenins equivalent voltage V_{TH} and resistance R_{TH} of a DC circuit with a single voltage source.
   (i) Verify experimentally the values of V_{TH} and R_{TH} in solving a series – parallel circuit.
   (ii) Determine the values of Norton's constant – current source I_N and Norton's current - source resistance R_N in a DC circuit containing one or two voltage sources.

2. Measurement of time constant of series R-C electric circuits and frequency response of a series RLC circuit.

(a) Measurement of time constant of series R-C electric circuits

Aim

To determine experimentally the time taken by a capacitor to charge and B discharge through a resistance.

Exercises

a. Determine experimentally the time taken by a capacitor to charge through a resistor and obtain a plot between voltage across capacitor and time.
b. Determine experimentally the time taken by a capacitor to discharge through a resistor and obtain a plot between voltage across capacitor and time.

3.(b) Resonant frequency and frequency response of a series R L C circuit.

Aim

To determine experimentally the resonant frequency f_R of a series RLC circuit.

To verify the resonant frequency of a series RLC circuit is given by the formula $f_R = 1 / 2\pi\sqrt{LC}$.

To develop experimentally the frequency – response curve of a series RLC circuit

Exercises

Draw the frequency response curve of a series RLC circuit (V_L Vs f, V_C Vs f)

Experimentally show the following

Resonant frequency $f_r = 1 / 2\pi \sqrt{LC}$

The impedance at resonance Z = R

4. Study of the effect of Q on frequency response and bandwidth of series and parallel resonant circuits

Aim

To study the effect of Q on frequency response and on bandwidth at the half – power points of series and parallel resonant circuits.

Exercises

Experimentally study the effect of Q on frequency response and bandwidth of RLC resonant circuit and obtain the following for three values of Q.

I Vs frequency

Half power points

Bandwidth

V_e Vs f

V_L Vs f

Experimentally determine the resonant frequency in a parallel resonant circuit. Draw current versus frequency in parallel resonant circuit.

5. Open circuit and load characteristics of self excited DC Generator

Aim

To conduct no load and load test on self excited generator and obtain the characteristics.

Exercise

Obtain the open circuit characteristics of a self excited D.C generator and determine critical resistance.

Draw the external and internal characteristics of a self excited D.C generatorandcompute full load regulation.

Load Test on DC Shunt motor.

Aim

To conduct load test on DC shunt motor and draw the characteristic curves.

Exercise

1. Draw the following characteristic curves for DC shunt motor
   - Output Vs η%
   - Output Vs Torque
   - Output Vs N
   - Output Vs I_L
   - Torque Vs N

6. Load Test on DC series motor

Aim

To conduct load test on DC series motor and to obtain the characteristics.

Exercise

1. Draw the following characteristics curve for DC series motor
   - Output Vs η%
   - Output Vs T
   - Output Vs N
   - Output Vs I
   - Torque Vs N

7. Swinburne's Test and speed control of DC shunt motor

Aim

To conduct Swinburne's test and predetermine the performance characteristics of DC machine and speed control of DC motor.

Exercise

Predetermine efficiency at various load current while operating as a motor and generator and plot a graph for O/P Vs η% output Vs η%

Draw the following curves for

- I_f Vs N at $V_a = 0.8\ V_a$ and V_a
- V_a Vs N at $0.8\ I_f$ and I_f

8. Load Test On Single-Phase Transformer and Open Circuit And Short Circuit Tests On Single Phase Transformer

Aim

To conduct load test on the given single phase transformer and determine its performance

2. To conduct O.C and S.C test on a single phase transformer and calculate its performance

Exercise

a. Draw the following graph for single phase transformer
   Output Vs η%
b. Determine the equivalent circuit of the transformer.
c. Predetermine the efficiency at different load at UPF and 0.8 Power factor lagging.
d. Predetermine the full load regulation at different power factor.
e. Draw the following curves
   (i). Output Vs η%
   (ii). Power factor Vs %Regulation

9. Load test on single phase induction motor

Aim

To obtain the load characteristics of single phase motor by load test.

Exercise

a. Conduct the load test on given single-phase induction motor and draw the following curves.
   1. Output Vs % η

2. Output Vs Speed
3. Output Vs Line current I_B
4. Output Vs Slip
5. Output Vs Power factor

10. No load and blocked rotor test on three-phase induction motor

Aim

To conduct no load and blocked rotor test and to draw the equivalent circuit and predetermine its performance.

Exercise

a. Determine the equivalent circuit parameters.
b. Draw the circle diagram and predetermine the efficiency, torque, power factor, slip and line current for three load condition.
   Predetermine the performance characteristics using the equivalent circuit for three load condition

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.		
6.	Three phase transformers	2 Nos.		
7.	D.C. Motor – Alternator set	4 sets		
8.	Three phase Induction Motor (Squirrel cage)	3 Nos.		
9.	Three phase slip ring Induction Motor	1 No.		
10.	Single phase Induction Motor	2 Nos.		
11.	Resistive load 3 phase – 2 , single phase - 3	5 Nos.		
12.	Inductive load	1 No.		
13.	Single phase Auto transformer	5 Nos.		
14.	Three phase Auto transformer	3 Nos.		
15.	Moving Coil Ammeter of different ranges	20 Nos.		

S.No.	Description of Equipment	Quantity required	Quantity available	Deficiency %
16.	Moving Coil Voltmeter of different ranges	20 Nos.		
17.	Moving Iron Ammeter of different ranges	20 Nos.		
18.	Moving Iron voltmeter of different ranges	20 Nos.		
19.	Wire wound Rheostats of different ratings	30 Nos.		
20.	Tachometers	10 Nos.		
21.	Single element wattmeters of different ranges UPF / LPF	20 Nos.		
22.	Double element wattmeters of different ranges	4 Nos.		
23.	Power factor meter	2 Nos.		
24.	Digital multimeter	5 Nos.		
25.	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		
26.	SCR based semi and fully controlled rectifier module	2 Nos.		
27.	SCR based chopper module	2 Nos.		
28.	SCR based inverter module	2 Nos.		
29.	SCR based AC voltage regulation module	2 Nos.		
30.	SCR, MOSFET, IGBT Trainer module	Each 2 Nos.		

EE2209 DATA STRUCTURES AND ALGORITHMS LAB L T P C
(Common to EEE, EIE & ICE) 0 0 3 2

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.

P = 45 TOTAL = 45 PERIODS

REQUIREMENT FOR A BATCH OF 30 STUDENTS

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

EE2253 CONTROL SYSTEMS L T P C
(Common to EEE, EIE & ICE) 3 1 0 4

AIM

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

OBJECTIVES

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

UNIT I SYSTEMS AND THEIR REPRESENTATION 9

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.

UNIT II TIME RESPONSE 9

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.

UNIT III FREQUENCY RESPONSE 9

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

UNIT IV STABILITY OF CONTROL SYSTEM 9

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.

UNIT V COMPENSATOR DESIGN 9

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

L = 45 T = 15 TOTAL = 60PERIODS

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.

EI2252 TRANSDUCER ENGINEERING L T P C
(Common to EIE & ICE) 3 0 0 3

AIM

To provide adequate knowledge in sensors and transducers.

OBJECTIVES

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

UNIT I SCIENCE OF MEASUREMENTS AND INSTRUMENTATION OF TRANSDUCERS 9

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

UNIT II CHARACTERISTICS OF TRANSDUCERS 9

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.

