NATIONAL ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)

K.R.NAGAR, KOVILPATTI – 628 503

www.nec.edu.in

REGULATIONS – 2013

DEPARTMENT OF

ELECTRONICS AND INSTRUMENTATION ENGINEERING

CURRICULUM AND SYLLABUS OF

B.E. – ELECTRONICS AND INSTRUMENTATION ENGINEERING

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

VISION

- Achieving excellence in Teaching–Learning, Research and Consultancy among nationwide peer groups.

MISSION

The EIE department will achieve its vision by:

- Offering well–balanced curriculum to acquire professional competencies and transferable skills.
- Bringing innovations in Teaching-Learning process through effective content delivery and appropriate assessment methods.
- Catalyzing the research activities of both faculty members and students through more and more sponsored research projects.
- Rendering its consultancy services by providing instrumentation solutions to the nearby Industries.

Program Educational Objectives (PEO)

Within a few years (3 to 5 years) of graduation, our graduates are expected to

1. be an engineer in Design, Manufacturing, Marketing, Operation and Maintenance with the technical and managerial skills in the fields of Measurement, Control, Robotics, and Automation Engineering Technology.
2. utilize modern and effective management skills for Performing Investigation, Analysis and Synthesis in the implementation of instrumentation and automatic control systems.
3. pursue higher studies at the institutes of repute in India and abroad and work in Educational Institutions, Research Organizations and Engineering Consultancy Companies and be successful entrepreneurs.
4. collaborate in multi disciplinary teams and be the leaders in their organization, their profession and in society.

Program Outcomes (PO)

1. Apply knowledge of Mathematics, Physics, Mechanics, Chemistry, Thermal Sciences, Earth Sciences, Biological Sciences, Engineering Fundamentals, Analog & Digital Electronics, Measurement & Instrumentation Principles and Control & Automation to the solution of complex engineering problems in Electronics and Instrumentation Engineering.
2. Identify, formulate, research literature and analyse complex Engineering problems in, Measurement & Instrumentation Systems, Control & Automation Systems and Computer Systems reaching substantiated conclusions using first principles of mathematics, Physics, Mechanics, Chemistry, Thermal Sciences, Earth Sciences, Biological Sciences and Engineering Sciences.
3. Design solutions for complex Electronics and Instrumentation Engineering problems, Design and Implement Control Systems, Instrumentation Systems, Modern Electronic Systems, Computer Systems, Design Instrumentation & Process Control Components and Design Processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations**.**
4. Conduct investigations of complex Electronics and Instrumentation Engineering problems in the areas of Instrumentation Devices and automatic control systems using research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
5. Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex Electronics and Instrumentation engineering problems pertaining to Electronics systems, Measurements, Control, Robotics and Automation with an understanding of the limitations.
6. Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice in the fields of Electronics system, Measurements, Control, Robotics and Automation and solutions to complex Electronics and Instrumentation Engineering problems.
7. Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex Electronics and Instrumentation Engineering Problems engineering problems in societal and environmental contexts.
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
9. Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
10. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
11. Demonstrate knowledge and understanding of engineering management principles and economic decision making and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

REGULATIONS 2013 – CURRICULUM AND SYLLABI

B.E. – ELECTRONICS AND INSTRUMENTATION ENGINEERING

SEMESTER I (Common to all B.E. / B.Tech., Degree Programmes)

S. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	SH100	Technical English – I	3	1	0	4
2.	SH101	Matrices and Differential Calculus	3	1	0	4
3.	SH102	Applied Physics	3	0	0	3
4.	SH103	Engineering Chemistry	3	0	0	3
5.	SH104	Fundamentals of Computing and Programming in C	3	0	0	3
6.	SH105	Engineering Graphics	2	3	0	4
PRACTICAL						
7.	SH106	C Programming Laboratory	0	0	3	2
8.	SH107	Physics and Chemistry Laboratory – I Part A – Physics Laboratory – I Part B – Chemistry Laboratory – I	0	0	3	2
9.	SH108	Engineering Practices Laboratory Part A – Mechanical and Civil Engineering Practices Part B – Electrical and Electronics Engineering Practices	0	0	3	2
		Total Number of Credits :				**27**

SEMESTER II

S. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	13E20	Technical English – II (***Common to all***)	3	0	0	3
2.	13E21	Integral Calculus and Transforms (***Common to all***)	3	1	0	4
3.	13E22	Solid State Physics (***Common to ECE, CSE, EEE, EIE, and IT***)	3	0	0	3
4.	13E23	Chemistry of Electrical and Electronic Materials (***Common to ECE, CSE, EEE, EIE and IT***)	3	0	0	3
5.	13E24	Electric Circuits (***EIE***)	3	1	0	4
6.	13E25	Basic Civil and Mechanical Engineering (***Common to ECE, CSE, EEE, EIE and IT***)	4	0	0	4
PRACTICAL						
7.	13E26	Computer Programming Laboratory (***Common to all***)	0	1	2	2
8.	13E27	Physics and Chemistry Laboratory – II (***Common to all***) Part A – Physics Laboratory – II Part B – Chemistry Laboratory – II	0	0	3	2
9.	13E28	Electric Circuits Laboratory (***Common to EEE and EIE***)	0	0	3	2
10.	13E29	English Language Skill Laboratory (***Common to all***)	0	0	3	2
		Total Number of Credits :				**29**

SEMESTER III

SL. No.	Course Code	Course Title	L	T	P	C
THEORY						
1	13EI31	Transforms and Complex Analysis	3	1	0	4
2	13EI32	Environmental Science and Engineering	3	0	0	3
3	13EI33	Digital Circuits	3	1	0	4
4	13EI34	Sensors and Transducers	3	1	0	4
5	13EI35	Electronic Devices and Circuits	3	1	0	4
6	13EI36	C++ and Data Structures	3	0	0	3
PRACTICAL						
7	13EI37	Electronic Devices and Circuits Laboratory	0	0	3	2
8	13EI38	C++ and Data Structures Laboratory	0	0	3	2
		TOTAL	**18**	**4**	**6**	**26**

SEMESTER IV

SL. No.	Course Code	Course Title	L	T	P	C
THEORY						
1	13EI41	Numerical Methods and Probability	3	1	0	4
2	13EI42	Industrial Instrumentation-I	3	0	0	3
3	13EI43	Electrical and Electronic Measurements	3	1	0	4
4	13EI44	Control Systems	3	1	0	4
5	13EI45	Electrical Machines	3	0	0	3
6	13EI46	Digital System Design and Applications	3	1	0	4
PRACTICAL						
7	13EI47	Transducers and Measurements Laboratory	0	0	3	2
8	13EI48	Electrical Machines and Control Systems Laboratory	0	0	3	2
9	13EI49	Communication Skills and Technical Seminar	0	0	3	2
		TOTAL	**18**	**4**	**9**	**28**

SEMESTER V

S. No.	Course Code	Course Title	L	T	P	C
THEORY						
1	13EI51	Industrial Instrumentation – II*	3	1	0	4
2	13EI52	Integrated Circuits and Applications	3	1	0	4
3	13EI53	Industrial Microcontrollers and Applications *	3	0	0	3
4	13EI54	Modern Control Systems	3	1	0	4
5	13EI55	Professional Ethics and Human Values (Common to all branches)	3	0	0	3
6	13EI56	Communication Systems	3	0	0	3
PRACTICAL						
7	13EI57	Industrial Microcontrollers Laboratory*	0	0	3	2
8	13EI58	Linear and Digital Integrated Circuits Laboratory	0	0	3	2
		TOTAL	**18**	**03**	**06**	**25**

SEMESTER VI

S. No.	Course Code	Course Title	L	T	P	C
THEORY						
1	13EI61	Industrial Process Control*	3	1	0	4
2	13EI62	Analytical Instrumentation*	3	0	0	3
3	13EI63	Digital Signal Processing Techniques	3	1	0	4
4	13EI64	Biomedical Instrumentation*	3	1	0	4
5	13EI65	Product Design and Development	3	0	0	3
6		Elective – I *(Electronics and Instrumentation Stream)*	3	0	0	3
PRACTICAL						
7	13EI67	Computer Control of Process Laboratory	0	0	3	2
8	13EI68	Industrial Instrumentation and Telemetry Laboratory	0	0	3	2
		TOTAL	**18**	**3**	**6**	**25**

SEMESTER VII

SL. No.	Course Code	Course Title	L	T	P	C
THEORY						
1	13EI71	Principles of Management (Common to all branches)	3	0	0	3
2	13EI72	Data Acquisition and Virtual Instrumentation *	3	0	2	4
3	13EI73	Logic and Distributed Control System	3	1	0	4
4	13EI74	Industrial Data Networks	3	0	0	3
5		Elective – II *(Electronics and Instrumentation Stream)*	3	0	0	3
6		Elective – III *(any stream)*	3	0	0	3
PRACTICAL						
7	13EI77	Product Design and Development Laboratory*	0	0	3	2
8	13EI78	Industrial Automation Laboratory*	0	0	3	2
9	13EI79	Comprehension	0	0	3	1
		TOTAL	**18**	**1**	**11**	**25**

SEMESTER VIII

SL. No.	Course Code	Course Title	L	T	P	C
THEORY						
1	13EI81	Power Plant Instrumentation*	3	1	0	4
2		Elective - IV *(Control & Automation Stream)*	3	0	0	3
3		Elective - V *(any stream)*	3	0	0	3
4		Elective - VI *(any stream)*	3	0	0	3
PRACTICAL						
5	13EI87	Project Work	0	0	12	6
		TOTAL	**12**	**1**	**12**	**19**

** Industry oriented courses (Invited lectures by Industrial Persons / Alumni, Field Visit)*

LIST OF ELECTIVES FOR ELECTRONICS AND INSTRUMENTATION ENGINEERING

Electronics and Instrumentation Stream (Minimum 2 Course Maximum of 5 Course)

S. No.	Course Code	Course Title	L	T	P	C
THEORY						
1	13EIAA	Fiber Optics and Laser Instruments (Common to EIE and EEE)	3	0	0	3
2	13EIAB	Embedded Systems	3	0	0	3
3	13EIAC	VLSI Design * (Common to EIE and EEE)	3	0	0	3
4	13EIAD	Instrumentation in Petrochemical Industries*	3	0	0	3
5	13EIAE	Testing and Calibration of Instruments*	3	0	0	3
6	13EIAF	Aeronautical Instrumentation *	3	0	0	3
7	13EIAG	Medical Informatics	3	0	0	3
8	13EIAH	Industrial Drives and Control*	3	0	0	3

Control and Automation Stream (Minimum 1 Course Maximum of 5 course)

SL. No.	Course Code	Course Title	L	T	P	C
THEORY						
1	13EIBA	Robotics and Automation* *(Common to EEE and EIE)*	3	0	0	3
2	13EIBB	System Identification and Adaptive Control	3	0	0	3
3	13EIBC	Intelligent Controllers	3	0	0	3
4	13EIBD	Process Control Components*	3	0	0	3
5	13EIBE	Building Automation*	3	0	0	3
6	13EIBF	Advanced Process Control	3	0	0	3
7	13EIBG	Nonlinear Control	3	0	0	3

Inter - disciplinary Stream (Maximum 2 Courses)

SL. No.	Course Code	Course Title	L	T	P	C
THEORY						
1	13EICA	Mechatronics	3	0	0	3
2	13EICB	Introduction to Soft Computing	3	0	0	3

3	13EICC	Industrial Safety Engineering*	3	0	0	3
4	13EICD	MEMS and Nano Technology	3	0	0	3
5	13EICE	Applied Thermodynamics	3	0	0	3
6	13EICF	Non Destructive Testing Techniques and Applications* *(Common to EIE and Civil)*	3	0	0	3
7	13EICG	Sensor Networks	3	0	0	3
8	13EICH	Industrial Chemical Process*	3	0	0	3
9	13EICJ	Digital Image Processing	3	0	0	3
10	13EICK	Solar Photovoltaic Fundamentals and Applications* *(Common to Mechanical, EEE and EIE)*	3	0	0	3
11	13EICL	Renewable Energy Systems *(Common to EEE and EIE)*	3	0	0	3
12	13EICM	Environmental Instrumentation *(Common to EIE and Civil)*	3	0	0	3
13	13EICN	Experimental Stress Analysis *(Common to Civil and EIE)*	3	0	0	3

** Industry oriented courses (Invited lectures by Industrial Persons / Alumni, Field Visit)*

TRANS DISCIPLINIARY ELECTIVES

S. No.	Course Code	Course Title	L	T	P	C
Any one of the following course is compulsory						
1.	13TD01E	Indian Business Laws	0	0	0	3
2.	13TD02E	Leadership and Personality Development	0	0	0	3
3.	13TD03E	International Business Management	0	0	0	3
4.	13TD04E	Basics of Marketing	0	0	0	3
5.	13TD05E	Retailing and Distribution management	0	0	0	3
6.	13TD06E	International Economics	0	0	0	3
7.	13TD07E	Indian Economy	0	0	0	3
8.	13TD08E	Rural Economics	0	0	0	3
9.	13TD09E	International Trade	0	0	0	3
10.	13TD10E	Global Challenges and issues	0	0	0	3
11.	13TD11E	Indian Culture and Heritage	0	0	0	3
12.	13TD12E	Indian History	0	0	0	3
13.	13TD13E	Sustainable Development and Practices	0	0	0	3
14.	13TD14E	Women in Indian Society	0	0	0	3
15.	13TD15E	Indian Constitution	0	0	0	3
16.	13TD16E	Bio Mechanics in Sports	0	0	0	3

SH100 TECHNICAL ENGLISH – I
(Common to all B.E. / B.Tech., Degree Programmes)

L T P C
3 1 0 4

COURSE OUTCOMES

The Student will

- apply basic grammar in Writing and Speaking.
- prepare formal Letter Writings.
- come out with proper pronunciation.
- speak confidently in interactions.
- develop interest to read any article.

UNIT I **12**

Language Focus: Technical Vocabulary, Word Formation, Concord, Tense (Present).
Writing: Leave Application Letter, Paragraph writing.
Listening: Listening to correct pronunciation of words.
Speaking: Self - Introduction, Greetings.

UNIT II **12**

Language Focus: Words often misspelled, Articles, Tense (Past)
Writing: Permission letters (In-plant training/Seminar/Workshop), Chart description.
Listening: Listening to the Sentences with correct stress and Intonation.
Speaking: Situational Conversations.

UNIT III **12**

Language Focus: Compound nouns, Tense (Future), Preposition, Comparative Adjectives.
Writing: Invitation Letter, Acceptance Letter, Declining Letter.
Listening: Listening to the conversations.
Speaking: One minute speech.

UNIT IV **12**

Language Focus: Modal verbs, Gerund, Infinitives, Voice.
Writing: Writing Instructions, Letters to Editor.
Listening: Listening to the different Tonal Expressions.
Speaking: Giving Opinions.

UNIT V **12**

Language Focus: 'If' Conditionals, 'Wh' questions, Question Tags.
Writing: Reading and Note - taking
Speaking: Group Discussion.
Reading: ERC, one word questions from the suggested book.

SUGGESTED ACTIVITIES

1. Matching words and meanings – Using words in context – Making sentences.
2. Exercises on gap filling and correction of errors on Concord (Subject – Verb Agreement).
3. Gap filling exercises using the appropriate Tense forms.
4. Exercises on transferring information from Graph to Text – Bar charts, Flow charts.
5. Making sentences using Modal verbs to express probability, compulsion, etc.
6. Exercises on Writing Instructions.
7. Exercises on framing Questions.
8. Other relevant classroom activities.

L: 45 T: 15 TOTAL: 60 PERIODS

BOOK SUGGESTED FOR READING

1. R.K.Narayanan, “Malgudi Days”, Indian Thought Publications, 1943.

REFERENCES

1. Rizvi. M. Ashraf, “Effective Technical Communication”, McGraw Hill Companies, 2005.
2. P.K.Dutt, G.Rajeevan and C.L.N. Prakash, “A Course in Communication Skills”, Cambridge University Press India, 2007.
3. Andrea.J.Rutherford, “Basic Communication Skills for Technology”, Pearson Education, 2nd Edition, 2007.

SH101 MATRICES AND DIFFERENTIAL CALCULUS
(Common to all B.E. / B.Tech., Degree Programmes)

L T P C
3 1 0 4

COURSE OUTCOMES

- Ability to find inverse and integral powers of matrices and to perform transformations of matrices.
- Ability to find the evolutes of various curves.
- Ability to solve ordinary and partial differential equations.
- Ability to obtain constrained maxima and minima.

UNIT I MATRICES 12

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties (excluding proofs); Cayley – Hamilton theorem (excluding proof) – Inverse and integral powers of a matrix using Cayley – Hamilton theorem; Diagonalisation of a matrix by orthogonal transformation; Quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT II DIFFERENTIAL CALCULUS 12

Curvature in cartesian, parametric and polar forms; Centre, radius and circle of curvature; Evolutes.

UNIT III FUNCTIONS OF SEVERAL VARIABLES 12

Partial derivatives; Total derivatives; Differentiation of implicit functions; Jacobians; Maxima and Minima - Method of Lagrangian multipliers.

UNIT IV 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 V PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations; Lagrange's linear equations; Solutions of standard types of first order partial differential equations; Linear partial differential equations of second and higher order with constant coefficients.

L: 45 T: 15 TOTAL: 60 PERIODS

TEXT BOOKS

1. Grewal. B.S, "Higher Engineering Mathematics", Khanna Publications, Delhi, 40th Edition, 2007.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India, 8th Edition, Reprint 2011.

REFERENCES

1. Bali N. P. and Manish Goyal, "Text book of Engineering Mathematics", Laxmi Publications Private Limited, 7th Edition, Reprint, 2010.
2. Ramana.B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2007.
3. Jain.R.K. and Iyengar.S.R.K., "Advanced Engineering Mathematics", Narosa Publishing House Private Limited, 3rd Edition, 2007.
4. Veerarajan.T., "Engineering Mathematics for semester I and II", Tata McGraw Hill Education Private Limited, New Delhi, 3rd Edition, 2012.
5. Veerarajan.T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Private Limited, New Delhi, 2012.

SH102 APPLIED PHYSICS

(Common to all B.E. / B.Tech., Degree Programmes)

L T P C
3 0 0 3

COURSE OUTCOMES

The students will be able to

- gain knowledge on the properties of matter and hydrodynamics.
- study and apply the ultrasonic methods for industrial and medical field.
- understand Lasers and to identify the appropriate Laser technique for industrial and medical field.
- understand the different types, fabrication, losses of optical fibers and the applications of fiber optics in communication and instrumentation.
- understand the physical properties of photons and electrons and to study the different Electron Microscopes.

UNIT I PROPERTIES OF MATTER AND HYDRODYNAMICS 9

Properties of Matter

Stress, Strain, Hooke's law; Types of moduli of elasticity; Torsional pendulum – Determination of Rigidity modulus of a wire; Bending of beams – Expression for bending moment – Measurement of Young's modulus by uniform and Non- uniform bending – I Shaped girders.

Hydrodynamics

Stream line flow, Turbulent flow, Poiseuille's formula for flow of liquid through a capillary tube, Determination of coefficient of viscosity of a liquid.

UNIT II ULTRASONICS 9

Production – magnetostriction effect – magnetostriction generator – piezoelectric effect – piezoelectric generator; Detection of ultrasonic waves; Properties – Cavitations – Velocity measurement – acoustic grating; Industrial applications – drilling, welding, soldering and cleaning – SONAR - Non Destructive Testing – pulse echo system through transmission and reflection modes – A,B and C scan displays; Medical applications – Sonograms.

UNIT III LASERS 9

Principle of spontaneous emission and stimulated emission, Population inversion, Pumping, Einstein's A and B coefficients – derivation; Types of Lasers - CO_2 Laser, Nd-YAG Laser, Semiconductor Laser (Homojunction); Determination of wavelength of Laser using grating and Particle size; Applications of Lasers: Industrial applications – Welding, Cutting and Heat treatment; Medical applications; Holography (construction and reconstruction).

UNIT IV FIBER OPTICS AND ITS APPLICATIONS 9

Principle and propagation of light in optical fibers; Numerical aperture and Acceptance angle; Types of optical fibers – material, refractive index and mode; Double crucible technique of fiber drawing; Splicing – fusion splicing; Loss in optical fiber – attenuation, dispersion and bending; Fiber optical communication system (Block diagram); Advantages and Applications of optical fiber; Fiber optic sensors – temperature and displacement; Endoscope.

UNIT V QUANTUM PHYSICS AND MICROSCOPY 9

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh Jean's Law from Planck's theory; Photoelectric effect – Law of Photoelectric effect – Photoelectric equation; Matter Waves – De Broglie wavelength - Schrodinger's wave equation – time independent and time dependent equations – Particle in one dimensional box; Heisenberg's Uncertainty principle; Linear Harmonic oscillator; Electron microscope – scanning electron microscope – transmission electron microscope.

TOTAL: 45 PERIODS

TEXT BOOKS

1. R.K.Gaur and S.C.Gupta, “Engineering Physics”, Dhanpat Rai Publications, New Delhi, 2009.
2. M.Arumugam, “Engineering Physics”, Anuradha Publishers, 2010.

REFERENCES

1. David Halliday, Robert Resnick, Jearl Walker, “Fundamentals of Physics”, John Wiley and Sons, Inc., USA, 9th Edition, 2013.
2. Arthur Beiser, “Concepts of Modern Physics”, McGraw Hill Publications Private Limited, 5th Edition, 2008.
3. Richard P.Feynmann, Robert B.Leighton and Mathew Sands, “Feynmann’s Lectures on Physics”, Addison Wesley Publication, USA, 2010.
4. Yoav Peleg, Reuven Pnini, Elvahu Zaarur, Eugene Hecht, “Schaum’s Outline of Quantum Mechanics”, McGraw Hill Companies Limited, USA, 2nd Edition, 2010.

SH103 ENGINEERING CHEMISTRY
(Common to all B.E. / B.Tech., Degree Programmes)

L	T	P	C
3	0	0	3

COURSE OUTCOMES

The students will be able to

- select suitable water treatment techniques for industrial and domestic purpose.
- acquire knowledge of electrochemistry.
- apply the contextual knowledge of adsorption techniques for industrial applications.
- synthesize polymers for domestic and industrial applications.
- understand the knowledge of nano materials for their applications in Science and Engineering.

UNIT I WATER TREATMENT 9

Hardness: types of hardness, estimation of hardness of water – EDTA method – problems; disadvantages of hard water: scales and sludges – disadvantages of scales and sludges – boiler corrosion – priming and foaming – caustic embrittlement; domestic water treatment: screening, sedimentation, coagulation, filteration, disinfection – chlorine – UV method; water softening: demineralization process; desalination: definition, reverse osmosis.

UNIT II ELECTRO ANALYTICAL TECHNIQUES 9

Electrode potential: definition, measurement of electrode potential, Nernst equation – problems; EMF: definition, measurement of EMF – Poggendorff's method; reference electrode: standard hydrogen electrode, calomel electrode, glass electrode – measurement of pH using glass electrode; CO_2 sensing electrode; conductometric titrations: acid-base titration (HCI vs NaOH); potentiometric titrations: redox titration (Fe^{2+} vs $K_2Cr_2O_7$), precipitation titration (Ag^+ vs NaCl).

UNIT III CATALYSIS AND SURFACE PHENOMENA 9

Types of catalysis – homogeneous catalysis – heterogeneous catalysis, mechanism of catalytic action - contact theory, catalytic promoters, catalytic poison; enzyme catalysis: Michaelis-Menton equation; adsorption: definition, types – physical adsorption – chemical adsorption – differences between physical and chemical adsorption; adsorption isotherms: definition, Frendlich and Langmuir adsorption isotherms, applications of adsorption.