UNIT III VARIABLE RESISTANCE TRANSDUCERS 9

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

UNIT IV VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE RANSDUCERS 9

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.

UNIT V OTHER TRANSDUCERS 9

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

L = 45 TOTAL = 45PERIODS

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.

IC2251 DIGITAL PRINCIPLES AND DESIGN L T P C
3 0 0 3

AIM

To introduce the fundamentals of Digital Circuits, combinational and sequential circuit, digital system design and VSI circuits.

OBJECTIVES

i. To review Boolean algebra and to simplify the mathematical expressions using Boolean functions – simple problems.
ii. To study implementation of combinational circuits
iii. To study the design of various synchronous and asynchronous circuits.
iv. To expose the students to programmable logic devices and digital logic families.
v. To introduce the concepts of VLSI circuits

UNIT I DESIGN OF COMBINATIONAL CIRCUITS 9

Review of Boolean algebra – codes, simplification using K-maps & Quine McCluskey method. Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers. Function realization using gates and multiplexers.

UNITII SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS 9

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; shift registers.

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

UNIT III PROGRAMMABLE LOGIC DEVICES 9

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 IV DIGITAL LOGIC FAMILIES 9

TTL, CMOS, NMOS, Dynamic MOS , ECL, I^2L, Operating conditions, Parameters, Interpreting data sheets. Power supply grounding considerations for digital ICs, TTL – to – CMOS Interface, CMOS – to – TTL interface.

UNIT V INTRODUCTION TO VLSI 9

Fundamental consideration – NMOS, CMOS, Design of combinational logic gates in CMOS.

L = 45 TOTAL =45PERIODS

TEXT BOOKS

1. M. Morris Mano, 'Digital Logic and Computer Design', Prentice Hall of India, 2002.
2. S.M.Sze, 'VLSI Technology', 2nd Edition, Tata McGraw Hill Publising Co. New Delhi, 1996.
3. Charles H.Roth, 'Fundamentals Logic Design', Jaico Publishing, IV edition, 2002.

REFERENCES

1.Theodore. F. Bogart,' Introduction to Digital Circuits', McGraw – Hill International edition.
2. John M.Yarbrough, 'Digital Logic, Application & Design', Thomson, 2002.
3.John F.Wakerly, 'Digital Design Principles and Practice', 3rd edition, Pearson Education, 2002.

EE2254 LINEAR INTEGRATED CIRCUITS AND APPLICATIONS L T P C
(Common to EEE, EIE & ICE) 3 0 0 3

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.

UNIT I IC FABRICATION 9

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.

UNIT II CHARACTERISTICS OF OPAMP 9

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.

UNIT III APPLICATIONS OF OPAMP 9

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.

UNIT IV SPECIAL ICS 9

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

UNIT V APPLICATION ICS 9

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.

L = 45 TOTAL = 45 PERIODS

TEXT BOOKS

1. Ramakant A.Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pears 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

EI2251 INDUSTRIAL INSTRUMENTATION – I L T P C
(Common to EIE & ICE) 3 0 0 3

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.

UNIT I MEASUREMENT OF FORCE, TORQUE AND VELOCITY 9

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.

UNIT II MEASUREMENT OF ACCELERATION, VIBRATION AND DENSITY 9

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.

UNIT III PRESSURE MEASUREMENT 9

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.

UNIT IV TEMPERATURE MEASUREMENT 9

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.

UNIT V THERMOCOUPLES AND RADIATION PYROMETERS 9

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.

L = 45 TOTAL = 45PERIODS

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.

EI2254 APPLIED THERMODYNAMICS L T P C
(Common to EIE & ICE) 3 1 0 4

OBJECTIVES

(I) .To expose the fundamentals of thermodynamics and to be able to use it in accounting for the bulk behaviour of the sample physical systems.
(II) To integrate the basic concepts into various thermal applications like IC engines, gas turbines, steam boiler, steam turbine, compressors, refrigeration and air conditioning.
(III) 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)

UNIT I BASIC CONCEPTS AND LAWS OF THERMODYNAMICS 12

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.

UNIT II IC ENGINES 8

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.

UNIT III STEAM BOILERS AND TURBINES 8

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.

UNIT IV COMPRESSORS, REFRIGERATION AND AIR CONDITIONING 8

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).

UNIT V HEAT TRANSFER 9

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.

L = 45 T = 15 Total = 60 PERIODS

TEXT BOOKS

1. R.S.Khurmi & J.K.Gupta, Thermal Engineering, S.Chand & Co. Ltd., 2006.
2.. 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.

EI2257 TRANSDUCERS AND MEASUREMENTS LABORATORY L T P C
(Common to EIE & ICE) 0 0 3 2

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 for inductance measurement.
8. Calibration of Single-phase Energy meter and wattmeter.
9. Calibration of Ammeter and Voltmeter using Student type potentiometer.
10. Design, Construction and calibration of series and shunt type ohmmeters.

P = 45, TOTAL = 45 PERIODS

Detailed syllabus:

1. Loading effect on potentiometer

Aim

To study the loading effect of potentiometer circuit.

Objectives

i. To observe the input output calibration curve using FET voltmeter the output device.
ii. To observe the I/O characteristic with an voltmeter whose input impedance is finite.
iii. 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

1. To identify and study the characteristics of strain guage and load cell.
2. To determine the sensitivity of strain guage and load cell.
3. 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.

3. (a) Characteristics of LVDT

Aim

To study the characteristics of LVDT

Objective

1. To study the displacement of the core from its null position.
2. 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

3. (b) Hall effect Transducer

Aim

To study the characteristics of Hall Effect transducer.

Objective

1. To determine the positive hall voltage at the bottom of the transducer.
2. To determine the negative hall voltage.
3. To identify and study the characteristics of hall effect transducer.
4. 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

3. (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.

4. (a) Characteristics of LDR

Aim

To determine the characteristics of LDR

Objectives

1. To determine the change in resistance for corresponding change in light intensity.
2. 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

4. (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 to 100^0C.
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

4. (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 characteristics of RTD and thermocouple and Study of smart transducers.

5. (a) Step response characteristics of RTD and Thermocouple

Aim

To study the step response characteristics of RTD and thermocouple.

Objective

a. To analyse the change in temperature due to change in emf in case of thermocouple.
b. To analyse the change in temperature due to change in resistance in case of RTD.
c. 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.

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

6. (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.

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. Bread board - 1 No
8.

9. Schering Bridge for capacitance measurement and Anderson Bridge For inductance Measurement.

7.(a) Schering's Bridge

Aim

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

Exercise

Measure the unknown value of capacitance.

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.

7.(b) Anderson's Bridge

Aim

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

Exercise

Measure the unknown value of 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.

8. (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.

Equipment

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

8. (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.

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.

9. (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.

Equipment

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

9. (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.

Equipment

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

4. RPS – 1 No.

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

Aim

To design and calibrate an ohmmeter.

EE2258 LINEAR AND DIGITAL INTEGRATED CIRCUITS LABORATORY L T P C
(Common to EEE, EIE & ICE) 0 0 3 2

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.

3a) Code converters, Parity generator and parity checking, Excess-3, 2s Complement,
Binary to Gray code using suitable IC's .

3(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:
i. Voltage to frequency characteristics of NE/ SE 566 IC.
ii. Frequency multiplication using NE/SE 565 PLL IC.

P = 45 TOTAL = 45PERIODS

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.

3a) 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

3b) 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

i) Voltage to frequency characteristics of NE/ SE 566 IC.
ii) 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	3		
3.	Function generator	3		
4.	IC trainer Kit	15		
5.	Analog AC trainer kit	4		
6.	Bread boards	10 each		
7.	Chips IC – 7400	10		
8.	Chips IC – 7402	10		
9.	Chips IC – 7408	10		
10.	Chips IC – 7432	10		
11.	Chips IC – 7410	25		
12.	Chips IC – 555	10		
13.	Chips IC – 741	10		
14.	Chips IC – 74153	10		
15.	Chips IC – 7474	10		
16.	Chips IC – 7490	10		
17.	Chips IC – 7447	10		
18.	Chips IC – 7476	10		
19.	Chips IC – 7420	10		
20.	Chips IC – 7404	15		
21.	Chips LM – 317	10		
22.	Chips LM – 723	10		

S.No.	Description of Equipment	Quantity required	Quantity available	Deficiency %
23.	Chips MA – 7840	10		
24.	Chips LM – 380	10		
25.	Chips ICL - 8038	10		
26.	Traffic light control kit	2		
27.	VDU	2		
28.	7 segment Display	5		
29.	Interfacing card such as keyboard etc.	3 each		
30.	Work tables	15		

EI2258 **THERMODYNAMICS LABORATORY** **L T P C**
(Common to EIE & ICE) **0 0 3 2**

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
10. values of specific speed, discharge, output and efficiency.
11. Test on impulse turbine to obtain its characteristics curves and hydraulic
12. design values.

LIST OF EQUIPMENTS

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.

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.

EC2311 MICROPROCESSORS AND MICRO CONTROLLER L T P C
3 0 0 3

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 9

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

UNIT II PROGRAMMING OF 8085 PROCESSOR 9

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 9

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 9

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

UNIT V MICRO CONTROLLER PROGRAMMING & APPLICATIONS 9

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.

TOTAL : 45 PERIODS

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. The 8088 & 8086 Microprocessors , Walter A Tribal & Avtar Singh, Pearson, 2007, Fourth Edition.

CS2311 OBJECT ORIENTED PROGRAMMING L T P C
3 0 0 3

AIM

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

UNIT I 7

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

UNIT II 12

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

UNIT III 8

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

UNIT IV **8**

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

UNIT V **10**

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

TOTAL : 45 PERIODS

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.

EI2302 **ANALYTICAL INSTRUMENTS** **LT P C**
3 0 0 3

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 9

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 9

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

UNIT III INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING INSTRUMENTS 9

Types of gas analyzers – Oxygen, NO_2 and H_2S 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 9

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 9

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.

TOTAL : 45 PERIODS

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

EI2303 INDUSTRIAL INSTRUMENTATION – II LT P C
3 0 0 3

AIM

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

OBJECTIVES

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

UNIT I VARIABLE HEAD TYPE FLOWMETERS 9

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 9

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 9

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 9

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 9

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 .

TOTAL : 45 PERIODS

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.

IC2301 POWER ELECTRONICS L T P C
3 0 0 3

AIM

Learning how to apply the electronic devices for conversion, control and conditioning of electronic 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 operation, switching techniques and basic topologics of DC-DC switching regulators.
- To learn the different modulation techniques of pulse width modulated inverters and to understand the harmonic reduction methods.
- To study the operation of AC voltage controller and Matrix converters.
- To study simple applications

UNIT I POWER SEMI-CONDUCTOR DEVICES 9

Study of switching devices, - Frame, Driver and snubber circuit of SCR, TRIAC, IGBT, MOSFET,- Turn-on and turn-off characteristics, switching losses, Communication circuits for SCR,

UNIT II PHASE-CONTROLLED CONVERTERS 9

2-pulse, 3-pulse and 6-pulse converters – Effect of source inductance – performance parameters – Reactive power control of cnverters – Dual converters - Battery charger.

UNIT III DC TO DC CONVERTER 9

Step-down and step-up chopper - Time ratio control and current limit control – Buck, boost, buck-boost converter, concept of Resonant switching - SMPS.

UNIT IV INVERTERS 9

Single phase and three phase (both 120^0 mode and 180^0 mode) inverters - PWM techniques: Sinusoidal PWM, modified sinusoidal PWM - multiple PWM – Introduction to space vector modulations - Voltage and harmonic control - Series resonant inverter - Current source inverter - Induction Heating.

UNIT V AC TO AC CONVERTERS 9

Single – phase AC voltage controllers – Multistage sequence control - single and three phase cycloconverters – Integral cycle control for Temperature control – Powerfactor control – Matrix converters.

TOTAL : 45 PERIODS

TEXT BOOKS

1. M.H. Rashid, 'Power Electronics: Circuits, Devices and Applications',

Pearson Education, PHI Third edition, New Delhi 2004.
2. Philip T.Krein, "Elements of Power Electronics" Oxford University Press, 2004 Edition.

REFERENCES

1. Ashfaq Ahmed Power Electronics for Technology Pearson Education, Indian reprint, 2003.
2. P.S.Bimbra "Power Electronics" Khanna Publishers, third Edition 2003.
3. Ned Mohan, Tore.M.Undeland, William.P.Robbins, 'Power Electronics: Converte Applications and Design', John Wiley and sons, third edition, 2003.

EI2311 BIOMEDICAL INSTRUMENTATION L T P C
3 0 0 3

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

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

UNIT I PHYSIOLOGY AND TRANSDUCERS 9

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 10

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 8

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 9

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

UNIT V ASSISTING AND THERAPEUTIC EQUIPMENTS 9

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

TOTAL : 45 PERIODS

TEXT BOOKS

1.R.S.Khandpur, 'Hand Book of Bio-Medical instrumentation', 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 .

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.

EC2313 MICROPROCESSOR AND MICROCONTROLLER LABORATORY L T P C 0 0 3 2

List of experiments with objective and exercise:

Objective

To understand programming using instruction sets of processors and microcontroller.

8-bit Microprocessor

1. Simple arithmetic operations:
   - Multi precision 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.

8. Programming Exercise on
   - RAM direct addressing
   - Bit addressing
9. Programming practice using simulation tools and C - compiler
   - Initialize timer
   - Enable interrupts.

10. Study of micro controllers with flash memory.

TOTAL : 45 PERIODS

Detailed Syllabus

8-bit Microprocessor

1. Simple arithmetic operations

a. Multi precision 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

1. Addition of two 8 bit numbers
2. Subtraction of two 8 bit numbers
3. Multiplication of two 8 bit numbers
4. Division of two 8 bit numbers

2. Programming with control instructions

I. Increment / Decrement.
II. Ascending / Descending order.
III. Maximum / Minimum of numbers.
IV. Rotate instructions.
V. 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
   1. Arrange the given array of data in ascending and descending order

2. Find the maximum and minimum number in a group of data given.
3. Conversion of the following
    1. ASCII to HEX code
    2. Conversion of HEX to ASCII code
    3. Conversion of BCD to HEX
    4. Conversion of HEX to BCD

2 **Peripheral Interface Experiments**:

i. 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.
    - Square wave
    - Triangular wave
    - 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

CS2312 OBJECT- ORIENTED PROGRAMMING LABORATORY L T P C
0 0 3 2

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

TOTAL : 45 PERIODS

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.