UNIT IV ENGINEERING POLYMERS 9

Polymerization – types of polymerization – addition – free radical addition polymerization mechanism – copolymerization – condensation polymerization; plastics: classification – thermoplastics and thermosetting plastics, preparation, properties and uses of commercial plastics – PVC, teflon, perlon – U, backelite; rubber: vulcanization of rubber, synthetic rubber – butyl rubber, SBR; composites: definition, types of composites – polymer matrix composites – FRP.

UNIT V NANO MATERIALS 9

Nanoparticles: definition, carbon nanotubes (CNT), types of carbon nano tubes – single walled and multi walled carbon nanotubes – fullerene; synthesis of carbon nanotubes: chemical vapour deposition – laser ablation – arc-discharge method; properties of CNT: mechanical, electrical, thermal and optical properties; applications of carbon nanotubes in chemical field, medicinal field, mechanical field and current applications.

TOTAL: 45 PERIODS

TEXT BOOKS

1. P.C.Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company, New Delhi, 15th Edition, 2005.
2. S.S.Dara, "A text book of Engineering Chemistry", S. Chand and Company Limited, New Delhi, 12th Edition, 2006.

REFERENCES

1. J.Hammer Mark, “Water and Waste water Technology”, Prentice Hall, New Arrivals, 2012.
2. G.Whitmore, “Electrochemistry and its Applications”, Sarup book publishers, New Delhi, 2009.
3. G.Whitmore, “Adsorption and Catalysis”, Sarup Book Publishers, New Delhi, 2008.
4. Fred.Bilmayer, “Text book of Polymer Science”, Wiley, 1st Edition, 2007.
5. T.Pradeep, “Nano – The Essential”, Tata McGraw Hill Education Private Limited, New Delhi, 2012.
6. S.C.Bhatia, “Engineering Chemistry”, CBS Publishers and Distributors, 1st Edition, 2011.

SH104 FUNDAMENTALS OF COMPUTING AND PROGRAMMING IN C
(Common to all B.E. / B.Tech., Degree Programmes)

L T P C
3 0 0 3

COURSE OUTCOMES

- Learn the major components of a computer system.
- Formulate the algorithms and analyze their complexity.
- Identify the correct and efficient ways of solving problems.
- Acquire knowledge about dynamic memory allocation, modular programming and data organization.
- Develop real time applications using the power of C language features.

UNIT I COMPUTER FUNDAMENTALS 10

Introduction – Characteristics of Computers – Evolution of Computers – Computer Generations – Classification of Computers – Basic Computer organization – Number Systems – Problem Analysis – Algorithms – Flow charts – Computer Software – Types of Software.

UNIT II BASIC C PROGRAMMING 9

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

UNIT III FUNCTIONS, ARRAYS AND POINTERS 9

Functions: User-defined functions – Definitions – Declarations - Call by reference – Call by value. Arrays: Declaration – Definition – Multidimensional Arrays – Functions with array as arguments. Pointers: Initialization – Pointers as Arguments – Pointers to Pointers – Dynamic Memory Management Functions.

UNIT IV STRUCTURES AND UNIONS 9

Derived types – Structures: Declaration – Definition – Initialization of structures – Accessing structures – Nested structures – Arrays of structures – Structures and functions – Pointers to structures – Self-referential structures – Unions.

UNIT V FILE HANDLING 8

File structure – binary and text files – File handling functions – File I/O — File Manipulations.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Pradip Dey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, Oxford University Press, 1st Edition, 2009.
2. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, Dorling Kindersley (India), 2011.

REFERENCES

1. Ashok.N.Kamthane, “Computer Programming”, Pearson Education (India), 2008.
2. Stephen G.Kochan, “Programming in C”, Pearson Education (India), 3rd Edition, 2005.
3. Brian W.Kernighan and Dennis M.Ritchie, “The C Programming Language”, Pearson Education Inc., 2005.

SH105 ENGINEERING GRAPHICS
(Common to all B.E. / B.Tech., Degree Programmes)

L T P C
2 3 0 4

COURSE OUTCOMES

- Students will be able to use the drawing instruments effectively.
- An ability to draw the basic engineering curves and problems related to projections of points, straight lines, planes and solids.
- Able to apply the knowledge acquired on practical applications of sectioning and development of solids.
- Able to draw simple solids and its sections in isometric view and projections and also to draw its perspective views.

Drawing Instruments – IS specifications on lines – drawing sheets – Printing letters and dimensioning – scales (not for examination) – First angle projection should be followed.

UNIT I PLANE CURVES 12

Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloids – Epi and Hypo cycloids - construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 12

Projection of points and straight lines located in the first quadrant – Traces – Determination of true lengths and true inclinations.
Projection of regular polygonal surfaces and circular lamina inclined to any one reference plane.

UNIT III PROJECTION OF SOLIDS 12

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

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES 12

Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – obtaining true shape of section.
Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinder and cone – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 12

Principles of isometric projection – isometric scale – isometric projections of simple solids – cube – prisms, pyramids, cylinder and cone in simple position only, truncated prisms, pyramids, cylinders and cones.
Perspective projection of prisms, pyramids and cylinders by visual ray method and vanishing point method.

TOTAL: 60 PERIODS

Note: In end semester examination from each unit one question with either or pattern may be asked. No short questions.

TEXT BOOK

1. N.D. Bhatt, “Engineering Drawing”, Charotar Publishing House, 46th Edition, 2003.

REFERENCES

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

SH106 C PROGRAMMING LABORATORY
(Common to all B.E. / B.Tech., Degree Programmes)

L T P C
0 0 3 2

COURSE OUTCOMES

- Acquire logical thinking and problem solving skills.
- Implement the algorithms and analyze their complexity.
- Identify the correct and efficient ways of solving problems.
- Acquire hands on practice in dynamic memory allocation, modular programming and data organization.
- Implement real time applications using the power of C language features.

LIST OF EXPERIMENTS

1. Solve problems such as temperature conversion, student grading, interest calculation.
2. Finding the 2's complement of a binary number.
3. Generation of the first 'n' terms of the Fibonacci sequence and prime sequence.
4. Computing Sine series and Cosine series.
5. Given distance traveled by a vehicle as $\mathbf{d = ut + 1/2at^2}$, where 'u' and 'a' are the initial velocity and acceleration. Calculate the distance traveled for different time intervals.
6. Solving the roots of a quadratic equation.
7. Designing a simple arithmetic calculator. (Use switch statement)
8. Performing the following operations: (Use loop statement)
   i. Generate Pascal's triangle.
   ii. Construct a Pyramid of numbers.
9. Performing the following operations to a string:
   i. To insert a sub-string into main string at a given position.
   ii. To delete 'n' characters from a given position in a string.
   iii. To replace a character of string either from beginning or ending or at a specified location.
10. Performing the following operations: (Use arrays)
    i. Matrix addition.
    ii. Transpose of a matrix.
    iii. Matrix multiplication by checking compatibility.
11. Performing the following operations: (Use recursive functions)
    i. To find the factorial of a given integer.
    ii. To find the GCD (Greatest Common Divisor) of two given integers.
    iii. To solve Towers of Hanoi problem.
12. Performing the Student Information Processing using File Handling concepts.

TOTAL: 45 PERIODS

SOFTWARE REQUIREMENTS

- Turbo C/ ANSI C Compiler
- Gcc compiler

SH107 PHYSICS AND CHEMISTRY LABORATORY – I

(Common to all B.E. / B.Tech., Degree Programmes)

L	T	P	C
0	0	3	2

PART A – PHYSICS LABORATORY – I

COURSE OUTCOMES

At the end of the Laboratory classes, the students are able to

- develop collaborative learning skills and to add some of their own ideas to the experiments and their explanations.
- understand the optical properties, mechanical properties and electrical properties.

LIST OF EXPERIMENTS

1. (a) Particle size determination using Diode Laser.
   (b) Determination of Laser parameters – Wavelength, and angle of divergence.
   (c) Determination of Numerical aperture and acceptance angle of an optical fiber.
2. Determination of thickness of a thin wire – Air wedge method.
3. Determination of velocity of sound and compressibility of the liquid – Ultrasonic Interferometer.
4. Determination of Dispersive power of a prism using Spectrometer.
5. Determination of Young's modulus – Non-uniform bending method.
6. Determination of coefficient of viscosity of liquid – Poiseuille's method.
7. Determination of specific resistance of a given coil of wire – Carey Foster's Bridge.

• A minimum of FIVE experiments shall be offered.

PART B - CHEMISTRY LABORATORY – I

COURSE OUTCOMES

The student

- can estimate the amount of hardness and acidity present in the water sample.
- gain knowledge about the estimation of nickel in an alloy.
- quantify the electrolyte by measuring the conductance and pH.

LIST OF EXPERIMENTS

1. Estimation of hardness of Water sample by EDTA method.
2. Estimation of acidity of Water sample.
3. Estimation of Nickel by EDTA method.
4. Conductometric titration (HCl Vs NaOH).
5. Conductometric titration ($BaCl_2$ Vs Na_2SO_4).
6. pH metric titration (HCl Vs NaOH).
7. Determination of molecular weight and degree of polymerization using Viscometry.

• A minimum of FIVE experiments shall be offered.

• Laboratory classes on alternate weeks for Physics and Chemistry.

TOTAL: 45 PERIODS

SH108 ENGINEERING PRACTICES LABORATORY
(Common to all B.E. / B.Tech., Degree Programmes)

L T P C
0 0 3 2

COURSE OUTCOMES

- Students will be able to prepare the pipe connections and identify the various components used in plumbing.
- An ability to prepare simple wooden joints using wood working tools.
- An ability to prepare simple lap, butt and tee joints using arc welding equipments.
- An ability to prepare simple components using lathe and drilling machine.

PART A – MECHANICAL AND CIVIL ENGINEERING PRACTICES

I PLUMBING WORKS: **5**

Study of components related to plumbing.
Hands-on-exercise:
Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

II CARPENTRY PRACTICES: **6**

Study of the joints in roofs, doors, windows and furniture.
Hands-on-exercise:
Wood work, joints by sawing, planning and cutting.

III WELDING: **5**

Study of the tools used in welding Gas welding practice.
Preparation of butt joints, lap joints and tee joints using arc welding.

IV BASIC MACHINING: **7**

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

REFERENCES

1. Ramesh Babu.V., “Engineering Practices Laboratory Manual”, VRB Publishers Private Limited, Chennai, Revised Edition, 2013 – 2014.
2. Jeyachandran.K., Natarajan.S. and Balasubramanian.S., “A Primer on Engineering Practices Laboratory”, Anuradha Publications, 2007.
3. Bawa.H.S., “Workshop Practice”, Tata McGraw Hill Publishing Company Limited, 2007.
4. Rajendra Prasad.A. and Sarma.P.M.M.S., “Workshop Practice”, Sree Sai Publication, 2002.
5. Kannaiah.P. and Narayana.K.L., “Manual on Workshop Practice”, Scitech Publications, 1999.

PART B – ELECTRICAL AND ELECTRONICS ENGINEERING PRACTICES

COURSE OUTCOMES

- An ability to develop familiarity with rudimentary measurement equipment – signal generators, oscilloscopes, multimeters and power supplies.
- Ability to demonstrate and evaluate the parameters of basic electronic components (wires, resistors, capacitors, diodes etc.) based on their physical parameters and dimensions.
- Define, describe, and analyze fundamentals of Boolean algebra and digital logic gates.
- An ability to predict qualitatively and quantitatively compute the steady state AC responses of basic circuits using the phasor method.
- Gain experience in the documentation of measurements and procedures as well as the preparation of formal reports.

I ELECTRICAL ENGINEERING PRACTICE 10

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

II ELECTRONICS ENGINEERING PRACTICE 12

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

TOTAL: 45 PERIODS

REFERENCES

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

13E20 TECHNICAL ENGLISH – II

(Common to all B.E. / B.Tech., Degree Programmes)

L T P C
3 0 0 3

COURSE OUTCOMES

The student will be able to

- apply correct form of language while Speaking and Writing.
- prepare his own Professional letter writings.
- interpret any passage after listening.
- interact at different situations fluently.

UNIT I **10**

Language Focus: Homonyms, Different grammatical forms of the same word, correct usage of words / phrases.
Writing: Recommendation writing.
Listening: Interpreting Poetic lines.
Speaking: Telephone English.

UNIT II **9**

Language Focus: Cause and Effect, Phrasal Verbs.
Writing: Quotation letter, Clarification Letter, Placing orders, Complaint Letter.
Listening: Conversations.
Speaking: Asking questions.

UNIT III **9**

Language Focus: Idioms and Phrases with animal names.
Writing: Checklist, Process Description.
Speaking: Presentations.

UNIT IV **9**

Language Focus: Technical Definitions, Transformation of Sentences.
Writing: Job Application Letter, Curriculum Vitae, Bio-data, Resume.
Speaking: Mock Interview.

UNIT V **8**

Language Focus: British and American Vocabulary, Numerical Expressions.
Writing: E-mail Writing, Report Writing.
Speaking: Group Discussion.

SUGGESTED ACTIVITIES

1. Making sentences using different grammatical forms of the same word.
2. Exercises on combining sentences using Cause and Effect expressions.
3. Writing Formal Letters.
4. Writing exercises on Recommendations.
5. Exercises on Idioms and Phrases.
6. Exercises on preparing letter of Job Application with annexure.
7. Exercises on British and American English words with meanings.

TOTAL: 45 PERIODS

BOOK SUGGESTED FOR READING

1. A.P.J.Abdul Kalam, Arun Tiwari, “Wings of Fire”, an Autobiography, University Press Private Limited India, 1999, 30th Impression, 2007.

REFERENCES

1. T.M.Farhathullah, “Communication Skills for Technical Students”, Orient Longman Private Limited, 2002.
2. K.R.Lakshmi Narayanan, “English for Technical Communication”, SciTech Publications, 1999.
3. Jack.C.Richards, Jonathan Hull and Susan Protor, “English for International Communication”, Cambridge University Press, 3rd Edition, 2004.

13E21 INTEGRAL CALCULUS AND TRANSFORMS
(Common to all B.E. / B.Tech., Degree Programmes)

L T P C
3 1 0 4

COURSE OUTCOMES

- Ability to find area and volume of objects using double and triple integrals.
- Ability to analyze the concepts related to vector calculus and to apply them in engineering field.
- Ability to perform the ideas of Laplace transform and Z-transform in their respective engineering subjects.

UNIT I MULTIPLE INTEGRALS 12

Double integration – Cartesian and polar coordinates; Change of order of integration; Change of variables between cartesian and polar coordinates; Triple integration in cartesian coordinates; Area as double integral; Volume as triple integral.

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 Stoke's theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.

UNIT III LAPLACE TRANSFORM 12

Definition of Laplace transform – Conditions for existence – Transform of elementary functions – Basic properties – Derivatives and Integrals of Transform – Transform of derivatives and integrals – Transform of unit step function and impulse function – Transform of periodic function – Initial and final value theorems.

UNIT IV INVERSE LAPLACE TRANSFORM 12

Definition of Inverse Laplace transform – Convolution theorem – Solution of linear ordinary differential equations of second order with constant coefficients using Laplace transformation techniques and solution of simultaneous differential equations of first order with constant coefficients using Laplace transformation techniques.

UNIT V Z – TRANSFORM 12

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

L: 45 T: 15 TOTAL: 60 PERIODS

TEXT BOOKS

1. Grewal.B.S., "Higher Engineering Mathematics", Khanna Publications, New Delhi, 40th Edition, 2007.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India, 8th Edition, 2011.

REFERENCES

1. Bali.N.P. and Manish Goyal, "Text book of Engineering Mathematics", Laxmi Publications Private Limited, 7th Edition, 2008.
2. Ramana.B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2007.
3. Jain.R.K. and Iyengar.S.R.K., "Advanced Engineering Mathematics", Narosa Publishing House Private Limited, 3rd Edition, 2007.
4. Veerarajan.T., "Engineering Mathematics for semester I & II", Tata McGraw Hill Education Private Limited, 3rd Edition, New Delhi, 2012.
5. Veerarajan.T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Private Limited, New Delhi, 2012.

13E22 SOLID STATE PHYSICS
(Common to ECE, CSE, EEE, EIE and IT)

L	T	P	C
3	0	0	3

COURSE OUTCOMES

The Student will be able to

- identify the crystal lattices, their structures and how the structure influences its major properties at different levels.
- choose the major functional and structural properties required for specific applications of conducting materials
- check the parameter that satisfies superconducting behaviour.
- relate technology to the physics of semiconductor devices.
- classify the magnetic materials and their storage applications.
- design optical materials that are able to be manufactured and measured using the state of art optical fabrication technologies.

UNIT I CRYSTAL PHYSICS 9

Lattice, Unit cell, Bravais lattice, Lattice planes; Miller indices – d-spacing in cubic lattice; Calculation of number of atoms per unit cell, Atomic radius, Coordination number and Packing factor for SC, BCC, FCC and HCP structures; Crystal defects – point, line and surface defects; Burger vector.

UNIT II CONDUCTING MATERIALS AND SUPERCONDUCTORS 9

Conductors

Band theory of solids - Distinguish between conductors, semiconductors and insulators on the basis of band theory of solids; 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.

Superconductors

Superconductivity: Properties – Meissner effect – Isotopic effect; Types of superconductors – Type I and Type II superconductors; Applications of superconductors – Magnetic levitation.

UNIT III SEMICONDUCTORS 9

Intrinsic semiconductor – carrier concentration derivation – Fermi level – variation of Fermi level with temperature – electrical conductivity – bandgap determination; Extrinsic semiconductors – carrier concentration derivation in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration; Hall effect – Determination of Hall coefficient – Applications.

UNIT IV MAGNETIC MATERIALS AND STORAGE DEVICES 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 – structure and applications; magnetic recording and readout – storage of magnetic data – tapes, floppy, Hard disk and CD ROM.

UNIT V OPTICAL MATERIALS 9

Optical properties of metals, insulators and semiconductors; Phosphorescence and fluorescence; Excitons traps and color centre and their importance; Different phosphors used in CRO screens, liquid crystal display, LED – working of LED; Thermography and its applications; Solar cell – PN junction solar cell – Conversion efficiency and solar concentration – Hetero junction solar cell.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Charles Kittel, "Introduction to Solid State Physics", John Wiley and Sons, Singapore, 7th Edition, 2007.
2. Dr.N.Sankar, S.O.Pillai, "A Text book of Engineering Physics", New Age International Publications, New Delhi, 2009.

REFERENCES

1. Donald A.Neamen "Semiconductor Physics and Devices", Tata McGraw Hill Publication, New Delhi, 3rd Edition, 2007.
2. M.Arumugam, "Materials Science", Anuradha publications, Kumbakonam, 2010.
3. Calister, "Material Science and Engineering: An Introduction", John Wiley and Sons, 6th Edition, 2009.

13E23 CHEMISTRY OF ELECTRICAL AND ELECTRONIC MATERIALS
(Common to ECE, CSE, EEE, EIE and IT)

L T P C
3 0 0 3

COURSE OUTCOMES

The students can

- apply the knowledge in designing new energy storing devices.
- identify the types of corrosion and to design a method to control the corrosion.
- apply the knowledge of photochemistry in designing the various electronic materials.
- choose proper analytical technique for analyzing the synthesized electronic materials.

UNIT I ENERGY SOURCES AND STORAGE DEVICES 9

Nuclear energy: definition – mass defect; types of nuclear reactions: nuclear fission – characteristics – nuclear chain reaction – fusion reactions – difference between nuclear fusion and fission reaction; nuclear reactor: components – light water nuclear reactor – breeder reactor; solar energy: solar cell – advantages; wind energy: wind mill – advantages; storage batteries: types – primary battery – alkaline battery – secondary battery – lead-acid, nickel-cadmium; lithium battery; fuel cell: H_2-O_2 fuel cell.

UNIT II CORROSION AND ITS CONTROL 9

Chemical corrosion: oxidation corrosion – Pilling-Bedworth rule; electrochemical corrosion: mechanism – hydrogen evolution mechanism – oxygen absorption mechanism – galvanic corrosion – differential aeration corrosion; factors influencing corrosion; corrosion control: cathodic protection: sacrificial anodic protection – impressed current cathodic protection – inhibitors; electroplating: methods of cleaning the article – electroplating of gold; electroless plating: advantages over electroplating – electroless plating of nickel.

UNIT III PHOTOCHEMICAL PROCESSES 9

Photochemical reactions: definition, characteristics; laws of photochemistry – Grothus-Draper's law – Stark-Einstein's law – Beer-Lambert's Law; quantum yield: definition, reason for low and high yield; photochemical equilibrium: photochemical synthesis of hydrogen chloride; photophysical processes: types – non radiative transition – internal conversion – inter system crossing – radiative transition – fluorescence – phosphorescence; chemiluminescence, thermoluminescence, photosensitization: definition, halogen photosensitizer, applications.

UNIT IV ELECTRONIC MATERIALS 9

Organic semiconducting materials: advantages; p-type and n-type semiconducting materials – pentacene – fullerens-C-60; organic dielectric material: definition, examples – polystyrene – PMMA; organic light emitting polymer: polythiophene; conducting polymers: types – intrinsically conducting polymer – doped conducting polymer – extrinsically conducting polymer – coordination conducting polymer, applications; polymer with piezoelectric, pyroelectric and ferroelectric properties: polyvinylidenefluoride; OLED materials: definition, polymer OLED material – polyphenylene vinylene.

UNIT V ANALYTICAL INSTRUMENTATION 9

UV-Visible spectroscopy: types of transitions – chromophore, auxochrome – instrumentation (block diagram only) – applications; IR spectroscopy: molecular vibrations – linear molecule – CO_2 – nonlinear molecule – H_2O – instrumentation (block diagram only) – applications; Atomic absorption spectroscopy: principle – instrumentation (block diagram only) – estimation of nickel by AAS; flame photometry: principle – instrumentation (block diagram only) – estimation of sodium by flame photometry; thermogravimetry (TG): definition – instrumentation (block diagram only) – characteristics of thermogram – factors influencing thermogravimetry – analyzing $CuSO_4.5H_2O$ thermogram – applications.

TOTAL: 45 PERIODS

TEXT BOOKS

1. P.C.Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company, New Delhi, 15th Edition, 2002.
2. S.S.Dara, "A text book of Engineering Chemistry" S.Chand and Company Limited, New Delhi, 13th Edition, 2006.
3. B.S.Chauhan, "Engineering Chemistry", University science press, New Delhi, 3rd Edition, 2009.

REFERENCES

1. S.C.Bhatia, "Engineering Chemistry", CBS Publishers and Distributors, 1st Edition, 2011.
2. Kuriacoarse J.C., and Rajaram.J., "Chemistry in Engineering and Technology", Vol.1 & 2, Tata McGraw Hill Publishing Company Limited, New Delhi, 1989.
3. Hagen Klauk, "Organic Electronics: Materials, manufacturing and applications", Wiley - VCH, 2006.
4. S.Rao, Dr.B.B.Parulekar, "Energy Technology", Khana Publishers, New Delhi, 21st Edition, 2004.
5. Skoog, Holler, Crouch, "Instrumental Analysis", Cengage Learning India Private Limited, New Delhi, 2011.
6. R.Chaudhary, "Basics of Photochemistry", Anmol Publications and Company, New Delhi, 2009.

13E24 ELECTRIC CIRCUITS
(EIE) **L T P C**
3 1 0 4

COURSE OUTCOMES

Students will be able to

- define basic electrical concepts, including electrical potential, electrical current, electrical power and electrical network topology including nodes, branches, and loops.
- define the relationship of voltage and current in resistors, capacitors, inductors, and mutual inductors.
- simplify and analyze the electric circuits using electric circuit theory.
- analyze the dynamic behavior of the first and second order AC and DC circuits.