GE2321 COMMUNICATION SKILLS LABORATORY L T P C
(Fifth / Sixth Semester) 0 0 4 2
(Common to all branches of B.E / B.Tech Programmes)

Globalisation has brought in numerous opportunities for the teeming millions, with more focus on the students' overall capability apart from academic competence. Many students, particularly those from non-English medium schools, find that they are not preferred due to their inadequacy of communication skills and soft skills, despite possessing sound knowledge in their subject area along with technical capability. Keeping in view their pre-employment needs and career requirements, this course on Communication Skills Laboratory will prepare students to adapt themselves with ease to the industry environment, thus rendering them as prospective assets to industries. The course will equip the students with the necessary communication skills that would go a long way in helping them in their profession.

Objectives:

- To equip students of engineering and technology with effective speaking and listening skills in English.
- To help them develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their job.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment exercises.

I. PC based session	**(Weightage 40%)**	**24 periods**

A. English Language Lab (18 Periods)

1. Listening Comprehension: (6)

Listening and typing – Listening and sequencing of sentences – Filling in the blanks - Listening and answering questions.

2. Reading Comprehension: (6)

Filling in the blanks - Close exercises – Vocabulary building - Reading and answering questions.

3. Speaking: (6)

Phonetics: Intonation – Ear training - Correct Pronunciation – Sound recognition exercises – Common Errors in English.

Conversations: Face to Face Conversation – Telephone conversation – Role play activities (Students take on roles and engage in conversation)

B. Viewing and discussing audio-visual materials (6 periods)
(Samples are available to learn and practice)

1. Resume / Report Preparation / Letter Writing (1)
Structuring the resume / report - Letter writing / Email Communication - Samples.

2. Presentation skills: (1)
Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation – Audience analysis - Body language – Video samples

3. Soft Skills: (2)
Time management – Articulateness – Assertiveness – Psychometrics – Innovation and Creativity - Stress Management & Poise - Video Samples

4. Group Discussion: (1)
Why is GD part of selection process ? - Structure of GD – Moderator – led and other GDs - Strategies in GD – Team work - Body Language - Mock GD -Video samples

5. Interview Skills: **(**1)
Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews- Video samples.

II. Practice Session	**(Weightage – 60%)**	**24 periods**

1. **Resume / Report Preparation / Letter writing**: Students prepare their own resume and report. (2)
2. **Presentation Skills:** Students make presentations on given topics. (8)
3. **Group Discussion**: Students participate in group discussions. (6)
4. **Interview Skills**: Students participate in Mock Interviews (8)

References:

1. Anderson, P.V, **Technical Communication**, Thomson Wadsworth , Sixth Edition, New Delhi, 2007.
2. Prakash, P, **Verbal and Non-Verbal Reasoning**, Macmillan India Ltd., Second Edition, New Delhi, 2004.
3. John Seely, **The Oxford Guide to Writing and Speaking**, Oxford University Press, New Delhi, 2004.
4. Evans, D, **Decisionmaker**, Cambridge University Press, 1997.
5. Thorpe, E, and Thorpe, S, **Objective English**, Pearson Education, Second Edition, New Delhi, 2007.
6. Turton, N.D and Heaton, J.B, **Dictionary of Common Errors**, Addision Wesley Longman Ltd., Indian reprint 1998.

Lab Requirements:

1. Teacher console and systems for students.
2. English Language Lab Software

3. Career Lab Software

Requirement for a batch of 60 students

Sl.No.	Description of Equipment	Quantity required
1.	**Server**	1 No.
	o PIV system	
	o 1 GB RAM / 40 GB HDD	
	o OS: Win 2000 server	
	o Audio card with headphones (with mike)	
	o JRE 1.3	
2.	Client Systems	60 No.
	o **PIII or above**	
	o **256 or 512 MB RAM / 40 GB HDD**	
	o **OS: Win 2000**	
	o Audio card with headphones (with mike)	
	o JRE 1.3	
3.	**Handicam Video Camera (with video lights and mic input)**	1 No.
4.	Television - 29”	1 No.
5.	Collar mike	1 No.
6.	Cordless mikes	1 No.
7.	Audio Mixer	1 No.
8.	DVD Recorder / Player	1 No.
9.	LCD Projector with MP3 /CD /DVD provision for audio / video facility - **Desirable**	1 No.

EI2304 INDUSTRIAL INSTRUMENTATION LABORATORY L T P C
0 0 3 2

OBJECTIVE

The training gained by the student in this area will be of immerse 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.

TOTAL : 45 PERIODS

Detailed syllabus:

1.Discharge coefficient of orifice plate

Aim

To find the discharge co-efficient of orifice plate.

Exercise

Find the discharge co-efficient C_d.

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 C_d.

Equipment

1. Orifice meter – 1 No
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/cm^2 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/cm^2 and actual reading shown by the gauge is noted down.
7. Graphs are drawn between
   i. Actual pressure Vs true pressure.
   ii. 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 the tube.
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 cylinder and switch on the vacuum pressure transmitter setup.
ii. Measure the output voltage in Volts for the corresponding vacuum pressure 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

Vacuum pressure setup
Vacuum pressure transmitter
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:
    i. Single wavelength
    ii. Multiple wavelength
    iii. Scanning mode
    iv. 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 30 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 p^H - value of Test Solutions

Aim

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

Exercise

Find the pH values of the test solutions.

Procedure

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

EI2351 MODERN ELECTRONIC INSTRUMENTATION L T P C
3 0 0 3

UNIT I DIGITAL INSTRUMENTS 9

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

UNIT II DISPLAY AND RECORDING DEVICES 9

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 9

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 9

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 DAQ CARDS 9

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.

TOTAL : 45 PERIODS

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.

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.
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.

EI2352 PROCESS CONTROL L T P C
3 1 0 4

AIM

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

OBJECTIVES

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

UNIT I INTRODUCTION 9

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 9

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 9

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 9

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 9

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.

L = 45 T = 15 TOTAL = 60PERIODS

TEXT BOOKS

1. Stephanopoulis, G, Chemical Process Control, Prentice Hall of India, New Delhi, 2006.
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,2003.

EI2404 FIBRE OPTICS AND LASER INSTRUMENTS L T P C
3 0 0 3

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 12

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 6

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 9

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 9

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 9

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.

TOTAL : 45 PERIODS

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

IC2351 ADVANCED CONTROL SYSTEM L T P C
3 0 0 3

AIM

To gain knowledge in state variable analysis, non-linear systems and optimal control.

OBJECTIVES

i To study the state variable analysis
ii To provide adequate knowledge in the phase plane analysis.
iii To give a basic knowledge in describing function analysis.
iv To analyze the stability of the systems using different techniques.
v To study the design of optimal controller.

UNIT I STATE VARIABLE ANALYSIS 9

Concept of state – State Variable and State Model – State models for linear and continuous time systems – Solution of state and output equation – controllability and observability - Pole Placement – State observer Design of Control Systems with observers.

UNIT II PHASE PLANE ANALYSIS 9

Features of linear and non-linear systems - Common physical non-linearities – Methods of linearising non-linear systems - Concept of phase portraits – Singular points – Limit cycles – Construction of phase portraits – Phase plane analysis of linear and non-linear systems – Isocline method.