UNIT I ELECTRIC CIRCUIT ELEMENTS AND ANALYSIS 12

Ohm's Law – Kirchoff's laws – DC and AC Circuits – Resistors in series and parallel circuits and its applications – Mesh current and node voltage method of analysis for DC and AC 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. Thevenin's and Norton's Theorem – Superposition Theorem – Maximum Power Transfer Theorem – Reciprocity Theorem and its applications.

UNIT III RESONANCE AND COUPLED CIRCUITS 12

Series and parallel resonance circuit and its applications – 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 AC with sinusoidal input.

UNIT V ANALYSING OF 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 and unbalanced loads – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

L: 45 T:15 TOTAL :60 PERIODS

TEXT BOOKS

1. Richard C.Dorf, James A.Svoboda, "Introduction to Electric Circuits", Wiley India, New Delhi, 6th Edition, 2009.
2. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", Tata McGraw Hill, 2007.
3. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Tata McGraw Hill publishers, New Delhi, 6th Edition, 2002.

REFERENCES

1. John Bird, "Electrical Circuit Theory and Technology", Newnes Publication, 4th Edition, 2010.
2. Paranjothi SR, "Electric Circuits Analysis", New Age International Limited, New Delhi, 1996
3. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw Hill, New Delhi 2001.
4. Chakrabati.A., "Circuits Theory (Analysis and synthesis)", Dhanpath Rai and Sons, New Delhi, 1999.
5. Charles K. Alexander, Mathew N.O. Sadik, "Fundamentals of Electric Circuits", 2nd Edition, McGraw Hill, 2003.

13E25 BASIC CIVIL AND MECHANICAL ENGINEERING
(Common to ECE, CSE, EEE, EIE and IT)

L	T	P	C
4	0	0	4

COURSE OUTCOMES

- An ability to identify the various systems and its components of various power plants.
- An ability to state and differentiate the working principles of IC engines.
- Students will be able to identify the various systems and components of refrigeration and air conditioning systems.

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.

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: 60 PERIODS

REFERENCES

1. Shanmugam G. and Palanichamy M.S., “Basic Civil and Mechanical Engineering”, Tata McGraw Hill Publishing Company Limited, New Delhi, 1996.
2. Ramamrutham S., “Basic Civil Engineering”, Dhanpat Rai Publishing Company Private Limited, 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.

13E26 COMPUTER PROGRAMMING LABORATORY
(Common to all B.E. / B.Tech., Degree Programmes)

L	T	P	C
0	1	2	2

COURSE OUTCOMES

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

- Demonstrate how to use the UNIX Shell commands.
- Use the Shell programming constructs.
- Learn tracing mechanisms (for debugging), user variables, Shell variables, read-only variables, positional parameters, reading input to a Shell script.
- Test on numeric values, test on file type, and test on character strings using shell scripts.
- Write moderately complex Shell scripts and make them executable.

Execute programs written in C under UNIX environment.

LIST OF EXPERIMENTS

1. Study of UNIX OS, vi Editor.

2. Use of Basic UNIX Shell Commands:
   ls, mkdir, rmdir, cd, cat, banner, touch, file, wc, sort, cut, grep, dd, dfspace, du, ulimit.

3. Shell Programming:
   i. Interactive shell scripts
   ii. Positional parameters
   iii. Arithmetic Operators
   iv. if-then-fi, if-then-else-fi, nested if-else
   v. Logical operators
   vi. if - elif, case structure
   vii. while, until, for loops, use of break
   viii. Metacharacters

4. Shell scripts for the following:
   i. Showing the count of users logged in
   ii. Printing column wise list of files in your home directory
   iii. To count lines, words and characters in its input (do not use wc)

5. C Programming on UNIX:
   i. Dynamic Storage Allocation
   ii. Pointers
   iii. Functions
   iv. File Handling

TOTAL: 45 PERIODS

SOFTWARE REQUIREMENTS

- UNIX/LINUX OS
- Gcc compiler

13E27 PHYSICS AND CHEMISTRY LABORATORY – II
(Common to all B.E. / B.Tech., Degree Programmes)

L	T	P	C
0	0	3	2

PART A - PHYSICS LABORATORY – II

COURSE OUTCOMES

At the end of the Laboratory classes, the students

- demonstrate and report the elastic behaviour of materials
- demonstrate the interference property of light waves
- demonstrate the diffraction property of light waves
- measure the thermal properties of conducting materials
- identify the substance that deforms continuously when subjected to shearing stress.

LIST OF EXPERIMENTS

1. Determination of Young's modulus – Uniform bending method.
2. Determination of Band Gap of a semiconductor material.
3. Determination of Hall Co-efficient.
4. Determination of Radius of curvature of a Plano convex lens using Newton's rings Method.
5. Determination of wavelength of mercury spectrum using spectrometer and grating
6. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
7. Torsional pendulum – Determination of Moment of Inertia of the disc and Rigidity modulus of the material of the wire.

• ***A minimum of FIVE experiments shall be offered.***

PART B - CHEMISTRY LABORATORY – II

COURSE OUTCOMES

The student

- can estimate the amount of alkalinity and Dissolved Oxygen (DO) present in the water sample.
- gain knowledge in the estimation of copper in an alloy and iron in rust.
- quantify electrolyte and ion by measuring the conductance and emf.

LIST OF EXPERIMENTS

1. Estimation of copper in brass by EDTA method.
2. Determination of Dissolved Oxygen (DO) in water (Winkler's method)
3. Estimation of alkalinity of Water sample
4. Estimation of Fe^{2+} ion in rust by Dichrometry
5. Conductometric titration (Mixture of acids vs NaOH)
6. Potentiometric Titration (Fe^{2+} vs $K_2Cr_2O_7$)
7. Estimation of Fe^{2+} ion by spectrophotometry.

TOTAL: 45 PERIODS

• ***A minimum of FIVE experiments shall be offered.***
• ***Laboratory classes on alternate weeks for Physics and Chemistry.***

13E28 ELECTRIC CIRCUITS LABORATORY
(Common to EEE and EIE)

L	T	P	C
0	0	3	2

COURSE OUTCOMES

- Illustrate the basic concepts of electric circuits.
- Relate the physical observations in network theorems of electrical circuits to theoretical principles.
- Examine the electric circuits using mesh and nodal analysis.
- Analyze the dynamic behavior of electric circuits using PSIM.
- Compute the frequency response of resonant and tuned circuits.

LIST OF EXPERIMENTS

1. Verification of Ohm's laws and Kirchoff's laws
2. Verification of Thevenin'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

13E29 ENGLISH LANGUAGE SKILL LABORATORY
(Common to all B.E. / B.Tech., Degree Programmes)

L	T	P	C
0	0	3	2

COURSE OUTCOMES

The Student will

- improve their pronunciation skill.
- gather information from any speech.
- imbibe the stress and intonation of the native speakers' accent.

1. Micro Skills

- Spotting the Homonyms / Silent letter words / mispronounced words
- Identifying the missing words in native speech
- Finding the cluster words
- Marking correct punctuation
- Marking word chunks
- Identification of sentences

2. Content Comprehension and making inferences

- Listening to audio files of Speech, Poetry, Recent Issues, News clippings, etc
    a. True / False
    b. Multiple Choice Questions
    c. Filling the blanks
    d. Filling the charts

3. Listen and Act

- Drawing the map using audio
- Picture completing task
- Transferring data to Graph

4. Interpreting the video clippings

5. Listening to Conversations

TOTAL: 30 PERIODS

13EI31 TRANSFORMS AND COMPLEX ANALYSIS L T P C
3 1 0 4

COURSE OUTCOMES

Upon completion of the course, students will be able to,

- Perform Fourier series analysis of the functions
- Solve the problems using Fourier transform techniques in engineering
- Understand the concept of wavelet transform
- Acquire the knowledge of conformal mappings
- Perform integration of complex functions

UNIT I FOURIER SERIES 12

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series– Half range cosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis.

UNIT II FOURIER TRANSFORMS 12

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

UNIT III WAVELETS AND WAVELET TRANSFORMS 12

Introduction – Continuous Wavelet Transforms – Discrete Wavelet Transforms – Orthonormal Wavelets

UNIT IV 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 V 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)

L: 45 T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

1. Grewal, B.S, "Higher Engineering Mathematics", Khanna publishers, Delhi, 40th Edition, 2007
2. Lokenath Debnath and Dambaru Bhatta "Integral Transforms and their Applications" Chapman & Hall /CRC Taylor and Francis Group, 2nd Edition, 2010.

REFERENCES

1. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics", Laxmi Publications Private Limited, 7th Edition, 2007.
2. Ramana.B.V., "Higher Engineering Mathematics", Tata Mc-Graw Hill Publishing Company Limited, New Delhi, 2007.
3. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, 3rd Edition, 2007.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India, 8th Edition, 2007.

13EI32 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
(Common to all B.E/B.Tech. Degree Programmes) **3 0 0 3**

COURSE OUTCOMES

Upon successful completion of course the student will be able to

- Understand the various ecosystem and biodiversity
- Classify the different types of natural resources and identify the role of individual in conservation of resources
- Identify and analyse the causes, effects and control measures of environmental pollution
- Identify the different types of environmental hazards and their management
- Analyse the social issues related to the environment and how human population affect the environment

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 9

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers– energy flow in the ecosystem – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) aquatic (pond) ecosystems. Field study of simple ecosystems –pond and forest. Introduction to biodiversity: definition - genetic, species and ecosystem diversity – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values –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. Field study of common plants, insects, birds.

UNIT II NATURAL RESOURCES 9

Forest resources: Use and over-exploitation, deforestation, case studies- dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water – 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, case studies – 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 III ENVIRONMENTAL POLLUTION 9

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Noise pollution (e) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – e-Waste: Definition-dimension of the problem - source-toxic Substances in e-waste - risks related to toxic substances–environmental problems-role of an individual in prevention of pollution.

UNIT IV ENVIRONMENTAL HAZARDS 9

Environmental hazards**:** Definition – Hazard- Types-Natural and man-made hazards – Natural hazards: Causes, effect and management of Earthquake, Flood, Landslide, Cyclones and Tsunami; Man-made Hazards**:** Hazards due to dams and reservoirs, hazards due to nuclear power plant, Industrial hazards. Case study: Chernobyl disaster, Bhopal gas tragedy.

UNIT V SOCIAL ISSUES, HUMAN POPULATION AND THE ENVIRONMENT 9

Water conservation: rain water harvesting-climate change: global warming, acid rain, ozone layer depletion-Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Ravikrishnan. A., "Environmental Science and Engineering, Sri Krishna Hitech Publishing Company Private Limited, 2010.
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.

REFERENCES

1. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2nd Edition, Pearson Education, 2004.
2. Rajagopalan. R, "Environmental Studies - From Crisis to Cure", Oxford University Press, 2005.
3. Natural Hazards – Local, National, Global: G. F. White (ed), Oxford University Press.

13EI33 DIGITAL CIRCUITS L T P C
3 1 0 4

COURSE OUTCOMES

Upon completion of the course, students will be able to

- Explain various number systems and to simplify the mathematical expressions using Boolean functions
- Design and implement combinational circuits and sequential circuits
- Comprehend the various memory devices.

UNIT I NUMBER SYSTEMS AND BOOLEAN ALGEBRA 12

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

UNIT II COMBINATIONAL CIRCUITS 12

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

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 12

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.

UNIT IV ASYNCHRONOUS SEQUENCTIAL CIRCUITS 12

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

UNIT V MEMORY DEVICES, PROGRAMMABLE LOGIC DEVICES AND LOGIC FAMILIES 12

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

L: 45 T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

1. M. Morris Mano, "Digital Logic and Computer Design", Prentice Hall of India, 10th Edition, 2008.
2. John M.Yarbrough, "Digital Logic, Application & Design", Thomson, 2002.

REFERENCES

1. Charles H.Roth, "Fundamentals Logic Design", Jaico Publishing, 6th Edition, 2009.
2. Floyd, "Digital Fundamentals", 8th Edition, Pearson Education, 2005.
3. John F.Wakerly, "Digital Design Principles and Practice", 3rd Edition, Pearson Education, 2002.

13EI34 SENSORS AND TRANSDUCERS L T P C
3 1 0 4

COURSE OUTCOMES

Upon completion of the course, students will be able to

- Define the basic need of measurement systems.
- Analyze the operation and construction of various transducers.
- Construct the various types of Resistive transducers.
- Demonstrate the features of Capacitive and Inductive Transducers
- Apply an appropriate transducer for various applications.

UNIT I SCIENCE OF MEASUREMENTS AND CLASSIFICATION OF TRANSDUCERS 12

Generalized measurement system - Units and standards – Calibration methods – Static calibration – Classification of errors -Limiting error and probable error – Error analysis – Statistical methods – Odds and uncertainty – Classification of transducers – Selection of transducers.

UNIT II CHARACTERISTICS OF TRANSDUCERS 12

Static characteristics – Accuracy, precision, resolution, sensitivity, linearity, repeatability, reproducibility, loading effect, drift, static error, span and range, hysteresis, dead time and dead zone - 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 12

Principle of operation, construction details, characteristics and applications of potentiometer-loading effect - strain gauge – types - Resistance temperature detector (RTD) – Thermistor - hot-wire anemometer - constant current and constant temperature operation - piezoresistive sensor - resistive humidity sensor.

UNIT IV VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS 12

Induction potentiometer – Variable reluctance transducers – Eddy current transducer – Principle of operation, construction details, characteristics and applications of LVDT –Capacitive transducer and types- differential capacitance arrangement – variation of dielectric constant for the measurement of liquid level - Capacitor microphone – Frequency response.

UNIT V MODERN TRANSDUCERS 12

Piezoelectric transducer –Hall Effect transducer – Magnetostrictive sensor- Digital displacement transducer– Smart sensors – IC sensor for temperature - AD 590, LM 335 - Fiber optic sensors- Introduction to SQUID sensors, Film sensors, Touch screen sensor, Photovoltaic and electromagnetic sensor, MEMS and Nano sensors.

L : 45 T : 15, TOTAL : 60 PERIODS

TEXT BOOKS

1. Ernest O.Doebelin, ‘Measurement systems’, 6th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2011.
2. A.K. Sawhney, ‘A course in Electrical & Electronic Measurement and Instrumentation’, Dhanpat Rai and Company Private Limited, 2004.

REFERENCES

1. D. Patranabis, Sensors and Transducers, 2nd Edition, Prentice Hall of India, 2010.
2. John P.Bentley, Principles of Measurement Systems, 3rd Edition, Pearson Education, 2005.
3. Neubert H.K.P., Instrument Transducers – An Introduction to their Performance and Design, Oxford University Press, Cambridge, 2003.
4. Murthy, D.V.S., “Transducers and Instrumentation”, 2nd Edition, Prentice Hall of India Private Limited, New Delhi, 2010.
5. S.Renganathan, “Transducers Engineering”, Allied Publishers, 2005.

13EI35 ELECTRONIC DEVICES AND CIRCUITS L T P C
3 1 0 4

COURSE OUTCOMES

Upon completion of the course, students will be able to

- Acquire basic knowledge about semiconductor devices and their implementation
- Design and analyze amplifiers, oscillators and wave generators using BJT and FET
- Design power amplifiers and how to implement them in circuits
- Design fixed and variable regulated power supply with various current range

UNIT I DIODES 12

PN diode : Introduction to Semiconductor:-Intrinsic, Extrinsic & Graphene–formation of pn junction – biasing the diode – VI characteristics of diode–static and dynamic resistance–drift and diffusion currents–transition and diffusion capacitance-Junction diode switching time

Diode applications: HWR –FWR– power supply filters –diode clipping and clamping circuits.

Special purpose diodes: Zener diodes – zener diode applications– Varactor diode– LED–photodiode – Schottky diode – Tunnel diode

UNIT II BJTs 12

Bipolar Junction Transistors : Transistor structure –basic operation –Transistor characteristics and parameters –transistor as an amplifier – transistor as a switch –transistor biasing–analysis of various dc bias circuits- dc load line - AC load line –bias stabilization – thermal runaway and thermal stability

BJT amplifiers: CE, CC and CB amplifiers– Small signal low frequency transistor amplifier circuit -h parameter representation of a transistor – Analysis of single stage transistor amplifier using parameters voltage gain, current gain, input impedance and output impedance –Multistage RC coupled Amplifiers –Transformer coupled amplifier- frequency response of amplifiers

UNIT III FETs 12

Field-EffectTransistors: 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 – Introduction to FinFET.

FET amplifiers: JFET/Depletion MOSFET small signal model – small signal analysis of CS, CD and CG amplifiers – Frequency response of amplifiers

UNIT IV POWER AMPLIFIERS AND FEEDBACK AMPLIFIERS 12

Power amplifiers: 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

Feedback amplifiers: Positive feedback– Advantages of Negative feedback –Voltage / current, series / shunt feedback amplifiers

UNIT V REAL TIME APPLICATIONS AND SPECIAL DEVICES 12

Sinusoidal signal generators: Oscillator – Condition for oscillation – Phase shift - Wein Bridge – Hartley - Colpitts and crystal oscillators.

Square wave generators: Multivibrators –Schmitt triggers

Power supply unit: linear regulator power supply – switched mode power supply – low drop out regulator

Special devices: Characteristics and applications of UJT, SCR, DIAC, TRIAC.

L: 45 T: 15, TOTAL: 60 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.

REFERENCES

1. Boylsted and Nashelsky, “Electronic Devices and Circuit Theory”, Prentice Hall of India, 6th Edition, 2009.
2. Millman, J., Prakash Rao.,M.S. and Taub,H., “Pulse Digital and Switching Wave Forms”, McGraw-Hill,2007.
3. Streetman, B. and Sanjay,B., “Solid State Electronic Devices”, Prentice Hall of India, 5th Edition, 2005.
4. Motters head. A, “Electronic Devices & Circuits an Introduction”, Prentice Hall of India, 2003.
5. Millman and Halkias, “Integrated Electronics”, McGraw-Hill, 2004.

13EI36 C++ AND DATA STRUCTURES L T P C
3 0 0 3

COURSE OUTCOMES

Upon successful completion of this course, the students will be able to

- Recognize and use object oriented programming constructs to write object oriented programs
- Describe encapsulation, polymorphism and inheritance.
- Identify the suitable data organization structure and its implementation methods.
- Analyze the importance of self-balancing trees for effective organizing the data.
- Enumerate the systematic way of solving problems.

UNIT I PRINCIPLES OF OBJECT ORIENTED PROGRAMMING 9

Introduction – Tokens – Expressions - C++ classes and objects - constructors and destructors - operators overloading and type conversions.

UNIT II ADVANCED OBJECT ORIENTED PROGRAMMING 9

Inheritance, Extending classes, Pointers, Virtual functions and polymorphism, File handling, Templates, Exception handling, Manipulating strings.

UNIT III LINEAR DATA STRUCTURES 9

Lists, Stacks and queues: Array and linked list implementation of List, Stack, Queue – Applications of List – Polynomial addition – sparse matrix – Applications of stack – Infix to Postfix – Evaluation of expression – Function calls.

UNIT IV NONLINEAR DATA STRUCTURES 9

Trees: Binary tree - Binary search tree - AVL tree. Graphs: Representations - Topological sort – Dijskstra's shortest path - Prim's and Kruskal's Algorithms - Network flow problems.

UNIT V SORTING AND SEARCHING 9

Sorting - Insertion sort - Shell sort - Heap sort - Merge sort - Quick sort. Searching – Linear search – Binary search – Fibonacci search.

TOTAL: 45 PERIODS

TEXT BOOKS

1. E.Balagurusamy, "Object Oriented Programming with C++", McGraw Hill Company Limited, 2007.
2. M.A.Weiss, "Data Structures and Algorithm Analysis in C++", 3rd Edition, Addison - Wesley, 2007.
3. A.V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", 1st Edition, Pearson Education, Reprint 2003.

REFERENCES

1. Bjarne Stroustrup, "Programming: Principles and Practice Using C++", Addison Wesley, 2008.
2. R. F. Gilberg, B. A. Forouzan, "Data Structures", 2nd Edition, Thomson India Edition, 2005.

13EI37 ELECTRONIC DEVICES AND CIRCUITS LABORATORY L T P C
0 0 3 2

COURSE OUTCOMES

Upon completion of the course, students will be able to

- Analyze the characteristics of two terminal and three terminal semiconductor devices.
- Use the modern virtual instrumentation kits to study the characteristics of devices and its applications.
- Design, test and implement the amplifiers and oscillators using BJT and FET.

EXPERIMENTS

1. Characteristics of Semiconductor diode and Zener diode
2. Characteristics of Transistor in Common Emitter, Common Collector, and Common Base Configuration
3. Characteristics of FET
4. Characteristics of SCR and UJT
5. Photodiode, photo transistor Characteristics and study of light activated relay circuit
6. Single phase half wave and full wave rectifiers with inductive and capacitive filters using Educational laboratory virtual instrumentation suite
7. Amplifier design using BJT
8. Differential amplifier using FET
9. Realization of Passive filters
10. Design of sinusoidal wave generator using BJT
11. Study of simulation experiments

TOTAL: 45 PERIODS

13EI38 C++ AND DATA STRUCTURES LABORATORY L T P C
0 0 3 2

COURSE OUTCOMES

Upon successful completion of this course, the students will be able to

- Implement common data structures, such as trees, lists.
- Design and apply appropriate data structures for solving computing problems.
- Develop the appropriate objects required to solve a programming problem.
- Practice exception handling mechanisms to handle runtime errors.
- Solve problems using advanced object-oriented concepts like inheritance, polymorphism, and generic programming.

LIST OF EXPERIMENTS

1. Design C++ classes with static members, methods with default arguments, friend functions. (For example, design matrix and vector classes with static allocation, and a friend function to do matrix-vector multiplication).
2. Develop C++ class hierarchy for various types of inheritances.
3. Implement Matrix class with dynamic memory allocation and necessary methods. Give proper constructor, destructor, copy constructor and overloading of assignment operator.
4. Design a simple application to demonstrate dynamic polymorphism and RTTI.
5. Design stack and queue classes with necessary exception handling
6. Implement singly and doubly linked lists.
7. Represent a polynomial as a linked list and write functions for polynomial addition.
8. Implement stack and use it to convert infix to postfix expression.
9. Implement an expression tree. Produce its pre-order, in-order, and post-order traversals.
10. Implement binary search tree and AVL Tree.

TOTAL: 45 PERIODS

LIST OF EQUIPMENTS AND COMPONENTS FOR A BATCH OF 30 STUDENTS (PER BATCH)

HARDWARE:

- 30 Personal Computers with Pentium III or Pentium IV
- RAM – 256 MB or higher
- Hard disk – 40 GB or higher

SOFTWARE:

- Turbo C ++(freeware) – to be installed in all PCs
- OS – Linux (or) Windows 2000/ Windows XP/ NT.

13EI41 NUMERICAL METHODS AND PROBABILITY L T P C
3 1 0 4

COURSE OUTCOMES

On the successful completion of the course, the students should be able to

- Solve the linear and non-linear algebraic equations using Numerical methods
- Find the solution of differential equations using Numerical methods
- Interpolate and approximate polynomials
- Apply the sampling Distributions to Engineering problem
- Understand the concept of Correlations and regressions

UNIT I SOLUTION OF ALGEBRAIC EQUATIONS 12

Solving non-linear algebraic equations- Newton- Raphson method-Iteration method. Solution of linear system - Direct methods - Gauss Elimination method – Gauss Jordan method; Iterative methods – Gauss Jacobi and Gauss – Seidel methods.

UNIT II INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Lagrange's and Newton's divided difference interpolation – Newton's forward and backward difference interpolation – Approximation of derivatives using interpolation polynomials- Numerical integration using Trapezoidal and Simpson's 1/3 rules.

UNIT III NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 12

Taylor's series method – Euler's method – Modified Euler's method – Fourth order Runge – Kutta method for solving first order equation; Milne's and Adam's predictor – corrector methods for solving first order equations – Finite difference methods for solving second order equations.