UNIT III DESCRIBING FUNCTION ANALYSIS 9

Basic concepts, derivation of describing functions for common non-linearities – Describing function analysis of non-linear systems – Conditions for stability – Stability of oscillations.

UNIT IV STABILITY ANALYSIS 9

Introduction – Liapunov's stability concept – Liapunov's direct method – Lure's transformation – Aizerman's and Kalman's conjecture – Popov's criterion – Circle criterion.

UNIT V OPTIMAL CONTROL 9

Introduction -Decoupling - Time varying optimal control – LQR steady state optimal control – Optimal estimation – Multivariable control design.

L = 45 T = 15 TOTAL = 60 PERIODS

TEXT BOOKS

1. I.J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.
2. Ashish Tewari, 'Modern control Design with Matlab and Simulink', John Wiley, New Delhi, 2002.

REFERENCES

1. George J. Thaler, 'Automatic Control Systems', Jaico Publishers, 1993.
2. M.Gopal, Modern control system theory, New Age International Publishers, 2002.
3. Gene F. Franklin, J. David Powell and Abbasemami-Naeini, " Feedback Control of Dynamic Systems", Fourth edition, Pearson Education, Low price edition.2002.

EC2361 DIGITAL SIGNAL PROCESSING L T P C
3 1 0 4

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 9

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 9

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 9

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 9

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 9

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

L = 45 T = 15 TOTAL = 60 PERIODS

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, California. (www.DSPguide.com)
4. B. Venkataramani, M. Bhaskar, 'Digital Signal Processors, Architecture, Programming and Applications', Tata McGraw Hill, New Delhi, 2003.

CS2364 EMBEDDED SYSTEM L T P C
3 0 0 3

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 9

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 9

Structural units in processor , selection of processor & memory devices – DMA – I/O devices : timer & counting devices – Serial communication using I^2C , CAN USB buses – Parallel communication using ISA , PCI ,PCI/X buses – Device drivers

UNIT III PROGRAMMING AND SCHEDULING 9

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 9

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 9

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

TOTAL : 45 PERIODS

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. Wajne Wolf, 'Computer as Components ', Pearson Education

IC2352 CONTROL SYSTEM LABORATORY L T P C
0 0 3 2

1. Determination of transfer function of DC Servomotor
2. Determination of transfer function of AC Servomotor.
3. Analog simulation of Type - 0 and Type – 1 systems
4. Determination of transfer function of DC Generator
5. Determination of transfer function of DC Motor
6. Stability analysis of linear systems

7. DC and AC position control systems

8. Stepper motor control system

9. Digital simulation of first systems

10. Digital simulation of second systems

TOTAL : 45 PERIODS

Detailed Syllabus

1. Determination of Transfer Function Parameters of a DC Servo Motor

Aim

To derive the transfer function of the given D.C Servomotor and experimentally determine the transfer function parameters

Exercise

1. Derive the transfer function from basic principles for a separately excited DC motor.
2. Determine the armature and field parameters by conducting suitable experiments.
3. Determine the mechanical parameter by conducting suitable experiments.
4. Plot the frequency response.

Equipment

1.	DC servo motor field separately excited – loading facility – variable voltage source	: 1 No
2.	Tachometer	: 1 No
3.	Multimeter	: 2 Nos
4.	Stop watch	: 1 No

2. Determination of Transfer Function Parameters of AC Servo Motor

Aim

To derive the transfer function of the given A.C Servo Motor and experimentally determine the transfer function parameters

Exercise

1. Derive the transfer function of the AC Servo Motor from basic Principles.
2. Obtain the D.C gain by operating at rated speed.
3. Determine the time constant (mechanical)
4. Plot the frequency response

Equipment

1.	AC Servo Motor	: Minimum of 100w – necessary

sources for main winding and control winding – 1 No

2. Tachometer : 1 No
3. Stopwatch : 1 No
4. Voltmeter : 1 No

3. Analog Simulation Of Type-0 And Type-1 System

Aim

To simulate the time response characteristics of I order and II order, type 0 and type-1 systems.

Exercise

1. Obtain the time response characteristics of type – 0 and type-1, I order and II order systems mathematically.
2. Simulate practically the time response characteristics using analog rigged up modules.
3. Identify the real time system with similar characteristics.

Equipment

1. Rigged up models of type-0 and type-1 system using analog components.
2. Variable frequency square wave generator and a normal CRO - 1 No

(or)

DC source and storage Oscilloscope - 1 No

4. Determination of Transfer function of DC Generator

Aim

To determine the transfer function of DC generator

Exercise

1. Obtain the transfer function of DC generator by calculating τ and gain

Equipment

1. DC Generator
2. Tachometer
3. Various meters
4. Stop watch

5. Determination of Transfer function of DC Motor

Aim

To determine the transfer function of DC motor

Exercise

1. Obtain the transfer function of DC motor by calculating τ and gain

Equipment

1. DC Motor
2. Tachometer
3. Various meters
4. Stop watch

6. Stability Analysis of Linear Systems

Aim

To analyse the stability of linear systems using Bode / Root locus / Nyquist plot

Exercise

1. Write a program to obtain the Bode plot / Root locus / Nyquist plot for the given system
2. Access the stability of the given system using the plots obtained
3. Compare the usage of various plots in assessing stability

Equipment

1. System with MATLAB / MATHCAD / equivalent software - 3 user license

7. DC and AC position Control system

Aim

To study the AC and DC position control system and draw the error characteristics between setpoint and error.

Exercise

1. To study various positions and calculate the error between setpoint and output. position
2. To measure outputs at various points (between stages)

Equipment

1. AC and DC position control kit with DC servo motor.
2. Power transistor
3. Adder

8. Stepper Motor Control System

Aim

To study the working of stepper motor

Exercise

1. To verify the working of the stepper motor rotation using microprocessor.

Equipment

1. Stepping motor
2. Microprocessor kit
3. Interfacing card
4. Power supply

9. Digital Simulation of First order System

Aim

To digitally simulate the time response characteristics of first -order system

Exercise

1. Write a program or build the block diagram model using the given software.

2. Obtain the impulse, step and sinusoidal response characteristics.
3. Identify real time systems with similar characteristics.

Equipment

1. System with MATLAB / MATHCAD (or) equivalent software - minimum 3 user license.

10. Digital Simulation of Second order Systems

Aim

To digitally simulate the time response characteristics of second -order system

Exercise

1. Write a program or build the block diagram model using the given software.
2. Obtain the impulse, step and sinusoidal response characteristics.
3. Identify real time systems with similar characteristics.

Equipment

System with MATLAB / MATHCAD (or) equivalent software - minimum 3 user license.

EI2356 PROCESS CONTROL SYSTEM LABORATORY L T P C
0 0 3 2

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)

TOTAL : 45 PERIODS

Detailed Syllabus

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 non-interfacing. – 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 - 1 No

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 K_c, Ti, T_d 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 (K_u) and ultimate period (P_u), calculate the controller parameters (K_c, T_i, T_d) 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

EI2357 VIRTUAL INSTRUMENTATION LAB L T P C
0 0 3 2

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.

4. 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.

TOTAL : 45 PERIODS

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS

Sl.No.	Specifications	Qty
1.	Laboratory Virtual Instrumentaion Engineering Software Package	30 users License
2.	PCI /USB DAQ Boards	2 Nos.
3.	Temperature Control Test Rig using Laboratory Virtual Instrumentation Enginering Software Package and Hardware Models	1 No.
4.	Sequential Control using Laboratory Virtual Instrumentation Engineering Software Package and Hardware Models.	1 No.

IC2401 DIGITAL CONTROL SYSTEM L T P C
3 0 0 3

AIM

To provide sound knowledge on the principles of discrete data control system

OBJECTIVES

i. To study the importance of sample data control system.
ii. To give adequate knowledge about signal processing in digital control.
iii. To study the importance of modeling of discrete systems and stability analysis of discrete data system.
iv. To study the importance of state space representation for discrete data system.
v. To introduce the design concept for digital controllers.

UNIT I COMPUTER CONTROLLED SYSTEM 6

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 9

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 9

Determination of the $\mathcal{Z}$ transform – mapping between s and $\mathcal{Z}$ domains - $\mathcal{Z}$ 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 $\mathcal{Z}$ transform method – response between sampling instants – stability on the $\mathcal{Z}$ - plane and jury's stability test – steady state error analysis for stable systems.

UNIT IV STATE VARIABLE ANALYSIS OF DIGITAL CONTROL SYSTEMS 9

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: 12

Digital PI, PD and PID Controller – Position and velocity forms – state regulator design – design of state observers – dead beat control by state feed back and dead beat observers.

TOTAL : 45 PERIODS

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.

EI2402 LOGIC AND DISTRIBUTED CONTROL SYSTEM L T P C
3 0 0 3

AIM

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

OBJECTIVES

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

UNIT I PROGRAMMABLE LOGIC CONTROLLER 9

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 9

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 9

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

UNIT IV DISTRIBUTED CONTROL SYSTEM 9

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

UNIT V INTERFACES IN DCS 9

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.

TOTAL : 45 PERIODS

TEXT BOOKS

.1. Petruzella, 'Industrial Electronics', McGraw Hill,

2..Michael P. Lukas, 'Distributed Control System', Van Nostrand Reinhold Co., Canada, 1986.

REFERENCES

1. T. Hughes, 'Programmable Logic Controllers', ISA press

EI2401 INDUSTRIAL DATA NETWORKS L T P C
3 0 0 3

UNIT I DATA NETWORK FUNDAMENTALS 9

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 9

Bridges – Routers – Gateways –Standard ETHERNET and ARCNET configuration-special requirement for networks used for control.

UNIT III HART AND FIELDBUS 9

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 9

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 9

Industrial Ethernet : Introduction – 10Mbps Ethernet, 100Mbps Ethernet.Radio and wireless communication : Introduction – components of radio link – the radio spectrum and frequency allocation – radio modems.

TOTAL : 45 PERIODS

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

CS2461 APPLIED SOFT COMPUTING L T P C
3 0 0 3

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 feed back 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 9

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 9

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 9

Classical sets – Fuzzy sets – Fuzzy relations **–** Fuzzification - Membership functions – Defuzzification – Methods of defuzzification – Fuzzy rules.

UNIT IV FUZZY LOGIC CONTROL 9

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 9

Gradient Search – Non-gradient search – Genetic Algorithms: Operators, search algorithm, penalty – Evolutionary Programming: Operators, Search Algorithms

TOTAL : 45 PERIODS

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

IC2403 ADVANCED CONTROL SYSTEMS LABORATORY L T P C
0 0 3 2

1. Simulation of first order and second order system with and without dead time using discretization method and Runge – Kutta method
2. Design of Discrete P+I+D controller and Deadbeat controller for a first order system
3. State feedback control of a process by pole placement.
4. State estimation of a process using full order and reduced order observers.
5. Logic gates operations, Timing Operations, counter operations and math operations using PLC.
6. Control of Bottle filling system and sequential operation of motors using PLC.
7. PC based data acquisition report generation.
8. Simulation of complex control systems using matlab package.
9. Study of distributed control system.
10. Control of a given process using Real Time Embedded controller

TOTAL : 45 PERIODS

Detailed Syllabus

1. Simulation of first order and second order system with and without dead time using discretization method and Runge – Kutta method

Aim

To simulate a first order system and second order system with and without dead time using discretization method and Runge-Kutta method.

Exercises

1. Write a program in C language for a first order system and second order system with and without dead time using discretization method.
2. Write a program in C language for a first order system and second order system with and without dead time using Runge – Kutta method.
3. To analyse the responses for various standard forcing functions.

Equipment

Computer Pentium (3 or 4) - 1 No

2. Design of Discrete P+I+D controller and Deadbeat controller for a first order system

Design of Discrete P+I+D controller

Aim

To design a discrete P+I+D controller for a first order system

Exercise

1. Write a program in C for position form of control algorithm.
2. Write a program in C for velocity form of control algorithm.
3. Analysis of the responses by implementing the position and velocity form of control algorithms for the first order system.
4. How to select the sampling rate in a digital control loop.

Equipment

Pentium Computer (3 or 4) - 1 No

Deadbeat controller for a first order system

Aim

To design a deadbeat for a first order process.

Objective

To examine a different methodology for designing digital feedback controllers, which makes use of the computational flexibility, offered by a digital computer.

Exercise

1. Design of Deadbeat controller for a first order process and analyse the closed loop response using C language.
2. Analysis of closed loop responses to step changes in set point using deadbeat.

Equipment

Computer Pentium (3 or 4) - 1 No

3. State feedback control of a process by pole placement.

Aim

To design state feedback gain matrix by pole placement technique for a multivariable process .

Exercise

1. Write a program using any software package to find state feed back gain matrix.
2. Analysis of the responses by implementing the state feedback technique by pole placement for a multivariable process.

Equipment

Computer Pentium (3 or 4) - 1 No

4. State estimation of a process using full order and reduced order observers

Aim

To estimate the states of a multivariable process using full order and reduced order observers

Exercise

1. Write a program using any simulation software package to estimate the states using full order and reduced order observers.
2. Analysis of responses by implementing the designed observers for a multivariable process.

Equipment

Computer Pentium (3 or 4) - 1 No

5. Logic gates operations, Timing Operations, counter operations and math operations using PLC

Aim

To study the operation of Programmable logic controller.

Exercise

1..Implementation of the AND / OR gate using PLC.
2. Implementation of proportional (P) control system.
3. A program which sounds an alarm when a preset count value is reached.
4. A program sounds an alarm after a time delay.
5.A program which illustrates the use of flags and the flag instructions.

Equipment

1. PLC Unit - 1 No
2. Computer Pentium (3 or 4) - 1 No

6. Control of Bottle filling system and sequential operation of motors using PLC.

Aim

To study the control of bottle filling system using PLC and sequential operation of motors using PLC.

Objectives

1. Instead of achieving the desired control or automation through physical wiring of control devices, in PLC how it is achieved through a program of software.
2. To develop the programming skills for the industrial needs.
3. How to develop an interface between PLC and the bottle filling system.
4. How to develop an interface between PLC and sequential motors using PLC.

Exercise

1. To develop the ladder diagram for the bottle filling system.
2. To develop the ladder diagram for the sequential operation of motors using PLC.

Equipment

1. Computer Pentium (3 or 4) - 1 No
2. PLC - 1 No
3. Bottle filling system - 1 No

7. PC based data acquisition report generation.

Aim

To acquire real world signals using Data Acquisition card.