UNIT IV PROBABILITY 12

Mean – Median – Mode - Standard Deviation – Probability - Conditional probability (Definitions only). One dimensional Random variable - Moments – Moment generating function and its properties - Discrete and Continuous distributions- Binomial, Poisson and Normal distributions.

UNIT V TWO DIMENSIONAL RANDOM VARIABLES 12

Two dimensional Random variables – Covariance - Correlations and Regressions.

L: 45 T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

1. K. Sankar rao "Numerical methods for scientists and engineers" Prentice Hall of India Private Limited, New Delhi, 3rd Edition, 2007.
2. S.C.Gupta , V.K.Kapoor "Elements of mathematical statistics" Sultan Chand & Sons, Educational Publishers, New Delhi.

REFERENCES

1. P. Kandasamy, K. Thilagavathy and K. Gunavathy, "Numerical Methods" S.Chand Company Limited, New Delhi, Reprint, 2012.
2. Dr.B.S.Grewal, "Numerical Methods in Engineering & Science with programs in C & C++" Khanna Publishers, 9th Edition, 2010.
3. T.Veerarajan "Probability,Statistics and Random Processes", Tata Mc-Graw Hill Publishing Company Limited, 3rd Edition, 2010.

13EI42 INDUSTRIAL INSTRUMENTATION – I L T P C
3 0 0 3

COURSE OUTCOMES

Upon completion of the course, students will be able to

- Explain the working of pressure measurements.
- Define the need of temperature transducer in industries.
- Apply thermocouple for different temperature applications.
- Define the basic principle of speed and torque measurements.
- Describe the features of density measurements.

UNIT I MEASUREMENT OF FORCE, TORQUE AND SPEED 9

Electric balance - Different types of load cells - Hydraulic, Pneumatic, strain gauge- Magnetoelastic and Piezoelectric load cells, Different methods of torque measurement; Strain gauge, Relative angular twist, Speed measurement-Capacitive tacho, Drag cup type tacho-D.C and A.C tacho generators, Stroboscope.

UNIT II MEASUREMENT OF ACCELERATION, VIBRATION AND DENSITY 9

Accelerometers - LVDT, Piezoelectric, Strain gauge and Variable reluctance type accelerometers - Mechanical type vibration instruments, Seismic instruments as accelerometer, Vibration sensor, Calibration of vibration pickups, Units of density and specific gravity, Baume scale and API scale, Pressure type densitometers - Float type densitometers, Ultrasonic densitometer, 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 gauge, lonization gauges, Cold cathode type and hot cathode type, 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 thermometers - Sources of errors in, filled in systems and their compensation, Bimetallic thermometers, RTD - characteristics and signal conditioning-3 lead and 4 lead RTDs - Thermistors.

UNIT V THERMOCOUPLE AND RADIATION PYROMETER 9

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

TOTAL: 45 PERIODS

TEXT BOOKS

1. D.Patranabis, “Principles of Industrial Instrumentation”, Tata McGraw-Hill Publishing Company, New Delhi, 2010.
2. A.K.Sawhney, A course in Electrical and Electronic Measurement and Instrumentation Dhanpat Raj and Sons, New Delhi, 2004.

REFERENCES

1. Ernest O.Doebelin, ‘Measurement systems’, 6th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2011.
2. R.K.Jain, Mechanical and Industrial Measurements, Khanna Publishers, Delhi 2002.

3. Donald P Eckman, Industrial Instrumentation, CBS Publishers & Distributors, Delhi, 2003.
4. B.G. Lipták, Instrument Engineers' Handbook (4^{th} Edition), Process Measurement and Analysis, Volume – I, CRC Press, London, 2003.

13EI43 ELECTRICAL AND ELECTRONIC MEASUREMENTS L T P C
3 1 0 4

COURSE OUTCOMES

Upon completion of the course, students will be able to

- Understand the operation of electrical instruments, various measurement techniques and the concept of identification and minimization of errors in particular measurement situations.
- Describe the measurement techniques of Power, Energy and Flux density.
- Explain the prospective ideas about Potentiometer & Instrument transformers and to extend the views in resistance measuring methods, inductance and capacitance measurement.
- Know the electronic measurement techniques of voltage, frequency etc.

UNIT I MEASUREMENT OF VOLTAGE AND CURRENT 12

D'Arsonval Galvanometer: Principle and operation – Different types of electrical measuring instruments: Principle, construction and operation of Moving coil, Moving iron, Electro dynamometer, Induction and Rectifier types, Errors and compensation – Extension of range of voltmeter and ammeter.

UNIT II MEASUREMENT OF POWER, ENERGY AND FLUX DENSITY 12

Electrodynamometer type wattmeter : Theory & its errors, Methods of correction – LPF wattmeter – Phantom loading – Induction type energy meter : Principle and operation – Measurement of flux density in ring specimens – Hopkinson Permeameter.

UNIT III POTENTIOMETERS AND INSTRUMENT TRANSFORMERS 12

DC potentiometer: Basic circuit, standardization, Laboratory type (Crompton's) – AC potentiometers: Drysdale (polar) type, Gall-Tinsley (coordinate) type – Applications of DC and AC potentiometers – Leeds Northrup self balancing potentiometer – Instrument Transformers: C.T and P.T – construction, theory, operation and characteristics.

UNIT IV MEASUREMENT OF R,L,C 12

Resistance Measurement : Series and Shunt type Ohmmeters, Megger, DC Bridges – Kelvin double bridge, Wheatstone bridge – AC Bridges – Inductance Measurement : Maxwell's bridge, Hay's bridge, Anderson bridge – Capacitance Measurement : Schering bridge and De Sauty's bridge – Sources of errors in bridge circuits.

UNIT V ELECTRONIC MEASUREMENTS 12

Electronic voltmeter: FET based Source follower type – Digital voltmeters: Ramp type and Integrating type – Analog to Digital Converter: Successive Approximation type – Digital frequency meter – Recorders: X-Y Recorder, Strip Chart Recorder and Magnetic Tape Recorder.

L: 45 T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

1. A.K. Sawhney, "A Course in Electrical & Electronic Measurements and Instrumentation", Dhanpath Rai and Company Private Limited, 2013.
2. E.W. Golding & F.C.Widdis, "Electrical Measurements and Measuring Instruments", A.H.Wheeler and Company, 2001.

REFERENCES

1. J.B.Gupta, "A Course in Electronic and Electrical Measurements and Instrumentation", S.K. Kataria and Sons, Delhi, 2003.
2. H.S.Kalsi, "Electronic Instrumentation", Tata McGraw Hill, 2004.
3. Martin U. Reissland, "Electrical Measurement – Fundamental Concepts and Applications", New Age International Private Limited, 2001.

13EI44 CONTROL SYSTEMS L T P C
3 1 0 4

COURSE OUTCOMES

Upon completion of the course, students will be able to

- Analyze the performance of linear feedback control systems.
- Describe the transient and steady state response of linear systems
- Investigate the stability Analysis of linear control systems
- Describe the concepts of frequency domain analysis in control engineering
- Analyze the various types of compensator design in control Systems

UNIT I MODELING OF PHYSICAL AND ELECTRICAL SYSTEM 12

Concepts of typical Control system –Open loop and closed loop control system - Applications – Transfer function- Mathematical modeling of electrical systems, mechanical systems- Electrical analogy of mechanical translational and mechanical rotational system – Transfer function model of D.C Servo motor and A.C servomotor – Block diagram reduction technique - Signal flow graph representation using Mason's gain formula.

UNIT II TIME RESPONSE ANALYSIS 12

Time response and its classification-Standard test signals – Time response of First order and Second order system ,Time domain specifications – delay time, rise time, peak time, settling time, peak overshoot. Steady state error and error constants- position, velocity and acceleration error constants – Generalized error series- P, PI, PID modes of feed back control.

UNIT III STABILITY OF CONTROL SYSTEM 12

Characteristics equation – Routh Hurwitz criterion of stability- Absolute and Relative stability - Concepts of Root Locus – Design procedure and construction of root locus technique .

UNIT IV FREQUENCY DOMAIN ANALYSIS 12

Frequency domain specifications - Bode plot - Polar plot – Determination of gain margin and phase margin from Magnitude and phase angle plot - Nyquist stability criterion – Correlation between frequency domain and time domain specifications.

UNIT V COMPENSATOR DESIGN 12

Performance criteria - Lag, Lead, Lag Lead networks – compensation design using Bode Plot and root locus - Introduction to state variable representation of continuous time system.

L: 45 T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

1. I.J. Nagrath and M.Gopal, "Control Systems Engineering", New Age International Publishers, 2007.
2. M. Gopal, "Control Systems, Principles and Design", Tata McGraw Hill, New Delhi, 2005.

REFERENCES

1. Benjamin C. Kuo, "Automatic Control systems", Pearson Education, New Delhi, 2009.
2. K. Ogata, "Modern Control Engineering", 4th Edition, PHI, New Delhi, 2005.
3. Richard.C. Dorf & Robert.H.Bishop, "Modern Control Systems", Addidon – Wesley, 2011.

13EI45 ELECTRICAL MACHINES L T P C
3 0 0 3

COURSE OUTCOMES

Upon completion of the course, students will be able to

- Explain the principle of operation of a DC Machine
- Compare the different types of transformer and derive its EMF equation
- Explain the principle of operation of synchronous machine with its starting methods
- Derive the transformer equivalent circuit of an Induction motor
- Analyze the different types of single phase machines

UNIT I D.C. MACHINES 9

Construction of D.C. Machines - Principle and theory of operation of D.C generator - EMF equation – Armature reaction - Principle of operation of D.C Motor - Torque equation - Types of D.C. Motors – Starters - Speed control of D.C Motors.

UNIT II TRANSFORMERS 9

Principle - Theory of ideal transformer - EMF equation - Construction details of shell and core type transformers – OC and SC tests - Equivalent circuit - Regulation and efficiency of a transformer - Introduction to three - phase transformer connections.

UNIT III SYNCHRONOUS MACHINES 9

Principle of alternators:- Construction details - salient and non-salient pole- Equation of induced EMF- EMF method- Synchronous motor - Starting methods, V curves and inverted V -Hunting.

UNIT IV INDUCTION MACHINES 9

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

UNIT V SPECIAL MACHINES 9

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

TOTAL: 45 PERIODS

TEXT BOOKS

1. Nagrath, I.J., and Kothari, D.P., “Electrical Machines”, Tata McGraw - Hill, 3rd Edition, 2004.
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. Chand and Company, 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 Limited, London, 1999.

13EI46 DIGITAL SYSTEM DESIGN AND APPLICATIONS L T P C
3 1 0 4

COURSE OUTCOMES

Upon completion of the course, students will be able to

- Build the basics of digital systems design with a focus on FPGA design.
- Design the combinational and sequential hardware system.
- Describe the Testing in digital circuits and testability

UNIT I DIGITAL LOGIC FAMILIES 12

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 II DIGITAL MEMORIES 12

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

UNIT III SYSTEM DESIGN USING PLDs AND CPLDs 12

Structure of Standard PLDs and Complex PLDs (CPLDs) – Design of combinational and sequential circuits using PLDs and CPLDs – Design of state machines using Algorithmic State Machines (ASM) chart as a design tool.

UNIT IV INTRODUCTION TO FIELD PROGRAMMABLE DEVICES 12

Field programmable combination devices, Field programmable logic sequences, Types of FPGA – Xilinx XC2000 & XC3000 series – Logic Cell Array (LCA) – Configurable Logic Blocks (CLB) – Input/Output Blocks (IOB) – Programmable Interconnection Points (PIP).

UNIT V TESTING IN DIGITAL CIRCUITS AND DESIGN FOR TESTABILITY 12

Detection and location of faults in combinational logic circuits –Stuck-at-fault model – Path sensitising method – Boolean difference method – Fault detection and location in synchronous sequential circuits – Design for testability – Adhoc techniques – Scan registers – Level Sensitive Scan Design – Boundary Scan -Built-in-self test.

L: 45 T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

1. Charles H.Roth, “Fundamentals Logic Design”, 4th Edition, Jaico Publishing, 2002.
2. Miron Abramonici, Melvin. A. Rrewer, Arthur.D. Friedman, “Digital System Testing and Testable Design”, Jaico Publishing house, 2002.

REFERENCES

1. Robert K Dueck, “Digital Design with CPLD applications and VHDL”, Thomson Asia, 2002.
2. Donald. P. Leach, Albert paul Malvino, Goutam Suha, “Digital Principles and Applications”, 6th Edition, Tata McGraw –Hill, 1997.

13EI47 TRANSDUCERS AND MEASUREMENTS LABORATORY L T P C
0 0 3 2

COURSE OUTCOMES

Upon completion of the course, students will be able to

- Observe the principles of operation of sensors and transducers.
- Demonstrate and analyze the practical concepts about different sensors and transducers which are useful for measuring process parameters through experimentation.
- Design the measurement system and criticize the output for the measurement of resistance, capacitance and inductance.

LIST OF EXPERIMENTS

1. 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
5. Characteristics of RTD, thermistor and thermocouple
6. Step response characteristics of RTD, thermocouple and thermistor.
7. Measurement of resistance using Wheatstone and Kelvin's bridges.
8. Measurement of capacitance using Schering Bridge and Measurement of inductance using Anderson Bridge.
9. Calibration of Single-phase Energy meter and wattmeter.
10. Calibration of Ammeter and Voltmeter.
11. Calibration of series and shunt type ohmmeters.
12. Statistical Analysis of Random Errors.
13. Study of smart transducers.

TOTAL: 45 PERIODS

13EI48 ELECTRICAL MACHINES AND CONTROL SYSTEMS LABORATORY **L T P C 0 0 3 2**

COURSE OUTCOMES

Upon completion of the course, students will be able to

- Describe the performance of DC shunt generators under load/no load conditions
- Compare the characteristics of different types of DC motors and induction motors under loaded conditions
- Analyze the performance of transformers on no load/load conditions
- Analyze the linear systems and controllers using Software Package.
- Determine the transfer functions of DC generator and DC motor.

LIST OF EXPERIMENTS

1. Open circuit and load characteristics of separately excited and self excited D.C. generator.
2. Load test on D.C. shunt motor.
3. Swinburne's test and speed control of D.C. shunt motor.
4. Load test on single phase transformer and open circuit and short circuit test on single phase transformer
5. Regulation of three phase alternator by EMF and MMF methods.
6. Load test on three phase induction motor.
7. No load and blocked rotor tests on three phase induction motor (Determination of equivalent circuit parameters)
8. Study of D.C. motor and induction motor starters.
9. Digital simulation of linear systems.
10. Stability Analysis of Linear system.
11. Study the effect of P, PI, PID controllers.
12. Design of Lead and Lag compensator.
13. Transfer Function of separately excited D.C. Generator.
14. Transfer Function of armature and Field Controller D.C. Motor.

TOTAL: 45 PERIODS

13EI49 COMMUNICATION SKILLS AND TECHNICAL SEMINAR L T P C
0 0 3 2

COURSE OUTCOMES

Upon completion of the course, students will be able to

- Express themselves fluently and appropriately in social and professional contexts.
- Develop the sub-skills required for paper presentations and group discussions.
- Acquire the soft skills and interpersonal skills which will help them to excel in their workplace.

A) LANGUAGE FUNCTIONS (15 hrs)

1. Compare and contrast
2. Giving reasons
3. Reporting
4. Expressing agreement and disagreement
5. Evaluating different standpoints
6. Analyzing a problem and giving solution.
7. Describing daily routines, events, and weather
8. Describing Objects
9. Defending a point of view
10. Talking about future plans and intentions

Language Functions:

The teacher should build micro activities to develop the use of language required to handle these Sub-functions of communication. In the process, the learners should get used to the linguistic. Elements needed for these functions.

B) SPEECH PRACTICE (15 hrs)

The themes are:

1. Cloning
2. Artificial satellites
3. Renewable sources
4. Telecommunication
5. Cyber Revolution
6. Space research
7. Polythene pollution
8. Fossil fuels
9. Safety measures in Automobiles.
10. Ecological threats
11. Water resources
12. Nuclear technology
13. Scientific farming
14. Thermal power plants
15. Nano Technology
16. Robotics
17. Artificial intelligence
18. Role of Fibre Optics
19. Exploration of Mars
20. Gas turbines
21. Indian space missions
22. Converting agricultural wastes for useful purposes
23. Developments in transportation
24. Scientific Farming
25. Impact of global warming
26. Desalination of water
27. Technology for national security

28. Industrial development and ecological issues
29. Recent trends in Automobiles
30. Hazards of E-waste
31. Mobile Jammer
32. Touch Screen Technology
33. Tidal Power
34. 3G Technology
35. Tsunami Warning System
36. Blue Tooth Technology

Seminar presentation on the themes allotted:

Each student should collect materials from Books, Internet, Journals and Newspapers for his/her theme and prepare a short Seminar Paper for 4 to 5 Pages. The presentation should be for 10 minutes using power point frames. It should be followed by a Viva Voce during which others should come forward to question, clarify, supplement or evaluate.

C) GROUP DISCUSSION / DEBATE (10hrs)

Grouping (each group consisting of 12 members)
Topics (12 topics – 3 topics to be selected by each group - to be practiced in cycles)

Group Discussion / Debate Topics:

1. Advertising is a legalized form of lying- Discuss.
2. Communicative competency in English is the golden key for success in the Global arena.
3. Is it just to force people to retire?
4. Attitude decides one's altitude in life.
5. Should an aspiring student go for a course which is in demand or for a course which he/she likes?
6. Is westernization a cultural degradation or enrichment?
7. Is Brain drain a threat to India?
8. Can Nuclear Energy be replaced by solar energy? – Discuss.
9. Do Mobile phones spoil the youth?
10. No two generations see eye to eye- Discuss.
11. Is scientific advancement a boon or a bane?
12. Does ragging develop friendship?

D) SPEAKING ON THE GIVEN PICTURE/DIAGRAM/CHART/TABLE (5 hrs)
RECORD LAY OUT:

Every student has to maintain a record in which he/she has to incorporate the following details.

- First page containing learner details and the topic of specialization
- Use of appropriate Language used in Language Function should be listed.
- Three news paper cuttings or journal or internet sources related to the specialized theme. (To be pasted on the pages)
- 10 Quiz questions of the specialized topic with expected answers.
- The seminar paper presented by the learner (to be pasted).
- Notes of observation - Lab. (Details about Interview skills – GD – Soft skills)
- The record should be duly signed by the course teacher and submitted to the External Examiner for verification during the semester practical.

TOTAL: 45 PERIODS

REFERENCES

1. Rizvi.M.Ashraf, "Effective Technical Communication", The MC Graw Hill Education Private Limited, Companies, New Delhi, 2010.
2. Sangeetha Sharma and Binod Mishra, "Communication Skills for Engineers and scientists", PHI Learning Private Limited, Delhi, 2009.

13EI51 INDUSTRIAL INSTRUMENTATION – II

L	T	P	C
3	1	0	4

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: outline the importance of instrumentation in industrial processes
CO2: explain the theory and operation of flow, level, viscosity, humidity and moisture measuring instruments.
CO3: compare available types of industrial instruments and made the proper selection for application under consideration.
CO4: explain the procedures for calibration of flow meters.
CO5: solve fundamental problems related to: flow, level, viscosity, Humidity and moisture.
CO6: participate in class discussions.

UNIT I VARIABLE HEAD TYPE FLOW METERS 12

Variable head type flow meters: - Orifice plate, Venturi tube, Flow nozzle and Dall tube – Installation of head flow meters – Conditioning Orifice Plates- Pitot tube.

UNIT II QUANTITY METERS, AREA FLOW METERS AND MASS FLOW METERS 12

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 meters:- Thermal and Coriolis – Temperature/pressure compensation in mass flow meters- Calibration of flow meters:– Dynamic weighing methods.

UNIT III ELECTRICAL TYPE FLOW METER 12

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 12

Level measurement:- Float, Displacer type and Bubbler system – Electrical level gauge:- Resistance and Capacitance – Nuclear radiation - Ultrasonic level transmitters - Guided Wave Radar Level Transmitters – vibration and microwave level switches- – Boiler drum level measurement. Leading manufacturers of flow and level instruments with specifications. (Non-descriptive).

UNIT V MEASUREMENT OF VISCOSITY, HUMIDITY AND MOISTURE 12

Viscosity:- Say bolt viscometer and Rotameter type viscometer – Consistency meters – Dry and wet bulb psychrometers – Hot wire electrode type hygrometer, Dew cell and Electrolysis type hygrometer – Commercial type dew point meter – Moisture measurement:- Different methods of moisture measurements- Moisture measurement in Instrument air supply.

L: 45 T: 15 TOTAL: 60 PERIODS

TEXT BOOKS

1. Doeblin E.O., “Measurement Systems Application and Design”, International Student Edition, 5th Edition, McGraw-Hill Book Company, 2004.

2. Patranabis D., “Principles of Industrial Instrumentation”, 3rd Edition, Tata McGraw-Hill Company Limited, 2011.

REFERENCES

1. Liptak B.G., “Instrumentation Engineers Handbook (Measurement)”, CRC Press, 2005.
2. Jain R.K., “Mechanical and Industrial Measurements”, Khanna Publishers, Delhi, 1999.
3. Eckman D.P., “Industrial Instrumentation”, Wiley Eastern Limited, 1990.

E-LEARNING RESOURCES

1. Lessons in Industrial Instrumentation :www.ibiblio.org/kuphaldt/socratic/sinst/book/liii.pdf
2. Industrial Flow measurement:http://eprints.hud.ac.uk/5098/1/macrabtreefinalthesis.

13EI52	INTEGRATED CIRCUITS AND APPLICATIONS	L	T	P	C
		3	1	0	4

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: explain the IC fabrication procedure and the characteristics of Operational Amplifiers.
CO2: design the circuits for signal analysis and describe the applications of Op-amp ICs.
CO3: illustrate the internal functional blocks and the applications of special ICs like Timers, PLL circuits, regulator circuits, ADCs.

UNIT I IC FABRICATION 12

Brief overview of microelectronic fabrication technology- Epitaxial Growth, masking and etching, Diffusion, Ion Implantation Processes-Description –Difference between discrete and integrated BJTs-cross-section of a MOSFET (enhancement and depletion type)-NMOS-PMOS-CMOS. Realization of monolithic ICs and packaging.

UNIT II CHARACTERISTICS OF OPERATIONAL AMPLIFIER 12

Introduction to operational amplifiers – Basic differential amplifier - dual input balanced output and unbalanced output - Internal block schematic of op amp - Power supply requirements - Op-amp parameters - ideal op amp Open loop gain – input and output impedance – frequency response, frequency compensation. Slew rate, Input bias current – offset - drift - compensating networks CMRR, SVRR, finite gain bandwidth and its effect in op amp circuit performance. Open loop and closed loop op amp configurations: Feedback configurations - Voltage series feedback and voltage shunt feedback -concept of virtual ground - voltage follower

UNIT III APPLICATIONS OF OPERATIONAL AMPLIFIER 12

Difference amplifiers with one op amp and 3 op amps - Use of offset minimizing resistor (ROM) and its design. Instrumentation amplifier IC and its application. Op amp applications - Summing - Difference – Log and Antilog amplifiers - V/I & I/V converters- Integrator and differentiator, multivibrators, waveform generators, clippers, clampers. Comparators: zero crossing – with reference voltage - regenerative (Schmitt trigger) comparators, window detector. Peak detector circuit. Precision rectifiers. Sample and hold circuit-ADC- successive approximation, flash, integrating. DAC —weighted, R-2R; ADC-DAC-performance specifications.