Exercise

Develop a program in C – language to acquire the data and display

Equipment

1. Data Acquisition card - 1 No
2. Computer Pentium (3 or 4) - 1 No

8. Simulation of complex control systems using matlab package.

Aim

To study the simulation of complex control systems using MATLAB package.

Objective

To examine the advanced control strategies like cascade control, feed forward plus feedback control, ratio control.

Exercise

1. To simulate cascade control, feed forward – feedback control using MAT LAB.
2. Compare the results of cascade control with conventional control.
3. To simulate a ratio control for a process to maintain a desired ratio.
4. Compare the results of feed forward – feedback with feedback control.

Equipment

1. Computer Pentium (3 or 4) - 1 No
2. MATLAB original licensed version 6.0.

9. Study of distributed control system.

Aim

To study the distributed control system

Objectives

1. To get the knowledge of communication interface between the controller and the server, server and the clients and the controller to the I/O units.
2. To know how the I/O connection with the process control station to the DCS I/O units.
3. To know how several LCU's is used to implement control strategies.
4. To know how the transmission of process data is connected to the high-level system elements (i.e. human interface and computing devices).
5. To know how the high – level element transmits information requests and control commands to the LCU's.
6. To know how the cost of plant wiring is reduced significantly by the few cables or buses used to implement the shared communication system.
7. To know how the transmission of process variables, controlled variables, alarm status information from the LCU's to the high – level interfaces and to low-level human interfaces in the system.`

Exercise

1. Using graphic and text features design different types of operator interaction pages, to suit different process stations available in process control lab.
2. Implement the various control actions like ON-OFF, Proportional, Proportional + Integral, Proportional +Derivative, Proportional + Derivative+Integral on different process stations available in process control lab.
3. Analyse the responses for set point and disturbance changes.

Equipment

1. Computer Pentium (3 or 4) - 1 No
2. DCS - 1 No

EI2406 INSTRUMENTATION SYSTEM DESIGN LABORATORY L T P C

(Any TEN experiments) **0 0 3 2**

Design of instrumentation amplifiers
Design of active filters
Design of regulated power supply
Design of V/I and I/V converters
Design of linearising circuit and cold – junction compensation circuit for thermocouples
Design of signal conditioning circuits for strain gauge and RTD
Design of orifice plate and rotameter
Design of control valve (sizing and flow – lift characteristic)
Design of PID controllers (using operational amplifier and microprocessor)
Piping and Instrumentation Diagram – case study
Preparation of documentation of instrumentation project (process flow sheet, instrument index sheet and instrument specifications sheet
Preparation of project scheduling (Job scheduling, installation procedure and safety regulations).

TOTAL : 45 PERIODS

Detailed Syllabus

1. Design and implementation of instrumentation amplifiers

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 and Implementation 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 < f_c < 5 KHz

Exercise

1. 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 - 1 No

3. Design of Regulated Power Supply

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.

4. Design and Implementation of V/I and I/V converters

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

5. Design of linearising circuit and cold – junction compensation circuit for thermocouples

Aim

To design a cold – junction compensation circuit for thermocouple.

Objectives

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 400^0C.
3. Vary the cold – junction temperature from 30 – 90^0C 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

6. Design of Signal Conditioning Circuits for Strain Gauge

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

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

IC 2404 COMPREHENSION L T P C
0 0 2 1

AIM:

To encourage the students to comprehend the knowledge acquired from the first Semester to Sixth Semester of B.E Degree Course through periodic exercise.

MG2351 PRINCIPLES OF MANAGEMENT L T P C
3 0 0 3

UNIT I OVERVIEW OF MANAGEMENT 9

Organization - Management - Role of managers - Evolution of Management thought - Organization and the environmental factors - Managing globally - Strategies for International Business.

UNIT II PLANNING 9

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 9

Nature and purpose of organizing - Organization structure - Formal and informal groups / 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 9

Creativity and Innovation - Motivation and Satisfaction - Motivation Theories Leadership - Leadership theories - Communication - Hurdles to effective communication - Organization Culture - Elements and types of culture - Managing cultural diversity.

UNIT V CONTROLLING 9

Process of controlling - Types of control - Budgetary and non-budgetary control techniques - Managing Productivity - Cost Control - Purchase Control - Maintenance Control - Quality Control - Planning operations.

TOTAL = 45 PERIODS

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.

CS2351 ARTIFICIAL INTELLIGENCE L T P C
3 0 0 3

UNIT-I PROBLEM SOLVING 9

Introduction – Agents – Problem formulation – uninformed search strategies – heuristics – informed search strategies – constraint satisfaction

UNIT-II KNOWLEDGE AND REASONING 9

Logical agents – propositional logic – inferences – first-order logic – inference in first-order logic – forward chaining – backward chaining – resolution

UNIT-III PLANNING 9

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

UNIT-IV UNCERTAIN KNOWLEDGE AND REASONING 9

Uncertainty – review of probability - probabilistic Reasoning – Bayesian networks – inferences in Bayesian networks – Temporal models – Hidden Markov models

UNIT-V LEARNING 9

Learning from observation - Inductive learning – Decision trees – Explanation based learning – Statistical Learning methods - Reinforcement Learning

TOTAL : 45 PERIODS

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, 199

CS2071 COMPUTER ARCHITECTURE L T P C
3 0 0 3

UNIT- I INSTRUCTION SET ARCHITECTURE 9

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 9

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 9

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

UNIT-IV MEMORY SYSTEM 9

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

UNIT–V I/O AND INTERFACES 9

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

TOTAL : 45 PERIODS

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.

CS2411 OPERATING SYSTEM L T P C
3 0 0 3

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 9

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 9

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 9

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 9

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 9

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

TOTAL : 45 PERIODS

TEXT BOOKS

1. Silberschatz, Galvin, and Gagne, “Operating System Concepts”, Sixth Edition, Wiley India vt 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.

CS2070 VISUAL LANGUAGES AND APPLICATION LT P C
3 0 0 3

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

i. To study about the concepts of windows programming models, MFC applications, drawing with the GDI, getting inputs from Mouse and the Keyboard.
ii. To study the concepts of Menu basics, menu magic and classic controls of the windows programming using VC++.
iii. To study the concept of Document/View Architecture with single & multiple document interface, toolbars, status bars and File I/O Serialization.
iv. To study about the integrated development programming event driven programming, variables, constants, procedures and basic ActiveX controls in visual basic.
v. 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 9

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 9

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 9

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. ening, closing and creating the files - Reading & Writing – C file derivatives – Serialization asics - Writing serializable classes.

UNIT IV FUNDAMENTALS OF VISUAL BASIC 10

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 8

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.

L = 45 T = 15 TOTAL = 60 PERIODS

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.

REFERENCES

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.

EI2021 POWER PLANT INSTRUMENTATION L T P C
3 0 0 3

UNIT I OVERVIEW OF POWER GENERATION 9

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 9

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 9

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 9

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 9

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

TOTAL: 45 PERIODS

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.

EI2022 INSTRUMENTATION IN PETROCHEMICAL INDUSTRIES L T P C
3 0 0 3

AIM

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

OBJECTIVES

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

UNIT I PETROLEUM PROCESSING 9

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

UNIT II OPERATIONS IN PETROLEUM INDUSTRY 9

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

UNIT III CHEMICALS FROM PETROLEUM PRODUCTS 9

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

UNIT IV MEASUREMENTS IN PETROCHEMICAL INDUSTRY 9

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 9

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.