UNIT IV SPECIAL ICs 12

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 12

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 T:15 TOTAL: 60 PERIODS

TEXT BOOKS

1. Ramakant A.Gayakward, “Op-amps and Linear Integrated Circuits”, 4th Edition, Pearson Education, 2003.
2. D.Roy Choudhary, Sheil B.Jani, “Linear Integrated Circuits”, 2nd Edition, New Age, 2004.

REFERENCES

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.
3. David A.Bell, “Op-amp & Linear ICs”, Prentice Hall of India, 2nd Edition, 2006.
4. Sergio Franco, “Design with operational Amplifiers & Analog ICs”, Tata McGraw Hill.1998.

13EI53 INDUSTRIAL MICROCONTROLLERS AND APPLICATIONS	L	T	P	C
	3	0	0	3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: learn importance of microcontroller in designing embedded applications

CO2: learn use of hardware and software tools

CO3: develop interfacing to real world devices

UNIT I INTRODUCTION TO MICROCONTROLLERS 9

8 bit Microprocessor and Microcontroller architecture, comparison, advantages and applications of each Harward and Von Neumann architecture, RISC and CISC comparison. Survey of 8 bit controllers and its features Definition of embedded system and its characteristics. Role of microcontroller in embedded System. Software and hardware tools for development of microcontroller based system such as assembler, compiler, IDÉ, Emulators, debugger, programmer, development board.

UNIT II 8051 MICROCONTROLLER ARCHITECTURE 9

MCS-51 architecture, family devices & its derivatives. Port architecture, memory organization, Interrupt structure, timers and its modes & serial communication and modes. Overview of Instruction set.

UNIT III PIC MICROCONTROLLER ARCHITECTURE 9

PIC18f architecture, registers, memory Organization and types, stack, oscillator options, BOD, power down modes and configuration bit settings. Port structure, interrupt structure & timers of PIC18F. Brief summary of Peripheral support Overview of instruction set, MPLAB IDE & C18 Compiler.

UNIT IV PIC MICROCONTROLLER PROGRAMMING 9

MSSP structure, UART, SPI, I2C, ADC, Comparators Interfacing serial port, ADC, RTC with I2C and EEPROM with SPI. Use of timers with interrupts,PWM generation. All programs in embedded C.

UNIT V PIC MICROCONTROLLER APPLICATIONS 9

Interfacing of switches, LED, LCD, Keypad, All programs in embedded C. Design of DAS system, Design of frequency counter with display on LCD, Design of Digital Multimeter, Design of DC Motor control using PWM Should cover necessary signal conditioning of input stage, hardware interfacing with PIC Microcontroller and algorithm or flowchart.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. K.J. Ayala, “The 8051 Microcontroller architecture, programming & Applications”, Penram Internal publishing (India), 2014.
2. M.A. Mazidi, “PIC Microcontroller & Embedded System”, 3rd Edition, Pearson 2008.

REFERENCE

1. M.A. Mazidi, “8051 Microcontroller & Embedded System”, 3rd Edition, Pearson 2008.

E-LEARNING RESOURCES

1. 18F xxx reference manual- www.microchip.com
2. I2C,EEPROM,RTC data sheets from www.ti.com

13EI54 MODERN CONTROL SYSTEMS

L	T	P	C
3	1	0	4

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: solve ordinary differential equations using Laplace Transformation and Inverse Laplace transformation.

CO2: describe the concept of sampling, digital data and discrete time systems.

CO3: model first and second-order linear dynamic systems such as mechanical, electrical and thermal-fluid systems.

CO4: determine stability analysis for the various dynamic systems.

UNIT I STATE SPACE ANALYSIS OF CONTINUOUS TIME SYSTEMS 12

State variable representation – State model of linear system, Conversion of state variable form to transfer function, State space representation using physical, phase and canonical variables, Eigen values and Eigenvectors – Solution of state equation – Concepts of controllability and observability.

UNIT II TRANSFORM AND SAMPLED DATA SYSTEMS 12

Sampled data theory – Sampling process – Sampling theorem – Signal reconstruction – Sample and hold circuits – z-Transform – Theorems on z-Transforms – Inverse z-Transforms – Discrete systems and solution of difference equation using z transform – Pulse transfer function – Response of sampled data system to step and ramp Inputs – Stability studies – Jury's test and bilinear transformation.

UNIT III STATE SPACE ANALYSIS OF DISCRETE TIME SYSTEMS 12

State variables – Canonical forms – Digitalization – Solution of state equations – Controllability and Observability – Effect of sampling time on controllability – Pole placement by state feedback – Linear observer design – First order and second order problems.

UNIT IV DIGITAL CONTROL 12

Digital PI, PD and PID Controller – Position and velocity forms – state regulator design – Design of state observers-Effects of the addition of the observer on a closed loop-Transfer function for the controller observer - Minimum order observer – dead beat control by state feedback and dead beat observers.

UNIT V NONLINEAR SYSTEMS 12

Introduction to nonlinear systems, Behavior of nonlinear system, Types of nonlinearity – Typical examples –Describing function – Basic concepts – Describing function of Dead Zone and saturation nonlinearity, Describing function of Dead Zone nonlinearity – Liapunov stability analysis – Stability in the sense of Liapunov – Definiteness of scalar functions – Quadratic forms – Second method of Liapunov – Liapunov stability analysis of linear time invariant systems.

L: 45 T: 15 TOTAL: 60 PERIODS

TEXT BOOKS

1. Gopal M., "Digital Control and State Variable Methods", 3rd Edition, Tata McGraw Hill, 2008.
2. Gopal M., "Modern Control Engineering", New Age International, 2005.

REFERENCES

1. Richard C. Dorf and Robert H. Bishop, “Modern Control Systems”, 8th Edition, Pearson Education, 2004.
2. Gopal M., “Control Systems: Principles and Design”, 2nd Edition, Tata McGraw Hill, 2003.
3. Katsuhiko Ogata, “Discrete-Time Control Systems”, Pearson Education, 2002.
4. Nagoor Kani.A, “Advanced Control Theory”, RBA Publications, 2011.

E-Learning Resources

1. http://nptel.ac.in/courses/108103008/
2. http://control.asu.edu/Classes/MMAE543/543.

13EI55 PROFESSIONAL ETHICS AND HUMAN VALUES **L T P C**
(Common to all branches) **3 0 0 3**

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: Understood the core values that shape the ethical behavior of an engineer
CO2: Exposed awareness on professional ethics and human values.
CO3: Known their role in technological development

UNIT I HUMAN VALUES 9

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies. 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 - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - Moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (IETE),India, etc.

L: 45, TOTAL: 45 PERIODS

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw-Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCES

1. Charles E Harris, Michael S. Protchard and Michael J Rabins, “Engineering Ethics – Concepts and Cases”, Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
2. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003.

3. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.
4. Charles D. Fleddermann, “Engineering Ethics”, Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint)

13EI56 COMMUNICATION SYSTEMS L T P C
3 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO 1: Explain the basic concepts of Analog transmission and reception techniques.
CO 2: Discuss the fundamental concepts of Digital Communication.
CO 3: Describe the concepts of telemetry system.

UNIT I AMPLITUDE MODULATION 9

Principles of amplitude modulation – AM envelope, frequency spectrum and bandwidth, modulation index and percent modulation, AM power distribution, AM modulator circuits – low level AM modulator, medium power AM modulator, AM transmitters – low level transmitters, high level transmitters, Receiver parameters. AM reception: AM receivers – TRF, Superheterodyne receivers, Double Conversion AM receivers.

UNIT II ANGLE MODULATION 9

Angle Modulation – FM and PM wave forms, phase deviation and modulation index, frequency deviation, phase and frequency modulators and demodulators, frequency spectrum of a angle modulated waves, Bandwidth requirement, Broadcast band FM, Average power FM and PM modulators – Direct FM and PM, Direct FM transmitters, Indirect transmitters, Angle modulation Vs. amplitude modulation. FM receivers: FM demodulators, PLL FM demodulators, FM noise suppression, Frequency Vs. phase Modulation.

UNIT III PULSE MODULATION 9

Pulse modulations – concepts of sampling and sampling theorems, PAM, PWM, PPM, PTM, quantization and coding: PCM, DM, slope overload error. ADM, DPCM

UNIT IV DIGITAL MODULATION 9

Introduction, Binary PSK, DPSK, Deferentially encoded PSK, QPSK, M-ary PSK, QASK, Binary FSK, MSK, Duo-binary encoding – Performance comparison of various systems of Digital Modulation.

UNIT V BIOMEDICAL TELEMETRY SYSTEM 9

Components of telemetry system, Bio-telemetry and its importance, Single and multi-channel biotelemetry, ECG telemetry system, Temperature telemetry system, Telemetry of Respiration, Multi-patient telemetry, Implantable telemetry for blood pressure and blood flow systems, transmission of analog physiological signals over telephone line, Essential parameter for telemedicine and applications.

L:45 TOTAL: 45 PERIODS

TEXT BOOKS

1. Wayne Tomasi, “Electronic Communication Systems: Fundamentals through Advanced”, 5th Edition, Pearson Education, 2003.
2. Simon Haykin, “Digital Communications”, 5th Edition, John Wiley & Sons, 2003.

REFERENCES

1. John G. Proakis, “Digital communications”, 5th Edition, Tata McGraw-Hill, 2008.
2. Taub and Schilling, “Principles of Communication Systems”, 2nd Edition, Tata McGraw-Hill, 2003.
3. Martin S. Roden, “Analog and Digital Communication System”, 3rd Edition, PHI, 2002.
4. Blake, “Electronic Communication Systems”, 2nd Edition, Thomson Delman, 2002.

13EI57	INDUSTRIAL MICROCONTROLLERS LABORATORY	L	T	P	C
		0	0	3	2

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: capable for programming in the microcontroller

CO2: interface the real world input and output signal

LIST OF EXPERIMENTS

1. Study of PIC Microcontroller Kit
2. Write a program for interfacing button, LED, relay & buzzer as follows
   - when button 1 is pressed relay and buzzer is turned ON and LED's start chase from left to right
   - when button 2 is pressed relay and buzzer is turned OFF and LED start chasing from right to left
3. To display message on LCD without using any standard library function.
4. Interfacing 4X4 keypad and displaying key pressed on LCD or on HyperTerminal.
5. Generate square wave using timer with interrupt
6. Interfacing serial port with PC both side communication.
7. Interfacing DS1307 RTC chip using I2C and display date and time on LCD
8. Interfacing EEPROM 24C128 using SPI to store and retrieve data
9. Interface analog voltage 0-5V to internal ADC and display value on LCD
10. Generation of PWM signal for DC Motor control.

P: 45 TOTAL: 45 PERIODS

13EI58	LINEAR AND DIGITAL INTEGRATED CIRCUITS LABORATORY	L	T	P	C
		0	0	3	2

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: demonstrate the linear and digital integrated circuits used in simple system configuration.
CO2: design the circuits for signal analysis using Op-amp ICs.

LIST OF EXPERIMENTS

1. Study of Basic Digital IC's. (Verification of truth table for AND, OR, EXOR, NOT,NOR, NAND, JK FF, RS FF, D FF)
2. Implementation of Boolean Functions, Adder/ Subtractor circuits.
3. Code converters, Parity generator and parity checker, 2s Complement, Encoders and Decoders using suitable IC's.
4. Counters: Design and implementation of 4-bit modulo counter.
5. Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC's.
6. Multiplexer/ De-multiplexer: 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: 45 PERIODS

13EI61	INDUSTRIAL PROCESS CONTROL	L	T	P	C
		3	1	0	4

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: model the real time process

CO2: design the controller

CO3: determine the controller parameter

CO4: implement the complex control loop with suitable final control element

UNIT I INTRODUCTION TO PROCESS CONTROL 12

Need for process control – Process with dead time, Process with inverse response – Continuous and Batch process – Degree of freedom – Self regulating and non self regulating processes - Servo and Regulator operation - Mathematical model of first order liquid level and thermal processes – Higher order process – Interacting and non-interacting systems – P&ID symbols.

UNIT II CHARACTERISTICS OF CONTROLLER 12

Control System parameter - Basic control action – Characteristics of Discontinuous controller modes – Two position mode – Multiposition mode – Floating controller mode - Characteristics of continuous controller - Proportional, Integral and Derivative control modes – Composite control modes – P+I, P+D and P+I+D control modes.

UNIT III ANALOG CONTROLLER AND TUNING 12

Electronic controllers to realize various control actions – Pneumatic Controllers – Simple performance criteria – IAE, ISE, ITAE and ¼ decay ratio –select the type of feedback controller – Tuning of controllers – Ziegler-Nichol's method and Cohen Coon method.

UNIT IV CONTROL SYSTEMS WITH MULTIPLE LOOPS 12

Cascade control – Feed forward control – Ratio control – Selective control systems – Split range control – Adaptive and inferential control - Case study of control schemes of binary distillation column.

UNIT V FINAL CONTROL ELEMENT 12

Final control operation – Signal conversion - I/P converter – Pneumatic and electric actuators – Classification of control valves – Valve positioner – Control valves characteristics – Control valve sizing – Cavitations and flashing – Selection of control valves.

L: 45 T: 15 TOTAL: 60 PERIODS

TEXT BOOKS

1. Curtis.D.Johnson, "Process Control Instrumentation Technology", 7th Edition, Pearson Education, New Delhi, 2002.
2. G.Stephanopoulis, "Chemical Process Control", Prentice Hall of India, New Delhi, 2003.

REFERENCES

1. Donald P. Eckman, "Automatic Process Control", Wiley Eastern Ltd., New Delhi, 1993.
2. Peter Harriott, "Process Control", Tata McGraw Hill, New Delhi, 1985.

E-LEARNING RESOURCES

1. http://nptel.ac.in/courses/103101003.
2. http://elearning.vtu.ac.in/06IT64.html

13EI62 ANALYTICAL INSTRUMENTATION

L	T	P	C
3	0	0	3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: describe the various techniques and methods of spectral analysis which occur in the various regions of the spectrum.

CO2: apply knowledge in the analysis of separation of components in a complex mixture using chromatographic techniques and also in the determination of elements in a chemical analysis using electromagnetic resonance techniques.

CO3: extend their views in the qualitative and quantitative estimation of industrial gases and also in the control of environmental pollution.

CO4: outline the latest ideas on Ion-selective electrodes, Radiation detectors and Microscopic techniques which have potential applications in chemical analysis for identifying the components.

UNIT I COLORIMETRY AND SPECTROPHOTOMETRY 9

Elements of an analytical instrument – Beer-Lambert law – Various components of an absorption instrument – Colorimeters: Single beam filter photometer and Double beam filter photometer – UV-Visible spectrophotometers: Single beam and double beam instruments – IR Spectrophotometers: Sources and detectors, Types-Attenuated Total Reflectance technique, FTIR Spectrophotometer – Atomic Absorption Spectrophotometer – Flame Photometer – Fluorescence Spectroscopy: Single beam and double beam filter fluorimeters.

UNIT II CHROMATOGRAPHY AND ELECTRO MAGNETIC RESONANCE TECHNIQUES 9

Chromatography techniques: Gas Chromatography, High Pressure Liquid Chromatography – Electro Magnetic Resonance techniques: Nuclear Magnetic Resonance (NMR) spectrometer – Basic principle, Instrumentation and applications, Electron Spin Resonance (ESR) spectrometer – Basic principle, Instrumentation and applications.

UNIT III INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING INSTRUMENTS 9

Type of gas analyzers: Paramagnetic Oxygen analyzer, IR analyzer, Thermal conductivity analyzer, Analysis based on ionization of gases – Pollution monitoring instruments: Estimation of Carbon monoxide, Nitrogen oxides, Sulphur dioxide – Measurement of Total Dissolved Solids (TDS): Gravimetry method and Conductivity method, Practical considerations.

UNIT IV pH METERS AND RADIATION DETECTORS 9

Types of pH meter: Null indication type, Chopper amplifier type, Digital pH meter – Electrodes: Glass electrode, Reference electrodes – Ion Selective Electrodes (ISEs): Solid state electrode, Gas sensing electrode, Bio catalytic membrane electrode – Radiation detectors: Ionization chamber, Geiger Muller counter, Proportional counter, Scintillation counter.

UNIT V MICROSCOPIC TECHNIQUES 9

Scanning Electron Microscope (SEM): Basic principle, Instrumentation and applications – Transmission Electron Microscope (TEM): Basic principle, Instrumentation and applications – Mass spectrometer: Basic principle, Types-Magnetic deflection and Time of flight, Applications.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. Khandpur, R.S. “Handbook of Analytical Instruments”, 2nd Edition, Eighth Reprint, Tata McGraw Hill Education Private Limited, 2011.
2. Robert D Braun, “Introduction to Instrumental Analysis”, Pharma Med Press, 2006.

REFERENCE

1. Liptak, B.G, “Process Measurement and Analysis”, 4th Edition, CRC Press, 2003.
2. Willard, H.H., Merritt, L.L., Dean, J.A., Settle, F.A., “Instrumental Methods of Analysis”, 7th Edition (1st Indian Edition), CBS publishing & distribution, 1986.

E-LEARNING RESOURCE

1. http://www.chemistryland.com/CHM130FieldLab/Lab2/Lab2.html

13EI63	DIGITAL SIGNAL PROCESSING TECHNIQUES	L	T	P	C
		3	1	0	4

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: classify the different types of signals and systems.

CO2: describe the different transforms and analyze the discrete time signals and systems.

CO3: realize the use of LTI filters for filtering different real world signals.

UNIT I INTRODUCTION 12

Mathematical representation of Continuous and discrete time signals: Classification of Signals – Periodic, Aperiodic, even, odd, energy and power signals, Deterministic and random signals, complex exponential and sinusoidal signals, periodicity, spectral density. Sampling theorem in time domain, sampling of analog signals, DT signals, Classification of the discrete time systems with its properties.

UNIT II Z TRANSFORM 12

Need for transform, relation between Laplace transform and Z transform, Properties of ROC and properties of Z transform, Relation between pole locations and time domain behavior, causality and stability considerations for LTI systems, Inverse Z transform, Power series method, partial fraction expansion method, Solution of difference equations.

UNIT III DISCRETE FOURIER TRANSFORMS 12

DFT, Properties of DFT, circular convolution, linear convolution, Computation of linear convolution using circular convolution, FFT, decimation in time and decimation in frequency using Radix-2 FFT algorithm.

UNIT IV FILTER DESIGN 15

IIR Filter Design: Concept of analog filter design, Design of IIR filters from analog filters, IIR filter design by approximation of derivatives, IIR filter design by impulse invariance method, Bilinear transformation method, warping effect. Characteristics of Butterworth filters and Chebyshev filters, Butterworth filter design.

FIR Filter Design: Ideal filter requirements, Gibbs phenomenon, windowing techniques, characteristics and comparison of different window functions, Design of linear phase FIR filter using windows and frequency sampling method.

Filter realization using direct form, cascade form and parallel form

UNIT V INTRODUCTION OF DIGITAL SIGNAL PROCESSOR AND APPLICATIONS 09

Basic elements of DSP and its requirements, advantages of Digital over Analog signal processing. General Architecture of DSP, Case Study of TMS320C67XX. Application of DSP to Voice Processing, Music processing and Image processing.

L: 45 T:15 TOTAL: 60 PERIODS

TEXT BOOKS

1. John G. Proakis, Dimitris G. Manolakis, “Digital Signal Processing: Principles, algorithms and applications”, 4th edition, Pearson Prentice Hall, 2007.
2. S. Salivahanan, C. Gnanapriya, “Digital Signal processing”, Tata McGraw Hill Education, 2011.

REFERENCES

1. Dr. Shaila Apte, “Digital Signal Processing”, 2nd Edition, Wiley India Publication, 2011.
2. K.A. Navas, R. Jayadevan, “Lab Primer through MATLAB”, PHI Learning Private Limited, Delhi, 2014.
3. Li Tan, Jean Jiang, “Digital Signal Processing: Fundamentals and applications”, Academic press, 2013.

13EI64 BIOMEDICAL INSTRUMENTATION

L	T	P	C
3	1	0	4

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: name and explain the organs of Nervous, cardio vascular and respiratory system of human body.

CO2: classify and select the transducers for biomedical applications.

CO3: explain the working of electrical & non-electrical physiological measurement devices and imaging instruments.

CO4: explain the working of rehabilitation and assisting devices.

UNIT I PHYSIOLOGY AND TRANSDUCERS 12

Cell and its structure – Resting and Action Potential – Propagation of action potential – Nervous system : Nerve cell – synapse – CNS- PNS-Electro physiology of heart and lungs-Mechanism of Hearing, Sound Conduction System – Anatomy of Eye – Introduction to biosensor and types.

UNIT II ELECTRO-PHYSIOLOGICAL MEASUREMENT 12

General block diagram of Biomedical Instrumentation system – 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. Basic Audiometer; Pure tone audiometer – ophthalmoscope, Tonometer, Perimeter. Electrical safety in medical environment: shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipments.

UNIT III NON-ELECTRICAL PARAMETER MEASUREMENT 12

Measurement of blood pressure –blood flow- Cardiac output – Heart rate – phonocardiography – Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – pH of blood –measurement of blood pCO2, pO2, - Introduction to ESR, GSR measurements.

UNIT IV MEDICAL IMAGING AND TELEMETRY 12

Radiographic and fluoroscopic techniques – Instrumentation in Computer tomography – MRI –Ultrasonography – Endoscopy – Thermography – Introduction to PET and SPECT - Different types of biotelemetry systems, telemedicine and patient monitoring.

UNIT V REHABILITATION AND ASSISTIVE DEVICES 12

Rehabilitation: Definition, Introduction to Concept of Rehabilitation, Types of rehabilitation: Sensory & Motor rehabilitation. Electronic Travel Appliances (ETA) : Path Sounder, Ultrasonic Torch, Nottingham Obstacle Sensors, Polarized Ultrasonic Travel aids, Materials used for wheel chairs, Type of Wheel Chairs, Tricycle, Walkers. Types and working of Pacemakers – Defibrillators – Diathermy – Heart Lung machine.

L: 45 T:15 TOTAL:60 PERIODS

TEXT BOOKS

1. R.S.Khandpur, “Hand Book of Bio-Medical Instrumentation”, Tata McGraw Hill Publishing Company Limited, 2003.
2. Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, “Bio-Medical Instrumentation and Measurements”, 2nd Edition, Pearson Education, PHI 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, 1989.
3. J.Webster,“Medical Instrumentation Application and Design”, 4th Edition, Wiley, 2009.
4. C.Rajarao and S.K. Guha, “Principles of Medical Electronics and Bio-medical Instrumentation”, Universities Press (India) Limited, Orient Longman Limited, 2000.
5. Robinson C.J. , ‘Rehabilitation Engineering’ (CRC Press) 1995.
6. Ballabio E., ‘Rehabilitation Technology’ (IOS Press) 1993.
7. Guyton Arthur C., ‘Physiology of Human Body’, (Saunders College Publishing, Inc, Philadelphia, PA, U.S.A., 1979.

13EI65 PRODUCT DESIGN AND DEVELOPMENT

L	T	P	C
3	0	0	3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: illustrate Product development design and theories in developing a product.
CO2: infer different process and plans involved in Product development.
CO3: explain Scopes in identifying Customer needs and Technical Process in Product development.
CO4: select different concepts in Product design, selection and testing.
CO5: outline the concepts of Intellectual Property Rights, Patents.

UNIT I INTRODUCTION 9

Introduction to Product design-Modern Product development-Characteristics of Successful Product-Challenges of Product development-Theories and Methodologies in Design-Examples of Product Development Process-Xerox Corporation, Microsoft Corporation, Ford Motor Company

UNIT II PRODUCT DEVELOPMENT & PLANNING 9

Product Development Process:

Product Development Teams-Basics of a Team, Team Composition, Team Strategies, Team Building, Team Evaluation-Generic Development Process-Concept Development: Front End Process, Adapting Generic Development Process, Product Development Process Flows.

Product Planning:

Product Planning Process, Four Types of Project Development Project- Process, Identify Opportunities, Evaluate & Prioritize Project, Allocate Resources and Plan Timing, Complete Pre-Project Planning.

UNIT III SCOPES IN PRODUCT DEVELOPMENT 9

Technical & Business Concern:

Determination of development process-S curves and New product Development-Basic Method: Mission Statements and Technical Questioning-Advanced Method: Business case Analysis, Design Drivers.

Identifying Customer needs:

Customer Satisfaction-Gathering Customer needs-Organizing & Prioritizing Customer needs.

Benchmarking & Engineering Specification:

Benchmarking Approach-Examples of Benchmarking: Coffee Mills

UNIT IV CONCEPT-GENERATION, SELECTION & TESTING 9

Concept Generation:

Activity of Concept Generation-Five Step Method-Clarify problem, Search Externally, Search Internally, Explore Systematically, Effect on Results and Process.

Concept Selection:

Integral part of product Development process-Structured Method-Concept Screening-Concept Scoring-Caveats

Concept Testing:

Seven Step Method of Testing a Product-Purpose, Survey Population & Format, Communicate, Customer response, Result analysis

UNIT V PROTOTYPING, PATENTS & IPR, PRODUCT DEVELOPMENT ECONOMICS 9

Prototyping:

Basics-Principles-Technologies-Planning for Prototyping

Intellectual Property Rights:
IPR-Overview of Patents-utility Patents-7 step process in preparing a patent
Product Development Economics:
Elements of Economic Analysis-Economic Analysis Process (4 step Process)-Qualitative Analysis

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. Karl T.Ulrich and Steven D. Eppinger, "Product Design and Development", 3rd Edition, Tata McGraw- Hill, 2003, ISBN 0-07-058513-X .
2. Kevin Otto and Kristin Wood, "Product Design", Pearson Education, 2003, ISBN: 8129702711

REFERENCE

1. K.Chitale R.C. Gupta, "Product Design and Manufacturing", 6th Edition, Prentice - Hall India.2003.

E-LEARNING RESOURCE

1. www.nasscom.in

13EI67 COMPUTER CONTROL OF PROCESS LABORATORY

L	T	P	C
0	0	3	2

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: analyze the dynamics of different order process in analytically, simulation basis and experimentally

CO2: design and develop the electronic controller

CO3: analyze the closed loop behaviour of various process variable

CO4: implement the complex control loop

LIST OF EXPERIMENTS

1. Dynamics of first and second order systems
2. Simulation of different order processes with and without transportation lag
3. Characteristics of various transmitter
4. Realization of on-off controller using operational amplifier
5. Realization of Proportional controller using operational amplifier
6. Characteristics of control valve with and without positioned
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)

P: 45 TOTAL: 45 PERIODS

13EI68	INDUSTRIAL INSTRUMENTATION AND TELEMETRY LABORATORY	L	T	P	C
		0	0	3	2

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: measure the flow rate using differential pressure flow meters calibrate the variable area flow meter and pressure gauges
CO2: operate analytical instruments for the measurement of pH, Conductivity and absorptivity of a solution.
CO3: construct and demonstrate Amplitude and Frequency modulation using MATLAB.
CO4: perform measurements of Industrial parameters like Viscosity, Level and Torque.

LIST OF EXPERIMENTS

1. Determination of Discharge coefficient of Orifice plate and Venturi meter.
2. Measurement of flow rate using Pitot tube.
3. Measurement of pH and conductivity of a solution.
4. UV-Visible Spectrophotometer.
5. Level Measurement using Differential pressure Transmitter.
6. Pressure gauge calibration using Dead Weight Tester.
7. Calibration of Rotameter.
8. Calibration of Thermocouple.
9. Measurement of vacuum pressure.
10. Determination of Viscosity using Saybolt / Redwood viscometer.
11. Pulse rate/Respiration rate Measurements.
12. Generation of Amplitude Modulation.
13. Generation of Frequency Modulation.
14. Generation of Pulse Amplitude Modulation.
15. Generation of Unit Impulse Signal and Sine Signal.

P: 45 TOTAL: 45 PERIODS

13EI71 PRINCIPLES OF MANAGEMENT **L T P C**

(Common to all branches) **3 0 0 3**

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: discuss the development of management thoughts and different types of Business organization.

CO2: practice the process of planning and decision making in an industrial situations.

CO3: design the suitable selection process for a particular job description.

CO4: apply different motivational techniques and leadership skills in the organization.

CO5: justify the various controlling techniques and tools in the organization.

UNIT I INTRODUCTION **9**

Historical developments – approaches to management – Management and Administration – Development of Management Thoughts – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organization, Meaning, features merits and demerits - Social responsibility.

UNIT II PLANNING **9**

Nature and Purpose– Steps in Planning Process – Objectives – Setting Objectives – Process of Managing through Objectives – Strategies – Policies and Planning Premises – Forecasting – Importance, Methods of Forecasting - Decision-making, Decision making Process and Types of Decisions.

UNIT III FUNCTIONAL AREA OF ORGANISATION **9**

Formal and Informal organization – Organization Chart – Structure and Process – Departmentation by different strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process - Techniques – HRD – Managerial Effectiveness.

UNIT IV DIRECTION **9**

Objectives– Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment – Communication – Process of Communication – Types of Communication – Barriers and Breakdown - Effective Communication - Electronic Media in Communication.

UNIT V CONTROLLING STRATEGIES **9**

System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology– Computers in handling the information – Productivity – Problems and Management – Control of Overall Performance – Direct and Preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. Harold Koontz and Heinz Weihrich, “Essentials of Management – An International Perspective”, Tata Mcgraw Hill, 8th Edition, 2009.
2. Hellriegel, Slocum and Jackson, “Management – A Competency Based Approach”, ThomsonSouth Western, 11th Edition, 2008.

REFERENCES

1. Stephen P. Robbins and Mary Coulter, “Management”, Prentice Hall of India”, 8th Edition, 2012.
2. Charles W.L Hill, Steven L McShane, “Principles of Management”, Mcgraw Hill Education, Special Indian Edition, 2007.
3. Vijayaraghavan G.K and Sivakumar M. “Principles of Management”, Lakshmi Publications, 1st Edition, 2012.
3. Ramachandran. S. “Principles of Management”, Air Walk Publications, 1st Edition, 2012.
4. Andrew J. Dubrin, “Essentials of Management”, Thomson South western, 9th Edition, 2011.

13EI72 DATA ACQUISITION AND VIRTUAL INSTRUMENTATION **L T P C 3 0 2 4**

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO 1: explain the basic concepts of virtual instrumentation.
CO 2: develop the basic program using Virtual instrumentation
CO 3: describe the Data Acquisition concepts.
CO 4: discuss the working of various instrument interfaces.
CO 5: demonstrate the applications of virtual instrumentation.

UNIT I REVIEW OF VIRTUAL INSTRUMENTATION 15

Review of quantization of signals – sampling theorem – Historical perspective of VI, Advantages of VI, Define VI, block diagram and architecture of VI, Pallets in VI, Data Flow Techniques, graphical programming in data flow, comparison with conventional programming. VIs and sub-VIs.

UNIT II PROGRAMMING TECHNIQUES 15

Loops and charts, arrays, clusters, graphs, case and sequence structures, formula modes, local and global variable, string and file input / outputs – file formats – basics of ELVIS, Multisim – application to Electronic Circuits – Rectifiers – Filters – Transient circuits.

UNIT III DATA ACQUISITION BASICS 15

ADC, DAC, DIO, Counters and timers, PC Hardware structure, timing, interrupts, DMA, Software and Hardware Installation. GPIB/IEEE 488 concepts, and embedded system buses - PCI, EISA, CPCI, and USB.

UNIT IV COMMON INSTRUMENT INTERFACES 15

Current loop - RS 232C/RS 485 – GPIB - System basics - interface basics: PCMCIA – VXI – SCXI - PXI etc - networking basics for office and industrial application VISA and IVI - image acquisition and processing - Motion Control – ADC – DAC – DIO – DMM - waveform generator.

UNIT V USE OF ANALYSIS TOOLS AND APPLICATION OF VI 15

Fourier Transforms Power spectrum - Correlation methods - windowing and flittering - Application in Process Control projects - Major equipments – Oscilloscope - Digital Multimeter - Pentium Computers - temperature data acquisition system - motion control employing stepper motor.

L: 45 P: 30 TOTAL: 75 PERIODS

TEXT BOOKS

1. Skolkoff, “Basic concepts of LABVIEW 4”, PHI, 1998.
2. Gary Johnson, “LABVIEW Graphical Programming”, 2nd Edition, McGraw Hill, 2009.

REFERENCES

1. S. Gupta, J.P. Gupta, “PC Interfacing for Data Acquisition and Process Control”, ISA, 2nd Edition, 2010.
2. L.T. Amy, “Automation System for Control and Data Acquisition”, ISA, 1992.
3. Technical Manuals for DAS Modules of Advantech and National Instruments.
4. Lisa K. Wells and Jeffrey Travis, “LABVIEW for Everyone”, PHI, 1997.

13EI73 LOGIC AND DISTRIBUTED CONTROL SYSTEM L T P C
3 1 0 4

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO 1: describe the PLC components and basic programming concept.
CO 2: recognize the instruction used in PLC.
CO 3: develop the program using PLC for industrial applications.
CO 4: explain the basic concepts of DCS and its Interfacing.
CO 5: describe the functionality of SCADA

UNIT I PROGRAMMABLE LOGIC CONTROLLER 12

Advantages of PLC over relay logic – Parts of PLC – Principles of operation – PLC versus Computer – PLC Size and Application - PLC Hardware components - Basics of PLC programming - Programming timers and counters.

UNIT II INSTRUCTION IN PLC 12

Instructions in PLC – Program control instructions - Data manipulation instructions - math instructions - sequencer and shift register instructions – Programming concept using Instructions.

UNIT III APPLICATIONS OF PLC 12

PLC Installation Practices - Editing and Troubleshooting – Data acquisitions system - Application of PLC - Case study of bottle filling system, traffic light control system –PLC in Cement industry - Programming concept in Allen Bradely PLC and Siemens PLC.

UNIT IV DISTRIBUTED CONTROL SYSTEM AND ITS INTERFACING 12

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

UNIT V SCADA 12

Introduction to SCADA - SCADA Functional requirements and Components - General features, Functions and Applications, Benefits - Configurations of SCADA, RTU (Remote Terminal Units) Connections - SCADA Communication requirements - Structure of a SCADA Communications Protocol.

L: 45 T: 15 TOTAL: 60 PERIODS

TEXT BOOKS

1. Petruzella, “Programmable Logic Controller”, McGraw Hill, 3rd Edition, 2009.
2. Michael P. Lukas, “Distributed Control System”, Van Nostrand Reinhold Co., Canada, 2001.

REFERENCES

1. T. Hughes, “Programmable Logic Controllers”, ISA press, 2007.
2. Krishna Kant, “Computer based Industrial Control”, Prentice Hall, New Delhi, 2004.
3. http://nptel.ac.in/courses/108106022
4. M. Chidambaram, “Computer Control of Processes ”, Narosa Book Distributors Pvt Ltd, 2002.

WEB RESOURCE

1. http://www.industry.usa.siemens.com/automation/us/en/process-control-system/pas-whitepapers/Documents/dcsand-plc-cement.pdf

13EI74 INDUSTRIAL DATA NETWORKS L T P C
3 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: describe the performance of network fundamentals such as OSI, TCP\IP and internet working device.
CO2: recognize various data communication links.
CO3: describe knowledge of various communication protocols.
CO4: explain general concept of industrial ETHERNET.

UNIT I DATA NETWORK AND INTER NETWORKING 9

Network hierarchy – Open System Interconnection model of ISO - TCP/IP- Data link control protocol- HDLC, Medium access control protocol: Token ring - CSMA/CD. Internetworking devices: Hubs-Bridges - Routers - Gateways –Switching: circuit switching and packet switching

UNIT II DATA COMMUNICATION LINKS 9

Introduction-Transfer of process data: remote process interface, field multiplexer, field bus - LAN: concepts, topology and internetworking, transmission media, data transmission techniques, error handling techniques, IEEE project 802 standard - Virtual AN - Wireless AN: ARCNET - Manufacturing automation protocol

UNIT III HART AND FIELDBUS 9

Introduction- Evolution of signal standard – HART communication protocol – Communication modes – HART networks – HART commands – HART applications. Field bus: Introduction – General Field bus architecture – Basic requirements of Field bus standard – Field bus topology – Interoperability – Interchangeability – Introduction to OLE for Process Control (OPC).

UNIT IV MODBUS AND PROFIBUS 9

MODBUS protocol structure – function codes – troubleshooting Profibus: Introduction – profibus protocol stack – profibus communication model – communication objects – system operation – troubleshooting

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.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. Behrouz A. Forouzan, “Data Communications and Networking”, Tata McGraw Hill, 2006.
2. Steve Mackay, Edwin Wright, Deon Reynders, John Park, “Practical Industrial Data networks Design, Installation and Troubleshooting”, 1st Edition, Newnes publication, Elsevier 2004.

REFERENCES

1. Willam Stallings, “Wireless Communication and Networks” 2nd Edition, Prentice Hall of India 2005.

2. Andrew S. Tanenbaum, “Computer Networks”, 4th Edition, PHI/Pearson Education 2002.
3. Theodore S.Rappaport, “Wireless communication Principles and Practice”, 2nd Edition, Prentice Hall of India, 2001.
4. Dobrivoje Popovic Vijay P. Bhatkar “Distributed Computer Control for Industrial Automation”, Marcel Dekker. Inc., 1990.

13EI77	PRODUCT DESIGN AND DEVELOPMENT LABORATORY	L	T	P	C
		0	0	3	2

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: apply the knowledge of domain engineering concepts to design and development of products

CO2: test the performance of the designed product.

CO3: demonstrate the working of designed product.

- In this course, students are expected to design a product systematically proceeding towards realization of a hardware or software product. The task will contain conceptualization of a product, specification, design, drawings, choice of materials and methods, procurement of components, fabrication and assembly of devices. Evaluation will be based on the total work input and scholastic quality of the work done.
- For Final Exam the students will be evaluated by the department technical committee headed by HOD and marks will be awarded based on the report submitted and product demonstration.
- The internal mark for this course is calculated based on the individual performance of the student in every lab class based on their preparation and method of developing product.

P: 45 TOTAL: 45 PERIODS

13EI78 INDUSTRIAL AUTOMATION LABORATORY

L	T	P	C
0	0	3	2

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: write the PLC program for Industrial processes

CO2: develop the control programming in DCS for Industrial processes

LIST OF EXPERIMENTS

1. Design of Electronic On/Off controller with relay concept
2. Implementation of On Off controller using ELVIS
3. Micro-processor based temperature control system
4. Batch process control by Programmable Logic Controller
5. PLC controlled level process
6. Reaction vessel control using Programmable Logic Controller
7. Traffic light control Using Programmable Logic Controller
8. Bottle filling system controlled by Programmable Logic Controller
9. Computer controlled Closed loop response of Temperature process
10. Computer controlled Closed loop response of pressure process
11. Implementation of Controller for Pressure and Temperature process in Distributed Control system
12. Automation of the Cement Plant and Beverage Plant using Distributed Control system

P: 45 TOTAL: 45 PERIODS

13EI79 COMPREHENSION

L	T	P	C
0	0	3	1

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO 1: apply the acquired technical skills to solve problems.

CO 2: demonstrate the contemporary techniques related to instrumentation engineering.

CO 3: review, prepare and present technological developments.

CO 4: deliver effective oral presentation.

Three periods per week shall be allotted in the time table for the activity and this time shall be utilized by the student to receive guidance from the members of faculty on solving real-life problems, group discussions, seminar presentations and library reading. The continuous assessment and end semester evaluation may be carried out as specified in the guidelines to be issued from time to time, for which,

1. Two written tests of objective type questions from the courses up to 6^{th} semester.
2. Seminars on latest topics may be conducted.
3. Oral Exams on G.K, Technical knowledge and reasoning.
4. Group discussions, may be conducted.

P: 45 TOTAL: 45 PERIODS

13EI81 POWER PLANT INSTRUMENTATION L T P C
3 1 0 4

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: describe the basic concepts of instrumentation in power generation.
CO2: describe the measurement procedures of power plant parameters.
CO3: explain the operation of various analyzers in power plant.
CO4: analyze the control loops in boiler and turbine of power plants.
CO5: distinguish the nuclear power plant and other power plants.

UNIT I OVERVIEW OF POWER GENERATION 12

Importance of instrumentation in power generation - Thermal power plants – Basic building blocks – P & I diagram – Overview of other methods of power generation – hydro, nuclear, solar and wind power– cogeneration.

UNIT II MEASUREMENTS IN POWER PLANTS 12

Electrical measurements – current, voltage, power, frequency, power factor etc. – nonelectrical 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 12

Flue gas oxygen analyser – analysis of impurities in feed water and steam – dissolved oxygen analyser –fuel analyser –Combustibles Analyser- pollution monitoring instruments.

UNIT IV CONTROL LOOPS IN BOILER AND TURBINE 12

Feed water control-Steam pressure control -Combustion control – air/fuel ratio control – furnace draft control – drum level control –super heater control –Intrinsic and electrical Safety- interlocks in boiler operation. Turbine monitoring and control: speed, vibration, shell temperature monitoring.

UNIT V NUCLEAR POWER PLANT INSTRUMENTATION 12

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

L: 45 T: 15 TOTAL: 60 PERIODS

TEXT BOOKS

1. B.G.Liptak, “Instrument Engineers Hand Book”, 4th Edition, CRC press, 2012.
2. K.Krishnaswamy, M.Ponni Bala, “Power Plant Instrumentation”, PHI Learning Limited, 2011.

REFERENCES

1. R.K.Jain, “Mechanical and Industrial Measurements”, Khanna Publishers, New Delhi, 2008.
2. Elonka,S. M. and Kohal. A.L. “Standard Boiler Operations”, McGraw-Hill, New Delhi, 2002.
3. P.K Nag, “Power Plant Engineering”, Tata McGraw Hill, 2001.
4. Sam G.Dukelow, “The Control of Boilers”, Instrument Society of America Press, 2003.

13EIAA	FIBRE OPTICS AND LASER INSTRUMENTS	L	T	P	C
	(Common to EIE and EEE)	3	0	0	3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: describe the basic concepts of optical fibres and their properties.

CO2: illustrate principles of optical fibres in Industrial applications

CO3: explain Industrial application and Medical applications in Lasers.

UNIT I OPTICAL FIBRES AND THEIR PROPERTIES 9

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 APPLICATIONS OF OPTICAL FIBRES 9

Fibre optic sensors – Fibre optic instrumentation system – Different types of modulators – Inter ferometric method of measurement of length– Moiré 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 APPLICATIONS 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 inter ferometry and application, Holography for non-destructive testing – Holographic components –Medical applications of lasers, laser and tissue interactive – Laser instruments instruments for surgery, removal of tumors of vocal cards, brain surgery, plastic surgery, gynecology and oncology

L:45 TOTAL: 45 PERIODS

TEXT BOOKS

1. J.M.Senior,"Optical Fibre Communication–Principles and Practice", Prentice Hall of India, 2009.
2. J.Wilson and J.F.B. Hawkes, "Introduction to Opto Electronics", Prentice Hall of India, 2001.

REFERENCES

1. G.Keiser, "Optical Fibre Communication", McGrawHill, 2008.
2. John F.Read, "Industrial Applications of Lasers", Academic Press, 1978.
3. Monte Ross, "Laser Applications",McGraw Hill,1968.

13EIAB EMBEDDED SYSTEMS

L	T	P	C
3	0	0	3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: describe the general principles of the microprocessor architecture
CO2: describe the general process of embedded system development and important embedded system terminologies
CO3: outline Systems Software Development, device driver development and the operating system concepts
CO4: distinguish real time tasks and scheduling concepts
CO5: develop program for embedded systems**.**

UNIT I INTRODUCTION TO MICROPROCESSOR ARCHITECTURE 9

Introduction-Instruction word formats-Representation of instructions and data-Addressing techniques-Branch and jump instructions-Flags –Condition codes-Status registers-Subroutine calls-Interrupts-Storage hierarchies-Virtual memory-Cache memory-Pipelined computers-RISC and CISC architecture -Cortex-A15 processor-Arduino controller

UNIT II INTRODUCTION TO EMBEDDED SYSTEM 9

Model of an embedded system-Microprocessor vs Microcontroller-Figures of merit for an embedded system-Classification of microcontroller unit:4/8/16/32 bits-Current trends-The hardware point of view: Microcontroller unit - A popular 8-bit microcontroller unit - Memory for embedded system-Low power design-Pullup and pull down resistors-Examples of embedded system : Mobile phone, Automotive electronics, Biomedical applications.

UNIT III SOFTWARE DESIGN ASPECTS 9

Software development tools: Embedded program development-Downloading the hex file to the non –volatile memory-Hardware simulator-Operating system concepts: Embedded operating system-Network operating system - Layers of an operating system-Functions performed by an operating system - Some terms associated with operating system and computer usage-The kernel-Tasks/Process-Scheduling algorithms-Threads-Interrupt handling-Inter process communication -Task synchronization-Semaphores-Priority inversion

UNIT IV CYPRESS'S PSOC 9

The PsoC family-PSoC1-the internal architecture of PSoC-The digital sub system-GPIO pins-Digital applications using PSoC-The analog section-System resources-PSoC3 and PSoC5- A survey of contemporary real time operating systems : PSOS, VRTX, QNX-Benchmarking real time systems – Basics

UNIT V PROGRAMMING IN EMBEDDED C 9

Getting the most out of C:Integer data types-Mixing data types-Useful typesets -Manipulating bits in memory-Manipulating bits in I/O ports-Accessing memory mapped I/O devices-Structures - Variant access-Mixing C and assembly : Programming in assembly-Register usage conventions-Typical use of addressing options-Instruction sequencing-Procedure call and return-Parameter passing-Retrieving parameters-Embedded C-PIC programming using MPLAB.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. Lyla B.Das, "Embedded Systems An Integrated Approach" Pearson Education, 2013.
2. Daniel W. Lewis, "Fundamentals of Embedded Software", Prentice Hall of India, 2006.

REFERENCES

1. Rajib Mall "Real-Time systems Theory and Practice" Pearson Education 2007.

2. Sriram. V.Iyer & Pankaj Gupta, “Embedded real time systems Programming”, Tata Mc Graw Hill, 2004.
3. Thomas C.Bartee, “Computer Architecture and Logic Design”, Tata McGraw-Hill, 2010.

E-LEARNING RESOURCE

1. http://www.cypress.com/

13EIAC	VLSI DESIGN	L	T	P	C
	(Common to EIE and EEE)	3	0	0	3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: describe the general principles of MOS Technology

CO2: describe the design process of MOS Technology

CO3: outline subsystem design and layout principles of VLSI circuits.

CO4: summarize basic Programming Concepts of HDL.

CO5: develop system design for various FPGA applications.

UNIT I MOS TECHNOLOGY 9

Introduction to IC Technology- MOS and VLSI Technology -MOS transistors: Enhancement and Depletion mode transistor actions- Fabrication of NMOS, CMOS and BiCMOS transistors-Thermal aspects of processing - BiCMOS Technology - Production of E beam Masks-MOS electrical properties: I_{DS} V_s V_{DS} relationships, Threshold voltage- Trans conductance V_s Output conductance and Pull up to pull down ratio determination- BiCMOS Inverters-Latch up in CMOS circuits

UNIT II DESIGN PROCESSES AND SCALING EFFECTS 9

MOS and BiCMOS circuit design: Stick diagrams- Lambda based design rules-Layout diagrams-Symbolic diagrams-Scaling models-Scaling factors for device parameters-Limitations of scaling-Limits due to sub threshold currents-Limits on logic levels and supply voltage due to noise

UNIT III SUBSYSTEM DESIGN AND LAYOUT 9

Switch logic-GATA logic: Two input nMOS, CMOS and BiCMOS NAND gates-Two input nMOS, CMOS and BiCMOS NOR gates - Combinational logic: Parity generator-Multiplexers-Clocked sequential circuits: Two phase clocking-Charge storage-Register elements and Shift register-System considerations: Bus lines arrangements-Pre-charged bus concepts-Power dissipation and Power distribution buses.