TOTAL : 45 PERIODS

TEXT BOOKS

1. 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.

EI2023 MICRO ELECTRO MECHANICAL SYSTEMS L T P C
3 0 0 3

UNIT I INTRODUCTION TO MEMS 9

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 9

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 9

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 9

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 9

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.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Stephen Santeria, "Microsystems Design ", Kluwer publishers, 2000.

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
5. James J.Allen, micro electro mechanical system design, CRC Press published in 2005

GE2023 FUNDAMENTAL IN NANOSCIENCE L T P C
3 0 0 3

UNIT I INTRODUCTION 10

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 10

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 5

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 10

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 10

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

TOTAL : 45 PERIODS

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.

IC2021 OPTIMAL CONTROL L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Statement of optimal control problem – Problem formulation and forms of optimal control – Selection of performance measures- Necessary conditions for optimal control – ontryagin's minimum principle – State inequality constraints – Minimum time problem.

UNIT II NUMERICAL TECHNIQUES FOR OPTIMAL CONTROL 9

Numerical solution of 2-point boundary value problem by steepest descent and Fletcher Powell method solution of Ricatti equation by negative exponential and interactive methods

UNIT III LQ CONTROL PROBLEMS AND DYNAMIC PROGRAMMING 9

Linear optimal regulator problem – Matrix Riccatti equation and solution method – Choice of weighting matrices – Steady state properties of optimal regulator – Linear tracking problem – LQG problem – Computational procedure for solving optimal control problems – Characteristics of dynamic programming solution – Dynamic programming application to discrete and continuous systems – Hamilton Jacobi Bellman equation.

UNIT IV FILTERING AND ESTIMATION 9

Filtering – Linear system and estimation – System noise smoothing and prediction – Gauss Markov discrete time model – Estimation criteria – Minimum variance estimation – Least square estimation – Recursive estimation.

UNIT V KALMAN FILTER AND PROPERTIES 9

Filter problem and properties – Linear estimator property of Kalman Filter – Time invariance and asymptotic stability of filters – Time filtered estimates and signal to noise ratio improvement – Extended Kalman filter – Case study: Boiler optimization and control.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Kirk D.E., 'Optimal Control Theory – An introduction', Prentice hall, N.J., 1970
2. Sage, A.P., 'Optimum System Control', Prentice Hall N.H., 1968.

REFERENCES

1. Anderson, BD.O. and Moore J.B., 'Optimal Filtering', Prentice hall Inc., N.J., 1979.
2. S.M. Bozic, "Digital and Kalman Filtering", Edward Arnould, London, 1979.
3. Astrom, K.J., "Introduction to Stochastic Control Theory", Academic Press, Inc, N.Y., 1970.

EE2029 SYSTEM IDENTIFICATION AND ADAPTIVE CONTROL L T P C
3 0 0 3

UNIT I NON PARAMETRIC METHODS 5

Nonparametric methods: Transient analysis-frequency analysis-Correlation analysis-Spectral analysis.

UNIT II PARAMETRIC METHODS 10

Linar Regression: The Lease square esimate-best liner unbiased etimation under linear constraints- updating the Parameter estimates for linear regression models-Predcion error methods: Description of Prediction error methods-Optimal Predictio – relationships between Prediction error methods and other identification methods-theoretical analysis.
Instrumental variable methods: description of nstrumental variable methods-theoretical analysis-covariance matrix of IV estimates- Comparison of optimal IV predicion error methods.

UNIT III RECURSIVE IDENTIFICATION METHODS 10

The recursive lest squares method-the recursive Instrumentl varible method-the recursive prediction error method-model validatio and model structure etermination.

Indenification of systems operating in closed loop: Identifiability considerations-direct indentification-Indirect indentification-joint input – output identification.

UNIT IV ADAPTIVE CONTROL SCHEMES 10

Introduction – users- Definitions-auto tuning-types of adaptive control-gain scheduling controller-model reference adaptive control schemes – self tunning controller. MRAC and STC : Approaches – The Gradient approach – Lyapunov functions – Passivity theory – pole placement method Minimum variance control – Predictive control.

UNIT V ISSUES IN ADAPIVE CONTROL AND APPLICATION 10

Stability – Convergence – Robustness – Application of adaptive conrol.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Soderstorm.T and Petre stioca, System Identification, Prentice Hall International (UK) Ltd. 1989.
2. Karl J.Astrom and Bjorn Wittenmark, Adaptive Conrol, Pearson Education, 2nd Editon, 2001.

REFERENCES

1. Ljung,L.System Identification:Theory for the user, Pretice Hall, Englewood cliffs, 1987.
2. Sastry S. and Bodson M., daptive control – stability, Convergence ad Robustness, Prentice Hall inc., New Jersey, 1989.

EE2023 ROBOTICS AND AUTOMATION L T P C
3 0 0 3

UNIT I BASIC CONCEPTS 9

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 9

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 9

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 9

Solution of inverse kinematics problem – multiple solution jacobian work envelop – hill climbing techniques – robot programming languages

UNIT V CASE STUDIES 9

Multiple robots – machine interface – robots in manufacturing and non- manufacturing applications – robot cell design – selection of robot.

TOTAL : 45 PERIODS

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.
5. Issac Asimov I Robot, Ballantine Books, New York, 1986.

GE2022 TOTAL QUALITY MANAGEMENT L T P C
3 0 0 3

UNIT I INTRODUCTION 9

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 9

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 9

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 9

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.

UNIT V QUALITY SYSTEMS 9

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.

TOTAL : 45 PERIODS

TEXT BOOK

1. Dale H.Besterfiled, et at., “Total Quality Management”, Pearson Education Asia, Third Edition, Indian Reprint (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. Suganthi,L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd. (2006)
4. Janakiraman,B and Gopal, R.K, “Total Quality Management – Text and Cases”, Prentice Hall (India) Pvt. Ltd. (2006)

GE2025 PROFESSIONAL ETHICS IN ENGINEERING LT P C
(For Affiliated Colleges under R-2008) 3 0 0 3

UNIT I Engineering Ethics 9

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 9

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 9

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 9

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 9

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

TOTAL : 45 PERIODS

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)

EI2403 VLSI DESIGN L T P C
3 0 0 3

AIM

To introduce the technology and concepts of VLSI.

OBJECTIVES

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

UNIT I BASIC MOS TRANSISTOR 9

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 9

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 9

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 9

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

UNIT V VHDL PROGRAMMING 9

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

TOTAL : 45 PERIODS

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.

EC2057 ADVANCED DIGITAL SIGNAL PROCESSING L T P C
3 0 0 3

[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

i. Detail study of time averaging , ensamble averaging & study of power spectral density.
ii. Detail study of parametric & non – parametric estimation
iii. Detail study of adaptive filters & its applications
iv. Introduction study of multivariable digital signal processing

UNIT I DISCRETE RANDOM SIGNAL PROCESSING 9

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 III SPECTRUM ESTIMATION 9

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 IV LINEAR ESTIMATION AND PREDICTION 9

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 ,Discrete Kalman filter

UNIT V ADAPTIVE FILTERS 9

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). RLS adaptive filters-Exponentially weighted RLS-sliding window RLS.

UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING 9

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. Application to sub band coding - Wavelet transform and filter bank implementation of wavelet expansion of signals.

L = 45 T = 15 TOTAL = 60 PERIODS

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. Dimitri s 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)