UNIT IV SPECIFICATION USING VERILOG HDL 9

Basic concepts- identifiers- gate primitives- gate delays- operators- timing controls-procedural assignments conditional statements-Data flow and RTL- structural ,gate level, switch level modeling- Design hierarchies-Behavioral and RTL modeling- Test benches-Structural, gate level description of decoder- equality detector- comparator- priority encoder-half adder- full adder- Ripple carry adder- D latch and D flip flop.

UNIT V SYSTEM DESIGN AND FPGA 9

System Design Examples: Design of eight inputs signed parallel adder/multiplier-Traffic Light Controller- Real Time Clock-Digital Input/ Output Card-FPGA –System design applications using FPGA- Case Studies: FPGA technology for UAV communications and control- FPGA PID Controller

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. D.A.Pucknell, K.Eshraghian, “Basic VLSI Design”, 3rd Edition, Prentice Hall of India, New Delhi, 2008.
2. Bhasker J., “VHDL Primer”, Prentice Hall ,2009

REFERENCES

1. Weste and Harris, “CMOS VLSI DESIGN”, 3rd edition, Pearson Education, 2010.
2. Ciletti, “Advanced Digital Design with the Verilog HDL”, Prentice Hall of India, 2010.

E-LEARNING RESOURCES

1. http://mil-embedded.com/articles/case-enables-uav-communications-control/
2. http://www.embedded.com/design/configurable-systems/4212241/ Case-Study-of-PID-Control-in-an-FPGA

13EIAD	INSTRUMENTATION IN PETROCHEMICAL INDUSTRIES	L	T	P	C
		3	0	0	3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: explain the exploration, recovery and separation processes of petroleum industry.

CO2: list all the products of petroleum and their uses.

CO3: use the relevant modern measuring instruments of various parameters in petroleum refinery.

CO4: explain the control loops employed in petroleum industry.

CO5: apply appropriate precautions using safety instruments for process and workers.

UNIT I PETROLEUM PROCESSING 9

Importance of petrochemical industry – Growth in India - Petroleum exploration: Seismic method and Electrical method – Recovery techniques: Primary, Secondary and Enhancement methods – Separators: Vertical, Horizontal and Double barrel types -Processing of wet gases: Physical absorption and Chemical absorption methods – Piping and Instrumentation diagram of a Petroleum Refinery.

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

Methane derivatives – Acetylene derivatives – Ethylene derivatives – Propylene derivatives

UNIT IV MEASUREMENTS IN PETROCHEMICAL INDUSTRY 9

Measurement of Density: Gow-Mac Densitometer, Electromagnetic Suspension Densitometer - Measurement of Viscosity: Capillary Extrusion Viscometer, Automatic Efflux Cup Viscometer -Measurement of Flow rate: Electromagnetic flow meter, Hotwire Anemometer – Measurement of Pressure: Capacitive pressure transducer, LVDT, McLeod gauge - Measurement of Level: Capacitance level indicator, Air purge system - Measurement of Temperature: RTD and its signal conditioning, Optical pyrometer. Estimation of Air, Water pollution and Solid wastes. Selection and maintenance of measuring instruments – Intrinsic safety of Instruments.

UNIT V CONTROL LOOPS IN PETROCHEMICAL INDUSTRY 9

Control loops of catalytic crackers and pyrolysis unit – Control loops of polyethylene production – Control loops of vinyl chloride production – Control loops of PVC production – pollution control Practices in petrochemical sector.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. A.L. Waddams, “Chemicals from Petroleum”, Gulf Publishing Company, Book Division; 4th Edition, 1980.
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.
3. Pollution Control Technologies - Volume 3, ISBN: 978-1-84826-118-1 (eBook), ISBN: 978-1-84826-568-4 (Print volume)

13EIAE TESTING AND CALIBRATION OF INSTRUMENTS

L	T	P	C
3	0	0	3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: gain knowledge on test measurement

CO2: define key terms related to calibration and interpret the meaning of each

CO3: select the proper calibration procedure

CO4: testing and calibration of different parameters

UNIT I TEST MEASUREMENT INSTRUMENTATION 9

Test Measurement Instrumentation – Components and Characteristics of an Ideal Test Measurement System, Differences between Test Measurement Instrumentation and Process Instrumentation, Smart Transducers ,Test Objective- Required Measurements, Accuracy Requirements, Frequency Response Requirements, Transducer Test Environment Limits, Transducer Connections and Space Limitations, Test Data Format, Test Data Analysis, Transducer Selection

UNIT II INTRODUCTION TO CALIBRATION 9

Traceability, Calibration Types, Calibration Requirements, Calibration Methodology, Instrument Specifications and Calibration Tests, Calibration Standard Requirements, Calibration Laboratories, Calibration standards

UNIT III CALIBRATION REQUIREMENTS AND SERVICES 9

Calibration procedure, calibration procedure content, calibration datasheet, P&IDs, loop diagrams, Instrument Specification Forms, Manufacturer's Specifications, Calibration Intervals, Safety Considerations, Calibration Status Labels, In-House Calibration Services, calibration management and maintenance

UNIT IV TESTING OF INSTRUMENTS 9

Voltage-Voltmeter, Current-Ammeter and Resistance-Ohmmeter, Temperature-Thermocouple, Pressure-Primary pressure sensing elements-Diaphragm, Bourdon tube

UNIT V CALIBRATION INSTRUMENTATION 9

Temperature Instrument, Pressure Instrument, Level Instrument, Flow Instrument Calibration

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. Mike Cable, "Calibration A technician's guide", ISA, 2005.
2. Keith R.Cheatle, "Fundamentals of Test Measurement Instrumentation", ISA, 2006.

REFERENCES

1. Clyde F.Coombs Jr, "Electronic Instrument Handbook", 3rd Edition, 2004.
2. WIKA Handbook Pressure & Temperature Measurement
3. Beamex, "Ultimate calibration", 2nd Edition, 2013.

E-LEARNING RESOURCES

1. http://www.pyro-electric.in
2. support.fluke.com/calibration

13EIAF	AERONAUTICAL INSTRUMENTATION	L	T	P	C
		3	0	0	3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: explain the different airplane control systems

CO2: relate the principles and operation of different of aircraft systems.

CO3: describe the principles and operation of Engine systems and auxillary systems.

CO4: explain the working of instruments used in aircraft system.

UNIT I AIRPLANE CONTROL SYSTEMS 9

Conventional Systems - fully powered flight controls - Power actuated systems – Modern control systems - Digital fly by wire systems - Auto pilot system active control Technology.

UNIT II AIRCRAFT SYSTEMS 9

Hydraulic systems - Study of typical workable system - components - Pneumatic systems - Advantages - Working principles - Typical Air pressure system – Brake system - Typical Pneumatic power system - Components, Landing Gear systems – Classification.

UNIT III ENGINE SYSTEMS 9

Fuel systems for Piston and jet engines - Components of multi engines. Lubricating systems for piston and jet engines - Starting and Ignition systems - Typical examples for piston and jet engines.

UNIT IV AUXILIARY SYSTEM 9

Basic Air cycle systems - Vapour Cycle systems, Evaporative vapour cycle systems - Evaporative air cycle systems - Fire protection systems, Deicing and anti icing systems.

UNIT V INSTRUMENTS 9

Flight Instruments and Navigation Instruments – Gyroscope - Accelerometers, Air speed Indicators – TAS, EAS- Mach Meters - Altimeters - Principles and operation - Study of various types of engine Instruments - Tachometers - Temperature gauges - Pressure gauges - Operation and Principles.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. S.Nagabhashana, L.K.Sudha, “Aircraft Instrumentation and Systems”, L.K. International Publishing Limited, 2010.
2. McKinley J.L., and Bent R.D., “Aircraft Maintenance & Repair”, McGraw-Hill, 1993.

REFERENCES

1. Mckinley J.L. and Bent R.D., “Aircraft Power Plants”, McGraw-Hill, 1993.
2. Pallet E.H.J., “Aircraft Instruments & Principles”, Pitman & Company, 1993.
3. Treager S., “Gas Turbine Technology”, McGraw-Hill, 2002.
4. Pallet E.H.J “Aircraft Instruments”, Pearson, 2009.

13EIAG	MEDICAL INFORMATICS	L	T	P	C
		3	0	0	3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: explain the key aspects of biomedical information processing, communication and system standards.

CO2: apply knowledge in the development of health care applications using medical databases.

CO3: extend their views in fulfilling the clinical testing needs of the medical fraternity in a hospital.

CO4: outline the recent advances in computer assisted medical informatics.

UNIT I INTRODUCTION 9

History and Structure of Medical Informatics – Medicine and the Internet – Security issues – Computer based medical information retrieval – Hospital Information System: Functional capabilities of a computerized HIS – Medical standards for communication : HL7 and DICOM – Bioinformatics: Biological switch boards and signaling cascades, Silicon based biology, Genome databases, Composite protein sequence databases and Training for bioinformatics and computational biology.

UNIT II CIS and CPR 9

CIS: Introduction, Benefits of CIS, Sources of data for decision-making, Modes of decision output to physician, CIS in Obstetrics-Gynecology, Clinical decision support – CPR: Introduction, History-taking by computer, Dialogue with the computer – Standards for healthcare information handling: HIPAA and FDA standard 21 CFR Part 11-Electronic records and Electronic signatures.

UNIT III COMPUTERS IN CLINICAL LABORATORY AND MEDICAL IMAGING 9

Automated clinical laboratories – Automated methods in hematology, cytology and histology, Intelligent Laboratory Information System – Computerized ECG, EEG and EMG – Computer assisted medical imaging: Nuclear medicine, Ultrasound imaging-Ultrasonography, Computed X-ray tomography and Radiation therapy planning.

UNIT IV COMPUTER ASSISTED MEDICAL DECISION-MAKING 9

Neuro computers and Artificial Neural Networks – Expert systems: General model of CMD, Computer assisted decision support systems, Production rule systems, Cognitive models, Semantic networks, Decision analysis in clinical medicine – Computers in the care of critically ill patients – Computer assisted surgery-Robotics.

UNIT V RECENT ADVANCES IN MEDICAL INFORMATICS 9

Virtual environment in medicine – Computer aids for the handicapped – Telemedicine – Computer Assisted Instruction (CAI) in medicine – Computer assisted patient education and health care information.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. R.D.Lele, “Computers in Medicine: Progress in Medical Informatics”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2. Mohan Bansal, “Medical Informatics – A Primer”, Tata Mcgraw Hill Publishing Company Limited, New Delhi, 2003.

REFERENCE

1. Shortliffe E.H et al., "Biomedical Informatics, Computer Applications in Health Care and Biomedicine", 3rd Edition, Springer, 2012.

E-LEARNING RESOURCE

1. http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?CFRPart=11

13EIAH INDUSTRIAL DRIVES AND CONTROL

L	T	P	C
3	0	0	3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: explain the fundamentals of electric drives and speed control characteristics.

CO2: analyze various power electronic circuits like converters, choppers, inverters and control circuits for electric drives

CO3: apply various modulation techniques of ac drive and digital techniques for industrial applications

CO4: explain the performance of converter fed and inverter fed motors for industrial applications

UNIT I ELECTRICAL DRIVES 9

Components of Electric drive system-Types of Electrical Drives (DC & AC)- Motor-Load Dynamics-Speed Torque conventions and multi quadrant operation-Load Torque Components-Nature and classification of Load Torques-Constant Torque and Constant Power operation of a drive-Steady state stability

UNIT II CONVERTER FED DC DRIVES 9

Single phase and three phases fully controlled converter - Performance of converter fed separately excited DC Motor- Multiquadrant operation of fully controlled rectifier fed motor

UNIT III CHOPPER FED DC DRIVES 9

Principle of operation and control techniques-Waveforms of various modes of operation of chopper fed DC drives.

UNIT IV INVERTER FED INDUCTION MOTOR DRIVE 9

Voltage source inverter-Current source inverter-1-phase, 3-phase Non-PWM and 3-phase PWM VSI fed induction motor drives.PWM techniques

UNIT – V DIGITAL CONTROL AND DRIVE APPLICATIONS 9

Digital techniques in speed control – Advantages and limitations – Microprocessor/Microcontroller and PLC based control of drives – Selection of drives and control schemes for Steel rolling mills – Paper mills – Cement mills – Machine tools – Lifts and Cranes – Solar and battery powered drives.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. G. K. Dubey, “Fundamentals of Electrical Drives”, Narosa Publishing House, 2003.
2. M. Rashid, “Power Electronics- Circuits, Devices and Applications”, 3rd Edition, Prentice Hall, 2004.

REFERENCES

1. Shepherd, Hulley, Liang, “Power Electronics and Motor Control”, 2nd Edition, Cambridge University Press.
2. Mohan, Undeland, Robbins “Power Electronics: Converters, Applications and design”, 3rdEdition, John Wiley & Sons, 2003.
3. Bimal K. Bose, “Modern power electronics and AC drives”, Pearson Education, 2004.
4. Werner Leonard, “Control of electrical drives”, Springer-Verlag, 3rd Edition, 2003.
5. G. K. Dubey, “Power Semiconductor Controlled Drives”, Prentice Hall, 1989.

6. R. Krishnan, “Electric motor drives: Modeling, analysis and control”, Pearson Education, 2003.

E-LEARNING RESOURCES

1. http://electrical-all.blogspot.in/p/power-electronics-basics.html
2. http://en.wikipedia.org/wiki/Inverter_%28electrical%29

13EIBA ROBOTICS AND AUTOMATION L T P C
(Common to EEE and EIE) **3 0 0 3**

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to
CO 1: explain the basics of the robotics.
CO 2: design the robot manipulator kinematics.
CO 3: analyze the robot trajectory control.
CO 4: analyze the robot motion and actuators.
CO 5: describe about the robot application.

UNIT I INTRODUCTION 9

Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications – classification by coordinate system and control system. Components of the Industrial Robotics: Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges.

UNIT II MANIPULATOR KINEMATICS 9

Manipulator Kinematics: Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics – problems. Differential transformation and manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Euler formations – Problems.

UNIT III TRAJECTORY CONTROL 9

Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion – straight line motion – Robot programming, languages and software packages.

UNIT IV ROBOT ACTUATORS AND MOTION ANALYSIS 9

Actuators: Pneumatic, Hydraulic actuators, electric and stepper motors. Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors. Motion Analysis: Homogeneous transformations as applicable to rotation and translation – problems.

UNIT V ROBOT APPLICATION IN MANUFACTURING 9

Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding and spray painting - Assembly and Inspection –Clean room robotics (SCARA).

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. Groover M P , “Industrial Robotics”, Tata Mc Graw Hill Edition, 2008.
2. Mittal R K and Nagrath I J, “Robotics and Control”, Mc Graw hill, 2003.

REFERENCES

1. A.K. Gupta, “Industrial Automation and Robotics”, Laxmi Publications, 3rd Edition, 2013.
2. Karl Mathia, “Robotics for Electronics Manufacturing”, Cambridge University press, 2010.
3. Fu K S, “Robotics”, McGraw Hill, 2008.
4. R.K. Rajput, “Robotics and Industrial Automation”, S. Chand Publishing, 2008.
5. Richard D. Klafter, “Robotic Engineering”, Prentice Hall, 1989.
6. Mark W. Spong and M. Vidyasagar , “Robot Dynamics and Control”, John Wiley and Sons (ASIA) Pvt. Ltd, 2004.

13EIBB SYSTEM IDENTIFICATION AND ADAPTIVE CONTROL L T P C
3 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: explain the different model structures of a system.
CO2: apply the Non parametric methods to identify the system model.
CO3: explain the different parameter estimation methods for a system.
CO4: apply the adaptive mechanism for real time process.

UNIT I MODELS FOR IDENTIFICATION 9

Basic approaches to System Identification, Models of LTI systems**:** A family of transfer function model -State space model - Distributed parameter model - Model sets, Structures and Identifiability-Models for Time-varying and Non-linear systems**:** Linear time varying models – Non-linear state-space models-Black box models.

UNIT II NONPARAMETERIC METHODS AND MODEL VALIDATION 9

Non Parameter Methods: Transient response and Correlation Analysis – Frequency response analysis – Spectral Analysis – General Aspects of the choice of model structure –Model structure selection based on Preliminary data analysis – Model validation.

UNIT III PARAMETER ESTIMATION 9

The prediction error approach –Frequency domain expressions for the asymptotic variance - The correlation approach -Least Square – Recursive Least Square – Recursive Instrumental Variable methods – Maximum Likelihood – Instrumental Variable methods.

UNIT IV ADAPTIVE COTROL 9

Introduction – Uses – Auto tuning – Self Tuning Regulators (STR) – Model Reference Adaptive Control (MRAC) – Types of STR and MRAC – Different approaches to self tuning regulators – Stochastic Adaptive control – Gain Scheduling.

UNIT V CASE STUDIES 9

Model identification for Inverted Pendulum – Implementation of Adaptive Control: Aircraft Flight Control – Heat Exchanger – Distillation column – Wind mill application – Ship steering control.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. Astrom and Wittenmark, “Adaptive Control”, Pearson Education, 2009.
2. Ljung, “System Identification Theory for the User”, PHI, 1999.

REFERENCES

1. Narendra and Annasamy, “Stable Adaptive Control Systems”, Prentice Hall Edition 2005.
2. Torsten Soderstrom, PetreStoica, “System Identification”, Prentice Hall International (UK) Ltd, 1994.

13EIBC INTELLIGENT CONTROLLERS L T P C
3 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: describe the architecture of intelligent control system.
CO2: differentiate the various networks in neural networks.
CO3: explain the basic concept and optimization techniques in genetic algorithms.
CO4: discuss the concept of fuzzy set theory and its architecture.
CO5: apply fuzzy logic control to simple applications.

UNIT I INTRODUCTION 9

Approaches to intelligent control – Architecture for intelligent control – Symbolic reasoning system - rule-based systems – conventional AI to computational intelligence – the AI approach – Knowledge representation. Expert systems – evolutionary computation – characteristics of soft computing.

UNIT II ARTIFICIAL NEURAL NETWORKS 9

Concept of Artificial Neural Networks and its basic mathematical model – McCulloch Pitts - neuron model – simple perceptron – Adaline and Madaline – Feed-forward Multilayer Perceptron - Learning and Training the neural network. Hopfield network – Self-organizing network and Recurrent network – Neural Network based controller.

UNIT III GENETIC ALGORITHM 9

Basic concept of Genetic algorithm and detail algorithmic steps – adjustment of free parameters – Solution of typical control problems using genetic algorithm. Concept on some other search techniques like tabu search – ant-colony search techniques for solving optimization problems – GA application to power system optimisation problem.

UNIT IV FUZZY LOGIC SYSTEM 9

Introduction to crisp sets and fuzzy sets – basic fuzzy set operation and approximate reasoning – Introduction to fuzzy logic modeling and control – Fuzzification – inferencing and defuzzification. Fuzzy knowledge and rule bases. Fuzzy modeling and control schemes for nonlinear systems – Self organizing fuzzy logic control – Fuzzy logic control for nonlinear time-delay system.

UNIT V APPLICATIONS 9,

Fuzzy logic control – Case studies: Inverted pendulum – Home heating system – Blood pressure during anesthesia – Identification and control of linear and nonlinear dynamic systems – Cart and Pole System with a varying pole length.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. Padhy.N.P, “Artificial Intelligence and Intelligent System”, Oxford University Press, 2005.
2. KOSKO,B. "Neural Networks and Fuzzy Systems", Prentice-Hall of India Pvt. Ltd., 1994.

REFERENCES

1. Jacek.M.Zurada, "Introduction to Artificial Neural Systems", Jaico Publishing House, 1999.

2. Zimmerman H.J. "Fuzzy set theory-and its Applications"- Kluwer Academic Publishers, 1994.
3. KLIR G.J. and FOLGER T.A. "Fuzzy sets, uncertainty and Information", Prentice-Hall of India Pvt. Ltd., 1993.
4. Goldberg D.E. “Genetic algorithms in Search, Optimization and Machine learning”, Addison Wesley, 2015.

13EIBD PROCESS CONTROL COMPONENTS L T P C
3 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1 : describe the components in generalized closed loop system.

CO2 : recognize the suitable valve for a real time process.

CO3 : explain the operation of regulators and throttling device.

UNIT I CONTROLLERS, TRANSMITTER, CONVERTERS AND RELAYS 9

Analog versus Digital Instruments – Electronic versus Pneumatic Instruments – Controllers: Pneumatic - Electronic – Analog and Digital – Converters – Function Generators – Computing relay: Telemetering systems –Thermostats – Transmitters: Pneumatic - Electronic and Intelligent

UNIT II CONTROL CENTERS, PANELS AND DISPLAYS 9

Annunciators and Alarms –Control centers and panels – Digital Readouts – Indicators – Analog displays – Lights – Recorders – Oscillographs – Loggers – Tape Recorders – Speech synthesis and voice reorganization – Switches, Push buttons and key boards – UPS and UVS

UNIT III ACTUATORS AND CONTROL VALVES 9

Actuators: Pneumatic, Hydraulic, Solenoid, Electric and Digital – Valves: Ball Valve – Butterfly valves- Digital Valves – Globe Valves – Pinch Valves – Plug Valves – Saunders Diaphragm valves – Sliding Gate valves – Special Valve Designs

UNIT IV REGULATORS AND OTHER THROTTLING DEVICES 9

Dampers – Electric Energy modulation – Pumps as control elements – Regulators: Flow, Level, Pressure and Temperature – Variable speed drives

UNIT V PROCESS CONTROL SYSTEMS 9

Batch control description and terminology – Batch process and their automation – Boiler control and optimization – Centrifuge control – Chiller control and optimization – Compressor control and optimization

L: 45 TOTAL: 45 PERIODS

TEXT BOOK

1. Bela G. Liptak, “Instrument Engineers” Handbook, (Volume 2), “Process Control”, CRC Press, 3rd Edition, 1999.

REFERENCES

1. Donald P. Eckman, “Automatic Process Control”, Wiley-India Pvt. Ltd., New Delhi, 2011.
2. Peter Harriott, “Process Control”, Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 30th Edition, 2008.

13EIBE BUILDING AUTOMATION **L T P C**
3 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: identify various systems of building automation and their characteristics.
CO2: describe the performance of controllers, heating and cooling systems of building management system.
CO3: describe about SCADA for energy management system.
CO4: explain general concept and principles of fire safety systems in building automation.
CO5: discuss the general principle and concepts of security systems.

UNIT I INTRODUCTION **9**

Introduction to Building Automation System – Features – Characteristics - Drawbacks of Building Automation system. Various Systems of Building Automation : Building Management System - Energy Management System - Security System - Safety System - Video Management System.

UNIT II BUILDING MANAGEMENT SYSTEM **9**

Introduction of HVAC review of Sensors and controllers - Air Handling Unit (AHU) – concept, components, working principle. AC plant room : concept – components - refrigeration cycle working principle - chiller sequencing - AC plant sequencing. Heat : types - heat transfer principles - measurement of heat transfer : Psychrometry – Concept - ASHRAE Psychrometric Chart – DBT – WBT – SE – RH – DPT - Sensible and Latent Cooling and Heating - IO Summary Calculation - Controller Sizing - Cable Selection - Earthing – Meaning – Importance - Panel Earthing EMI and Tackling EMI.

UNIT III ENERGY MANAGEMENT SYSTEM **9**

Energy Management Centers and their functions – architectures - recent developments- Analysis of power quality- Energy Reports - Energy Conservation-SCADA Functional requirements –Components - General features - Functions and Applications - Benefits. Configurations of SCADA, RTU (Remote Terminal Units) Connections - SCADA in Power System Automation.

UNIT IV SAFETY SYSTEMS **9**

Introduction - Fire – Meaning - Fire Development Stages - Fire Sensors and Detectors - Detector Placement and Detectors Required For Various Applications - Fire Extinguishing Principles - Fire Extinguishers and its Classification. Fire Alarm System – Controllers – Components – Features - Concept of Fire Loop and Fire Devices – 2 Wire and 4 Wire Loops - Working Principle - System Description – Pre alarm – Alarm – Trouble – Fault – Differences - Cable Selection - Installation Guidelines Best Installation Practices - Logic Example NFPA and IS2189 Standards.

UNIT V SECURITY SYSTEMS **9**

Introduction, Access Control – Concept - Generic Model – Components – Types – Features - Card Technologies – Protocols – Controllers - Concept of Antipassback – Biometrics - Issues With Biometrics – Cabling - Video Door phone - Intrusion Detection System – Sensors - Working Principle - Access Control System Programming.

L: 45 TOTAL: 45 PERIODS

TEXT BOOK

1. Reinhold A. Carlson Robert A. Di Giandomenico, "Understanding Building Automation Systems: Direct Digital Control, Energy Management, Life Safety, Security Access Control, Lighting, Building", 1st Edition R.S. Means Company Ltd, 1991.

REFERENCES

1. Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, "Guide to Energy Management", 7th edition, Fairmont Press, 2011. ISBN: 978-1439883488 .
2. Morawski, E "Fire Alarm Guide for Property Managers", Kessinger Publishing, 2007.
3. Kruegle, Herman, "CCTV Surveillance: Analog and Digital Video Practices and Technology", 2nd Edition Butterworth- Heinemann Publisher, 2006.
4. Steve Doty and Wayne C. Turner, "Energy Management Handbook," 7th edition, Fairmont Press, 2009. ISBN: 978-1420088700.
5. ASHRAE Handbook - Fundamentals (I-P)," American Society of Heating, 2009. 978-1933742540
6. Damjanovski, Vlado, "CCTV" 3rd Edition Butterworth- Heinemann Publisher, 2003.
7. CIBSE Guide, "Building Control Systems, Applications Guide", The CIBSE, 2000.

WEB RESOURCE

1. nptel.ac.in/courses/108106022

13EIBF ADVANCED PROCESS CONTROL L T P C
3 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1 : explain the computer control of different process.
CO2 : develop the discrete model for a continuous system.
CO3 : analyse the closed loop performance of sampled data systems.
CO4 : develop the control scheme and control algorithm for dead time process.
CO5 : design a advanced control schemes.

UNIT I ELEMENTS OF COMPUTER PROCESS CONTROL 9

Review of Conventional Process Control: Introduction to Process Control - Process Dynamics and Mathematical Models - Types of Dynamic Processes - Basic Feedback Control - Stability of Conventional Control Systems - Problem Control Situations - Computer - Conventional Control versus Computer Control - Computer System Software Concepts - Configurable Digital Systems and Networks - Single - Loop Computer Control : The Present System - Switchover to Computer Control – Computer Control of Flow, Level, Temperature and Pressure Process.

UNIT II DISCRETIZATION OF THE PROCESS 9

The Z Transformation: Z Transform of Various Functions - Properties of Z Transforms - The Inverse Z Transformation-Pulse Transfer Functions : Complex Series Representation of the Sampler - Development of the Pulse Transfer Function-Data Holds : Transfer Function of the Zero Order Hold - Transfer Function of the First Order Hold-Sampling Frequency Considerations - Selection of Optimum Sampling Period.

UNIT III ANALYSIS OF SAMPLED DATA SYSTEM 9

Open loop response of sampled - data systems - Example of Open Loop Response – Closed Loop Pulse Transfer Functions - Example to Determine Closed Loop Transient Response - Design of Sampled Data Control Systems - Deadbeat Algorithm - Dahlin Algorithm - Digital Equivalent to a Conventional Controller - Treatment of Noisy Process Signals - Stability of Sampled Data Control System: Schurr - Chonn Stability Criterion.

UNIT IV MODELING AND CONTROL ALGORITHM FOR A PROCESS 9

Modified Z Transforms : Definitions and Evaluation of Modified Z Transforms - Application of Modified Z Transforms to Systems with Dead Time - Application of Modified Z Transforms to determine Output Between Sampling Instants - Design and Application of Advanced Control Concepts: Process Modeling from Step Test Data - Pulse Testing for Process Identification – Time Domain Process Identification - Algorithms for Processes with Dead Time : Smith Predictor Algorithm - Analytical Predictor Algorithm - Algorithm of Gautam and Mutharasan.

UNIT V DESIGN OF ADVANCED CONTROL SCHEME 9

Feed forward control: Introduction and Design Fundamentals - Cascade Control: Controller Design of Cascade Systems - An Industrial Application of Cascade - Control Technique - Use of Cascade Control - Multivariable Control Systems: The Interaction Measure - Interaction and Decoupling.

L: 45 TOTAL: 45 PERIODS

TEXT BOOK

1. Pradeep B.Deshpande and Raymond H.Ash, “Elements of Computer Process Control with Advanced Control Applications”, Prentice Hall 2004.

REFERENCES

1. Benjamin C.Kuo, Digital Control Systems, Oxford University Press, 2010.
2. Franklin, G. F. and J. D. Powell, Digital Control of Dynamic Systems, Addison-Wesley, 2007.
3. Astrom, K. J. and B. Wittenmark, “Computer Controlled Systems”, Prentice Hall, 2005.

13EIBG NONLINEAR CONTROL L T P C
3 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: develop the describing function for different nonlinearities.
CO2: evaluate the stability of the system using Lyapunov theory.
CO3: analyze the nonlinear systems behavior using phase plane trajectory.
CO4: summarize the basic concepts of nonlinear control system design.
CO5: explain the different linearization method.

UNIT I NON LINEAR CONTROL : INTRODUCTION 9

Nonlinear system behavior-Need of Nonlinear control – Some Common Nonlinear system-Behaviours – Limit cycles – Bifurcations – Describing Functions – Common Non-Linearities and its Describing Functions.

UNIT II FUNDAMENTALS OF LYAPUNOV THEORY 9

Nonlinear Systems and Equilibrium Points- Autonomous and Non-Autonomous Systems - Concepts of Stability-Linearization and Local Stability- Lyapunov's Direct Method-Positive definite Functions and Lyapunov Functions- Lyapunov Analysis of Linear Time Invariant Systems-Krasovski's Method.

UNIT III PHASE PLANE ANALYSIS 9

Concepts of phase plane analysis- Phase portraits- singular points- Symmetry in phase plane portraits- Phase plane Analysis of Linear systems – Phase Plane Analysis of Nonlinear systems – Existence of Limit cycles.

UNIT IV NON LINEAR CONTROL SYSTEM DESIGN 9

Sliding Control – A notational simplification – Multi Input systems : Adaptive control – Basic concepts – Adaptive control of First order systems – Adaptive control of Nonlinear systems.

UNIT V FEEDBACK LINEARIZATION 9

Feedback Linearization and the Canonical form – Input-State Linearization – Input – Output Linearization – Input – state Linearization of SISO systems – Input – Output Linearization of SISO systems.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. M Gopal, "Digital Control and State Variable Methods, Conventional and Intelligent Control Systems", 4th Edition, McGraw-Hill Inc., New Delhi, 2009.
2. J A E Slotine and W Li, "Applied Nonlinear Control", PHI, 1991.

REFERENCES

1. Hasan Khalil, "Nonlinear Systems and Control", Prentice Hall, 2002.
2. Katsuhiko Ogata, "Modern Control Engineering", Prentice Hall Inc., 1997.

13EICA MECHATRONICS L T P C
3 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: explain the fundamental concepts of Mechatronics and different types of Sensors and transducers being used in Mechatronic Applications.

CO2: describe the various types of actuation systems and controlling techniques used in the different Mechatronic applications.

CO3: illustrate the recent advancements in Industrial Mechatronics.

UNIT I INTRODUCTION 7

Mechatronics – definition - basic elements – evolution levels – A modular approach to Mechatronics and engineering design.

UNIT II SENSORS AND TRANSDUCERS 11

Performance characteristics -Types – Displacement: Strain Gauge, Potentiometer, Capacitive, LVDT –Position: Optical Encoders – Proximity: Incremental Optical Encoder, Eddy Current Proximity Sensor, Pneumatic Proximity Sensor – Velocity: Optical Encoder, Variable reluctance Tachogenerator – Pyro electric sensors – PVDF Tactile sensor – Selection of sensors - Data Presentation elements : DVM, VDU, Printers, Magnetic recording – Displays: LED, LCD – DAQ System – Data logger.

UNIT III ACTUATION SYSTEMS 9

Mechanical Actuation Systems: Types of Motion, Kinematic Chains, Cams, Gear trains, Ratchet and Pawl, Belt and Chain drives, Bearings – Electrical Actuation Systems: Relay, SCR, BJT, Permanent Magnet DC Motor, H Circuit, Brushless DC Motor, Single phase Squirrel Cage AC Induction Motor, Variable Reluctance Stepper Motor, Stepper motor specifications and control – Pneumatic and Hydraulic Actuation Systems : Pneumatic and Hydraulic Power Supplies, Directional Control Valves, Pressure Control Valves, Linear Actuator, Process Control Valves, Rotary Actuators.

UNIT IV CONTROL SYSTEMS 9

Closed Loop Controllers: Terminology, Two Step Mode, Proportional Control, Derivative Control, Integral Control, PID Controller – Digital closed loop control system and implementing control modes – Artificial Intelligence: Perception and Cognition, Rule based reasoning, learning - Programmable Logic Controllers: Basic Structure, Ladder Programming, Logic Functions, Latching, Sequencing, Timers and Counters.

UNIT V RECENT ADVANCES 9

Domestic Washing Machine system – Pick and Place Robot – High speed tilting trains - Car Park barriers – Automatic Digital Camera – Car Engine Management System – Bar code Reader – Medical Mechatronics with MRI.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. Bolton W., “Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering”, 4th Edition, Pearson Education, 2012.
2. Dradly D.A., Dawson D., Burd N.C. and Loader A.J., “Mechatronics: Electronics in Products and Processes”, Nelson Thomas Ltd, 2004.

REFERENCES

1. Singh M.D. and Joshi J.G., "Mechatronics", 4th Edition, PHI Learning Pvt. Ltd, 2011.
2. David G Alciatore and Michael B Histand, "Introduction to Mechatronics and Measurement Systems", 5th Print, Tata McGraw Hill, 2010.

13EICB INTRODUCTION TO SOFT COMPUTING L T P C
3 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO 1: identify and describe neural network techniques and their roles in building intelligent machines.
CO 2: explain neural networks architecture and learning methodologies.
CO 3: describe the fuzzy logic techniques and its properties.
CO 4: apply fuzzy logic and reasoning to solve engineering problems.
CO 5: describe the concepts of genetic algorithms.

UNIT I NEURAL NETWORKS-1 (INTRODUCTION AND ARCHITECTURE) 9

Neuron - Nerve structure and synapse - Artificial Neuron and its model - activation functions - Neural network architecture: single layer and multilayer feed forward networks - recurrent networks. Various learning techniques : perception and convergence rule - Auto-associative and hetro-associative memory.

UNIT II NEURAL NETWORKS – II (BACK PROPAGATION NETWORKS) ARCHITECTURE 9

Perception model – solution - single layer artificial neural network - multilayer perception model: back propagation learning methods - effect of learning rule co-efficient: back propagation algorithm - factors affecting back propagation training - applications.

UNIT-III FUZZY LOGIC-I (INTRODUCTION) 9

Basic concepts of fuzzy logic - Fuzzy sets and Crisp sets - Fuzzy set theory and operations - Properties of fuzzy sets - Fuzzy and Crisp relations - Fuzzy to Crisp conversion.

UNIT IV FUZZY LOGIC –II (FUZZY MEMBERSHIP, RULES) 9

Membership functions - interference in fuzzy logic - fuzzy if-then rules - Fuzzy implications and Fuzzy algorithms - Fuzzyfications and Defuzzificataions - Fuzzy Controller - Industrial applications.

UNIT V GENETIC ALGORITHM (GA) 9

Basic concepts - working principle - procedures of GA - flow chart of GA - Genetic representations - (encoding) Initialization and selection - Genetic operators – Mutation - Generational Cycle - applications.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. S. Rajsekaran and G.A. Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications” Prentice Hall of India, 6th Edition, 2006.
2. N.P.Padhy, “Artificial Intelligence and Intelligent Systems” Oxford University Press, 2005.

REFERENCES

1. Siman Haykin, “Neural Netowrks” Prentice Hall of India, 2002.
2. Kumar Satish, “Neural Networks” Tata Mc Graw Hill, 3rd Edition, 2007.
3. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India, 3rd Edition, 1995.

13EICC INDUSTRIAL SAFETY ENGINEERING L T P C
3 0 0 3

COURSE OUTCOMES

Upon successful completion of this course, the students will be able to

CO 1: appraise the concept of accidents and their prevention.

CO 2: use the ergonomics to design the work system and to change the human behaviour to avoid accidents.

CO 3: appraise the various hazards present in an industry and to control the hazards.

CO 4: evaluate the types of fires and to select the proper fire extinguishing systems.

CO 5: use the various safety management techniques to promote safety practice and avoid accidents.

UNIT I ACCIDENT INVESTIGATION AND ANALYSIS 9

Concept of an Accident, reportable and non reportable accidents, reporting to statutory authorities. Principles of accident prevention-accident investigation and analysis-Unsafe act and unsafe condition- Domino sequence-cost of accidents- supervisory role –role of safety officer-role of safety committee- permanent total disabilities, Permanent partial disabilities, Temporary total disabilities-Calculation of frequency rate and severity rate of accidents. Factories act and rules related to safety.

UNIT II ERGONOMICS AND HUMAN BEHAVIOUR 9

Introduction to ergonomics and its area of application in the work system. Anatomy, Posture and body mechanics-low back pain, risk factors for musculoskeletal disorders in the work place-behavioral aspects of posture - effectiveness. Individual differences, Factors contributing to personality, fitting the man to the job. Motivation -job satisfaction - Frustration and conflicts, reaction to frustration, emotion and frustration. Attitudes - determination of attitudes- changing attitudes.

UNIT III HAZARDS AND THEIR CONTROL 9

Physical hazards-Noise, heat, vibration, ionizing and non ionizing radiations, and effects. Chemical hazards-dusts, fumes, mist, vapor, fog, gases, types, concentration, exposure Vs dose, TLV. Mechanical hazards. Engineering control methods- use of personal protective equipments.

UNIT IV FIRE PREVENTION AND PROTECTION 9

Fire triangle-principles of fire extinguishing- various classes of fires- A, B, C, D types of fire extinguishers- Industrial fire protection systems. Sprinklers- Fire hydrants- Alarm and detection systems- other suppression systems- CO2 system, foam system and DCP system.

UNIT V SAFETY MANAGEMENT TECHNIQUES, EDUCATION AND TRAINING 9

Incident Recall Technique (IRT), disaster control, Job safety Analysis, Safety survey, safety inspection. Safety training programs, seminars, conferences, competitions- method of promoting safe practice- motivation- creating awareness, awards, celebrations, safety posters, safety displays, safety incentive scheme- domestic safety and training.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. Heinrich.H.W. “Industrial Accident Prevention”, McGraw Hill Company, New York, 1980.
2. John V. Grimaldi and Rollin H. Simonds, “Safety Management” , All India Travellers Book Seller, New Delhi, 1989.

REFERENCES

1. Krishnan.N.V. “Safety Management in Industry”, Jaico Publishing House, Bombay, 1997.
2. Lees, F. P. “Loss Prevention in Process Industries”, Butter Worth publications, London, 2nd Edition, 1990.
3. Dan Peterson, “Techniques of Safety Management”, McGraw Hill Company, Tokyo, 1981.
4. Hunter, Gomos, “Engineering Design for Safety”, McGraw Hill Inc., 1992.
5. Encyclopedia of “Occupational Health and Safety” Vol I and II, Published by International Labour Office, Geneva, 1985.
6. Gupta. R.S., “Hand Book of Fire Technology”, Orient Longman, Bombay, 1977.
7. E.J.Mc Cormick and M.S. Sanders “Human Factors in Engineering and Design”, TMH, New Delhi, 1982.
8. Hand Book of “Occupational Safety and Health”, National Safety Council, Chicago, 1982.
9. Derek, James, “Fire Prevention Hand Book”, Butter Worths and Company, London, 1986.

13EICD MEMS AND NANO TECHNOLOGY L T P C
3 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: discuss the fundamentals of MEMS and Microsystems.
CO2: explain the various micro system materials and fabrication process.
CO3: outline the basics of nanotechnology.
CO4: describe the Nanostructures and various properties.
CO5: apply the concept of MEMS and Nanotechnology in industrial and healthcare applications.

UNIT I INTRODUCTION TO MEMS AND MICRO SYSTEMS 9

Microsystems and Microelectronics – Miniaturization – Micro sensors: Chemical Sensors- Optical Sensors- Pressure Sensors - Thermal Sensors – Micro actuators and Micro motors.

UNIT II MICROSYSTEM MATERIALS and FABRICATION PROCESS 9

Microsystem Materials: Molecular Theory and Intermolecular Forces – Silicon Piezo Resistors– Electrochemistry – Substrates and Wafers – Silicon Compounds – Polymers – Packaging Materials. Fabrication process: Photolithography – Ion Implantation – Diffusion – Oxidation – Chemical Vapor Deposition – Etching

UNIT III NANOTECHNOLOGY BASICS 9

Nanobuilding Blocks – Atoms and Molecular Structure – Molecular Recognition – Tools For Measuring Nanostructures – Electron Microscopy – Spectroscopy – Molecular Synthesis and Polymerization – Encapsulation.

UNIT IV SCIENCE OF NANO MATERIALS 9

Classification of nano structures – effect of the nanometer length scale effects of nano scale dimensions on various properties – structural – thermal – chemical – mechanical – magnetic - optical and electronic properties – effect of nanoscale dimensions on biological systems. Fabrication methods – Top down processes – bottom up process.

UNIT V APPLICATIONS OF MEMS and NANOTECHNOLOGY 9

MEMS: Application in Automotive Industry – Healthcare – Aerospace – Industrial products. Nanotechnology: Nano biosensors and Biomedical Applications – Resistive semiconductor gas sensor – Semiconductor sensor array.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. Richard Booker, Earl Boysen , “Nanotechnology”, Wiley Dreamtech (P) Ltd, 2006.
2. Mart Ratner, Daniel Ratner , “Nanotechnology”, Pearson Education, 2003.

REFERENCES

1. Vinod Labhasetwar, Diadra L. Leslie Pelecky “Biomedical applications of Nanotechnology” A.John wiley sons publications, New Jersy, 2007.
2. Mohamed Gad-el-Hak , “The MEMS Hand book”, CRC Press, New York, London, 2005.
3. Charles P. Poole, “Introduction to nanotechnology”, Wiley publications,2003.
4. Norio Taniguchi, “Nano Technology”, Oxford University Press, New York, 2003.
5. Tai, Ran Hsu, “MEMS and Microsystems Design and Manufacture”, Tata Mc Graw Hill, 2002.

13EICE APPLIED THERMODYNAMICS L T P C
3 0 0 3

COURSE OUTCOMES

At the end of the course, the students will be able to

CO1 : apply the laws of thermodynamics in thermal systems like heat engines, refrigerators and heat pumps.
CO2 : explain power producing thermal systems and their applications.
CO3 : describe about various performance monitoring systems used in automobiles.
CO4 : express different performance monitoring systems used in power plants.
CO5 : explain various power absorbing systems and their applications.

UNIT I BASIC CONCEPTS AND LAWS OF THERMODYNAMICS 9

Thermodynamic study – Types - Classical approach; Thermodynamic systems – Properties and Equilibrium - Work and heat transfer – Point and Path functions; First law - Systems and Control volumes – Steady Flow Analysis; Second law – Heat engines, Refrigerators and Heat pumps - Carnot theorem.

UNIT II POWER PRODUCING SYSTEMS 9

Otto Cycle and Diesel Cycle - SI and CI Engines - Working principle - Applications; Open and closed cycle gas turbines – Applications; Ideal Rankine Cycle - Layout and working of steam power plant.

UNIT III PERFORMANCE MONITORING OF AUTOMOBILES 9

Emission - Monitoring - Control methods; Factors influencing maintenance and equipment life; Combustion inspection; Crash testing; Recent developments - Electronic stability control (ESC), Intelligent Parking Assist System (IPAS), Global Positioning System (GPS).

UNIT IV POWER ABSORBING SYSTEMS 9

Principle of Vapour Compression and Absorption system – Layout of typical domestic refrigerator; Solar cooling; Steam jet refrigeration; Thermo electric refrigeration; Air conditioning systems – Types- Comfort and Industry Requirements – Applications; Heat pumps, Fans and Blowers - Working principle - Applications.

UNIT V PERFORMANCE MONITORING OF POWER PLANTS 9

Thermo physical properties – Measurement; Micro computer interfacing; Intelligent instruments in use; Boiler - Operation control - Output adjustment - Load dispatching - Minimum load operation - Start-up and Stop Operation Control.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

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

REFERENCES

1. Eastop and McConkey, “Applied Thermodynamics”, Pearson Education Pvt. Ltd. New Delhi, 2009.
2. Rogers and Mayhew, “Engineering Thermodynamics – Work and Heat Transfer”, Pearson Education Pvt. Ltd., New Delhi, 2006.
3. P.K.Nag, “Engineering Thermodynamics”, Tata McGraw Hill, New Delhi, 2005.

4. Rajput, B.K. Sankaar, Thermal Engineering, S.Chand and Co. Ltd., 2005.
5. Internet sources, Wikipedia, nptel, etc.
6. Barney, 'Intelligent Instrumentation', Prentice Hall of India, 1988.
7. Holman, J.P., "Experimental methods for engineers", McGraw-Hill, 1988.

13EICF NON DESTRUCTIVE TESTING TECHNIQUES AND APPLICATIONS **L T P C 3 0 0 3**

(Common to EIE and Civil)

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1 : differentiate the Non destructive testing from destructive testing techniques.
CO2 : explain the fundamentals and principles involved in the various Non destructive testing.
CO3 : describe the procedures used to perform basic NDT techniques.
CO4 : analyze the advantages and limitations of one method over other methods.
CO5 : critically appraise the NDT techniques available and select the most appropriate one for a given situation/application.

UNIT I VISUAL INSPECTION AND LIQUID PENETRANT TESTING 9

Introduction: Comparison of Destructive and Non-Destructive Tests-Conditions for Effective Non-Destructive Testing

Visual Inspection:-Optical aids used for visual Inspection-Applications

Liquid Penetrant Testing: Physical Principles-Procedure for Penetrant Testing-Penetrant Testing Materials –Penetrant Testing Methods-Water washable and Post-Emulsifiable Method.

UNIT II ULTRASONIC AND ACOUSTIC EMISSION TESTING 9

Ultrasonic Testing: Principle- Ultrasonic Transducers-Flaw detection equipment-Modes of display- Variables affecting Ultrasonic Test-Pulse echo, through transmission and Angle Beam Testing- Applications, Advantages and Limitations.

Acoustic Emission Testing: Principle – Instrumentation –Advantages, Limitations and applications- Acoustic Emission testing of metal pressure vessels-Fatigue crack detection in Aerospace structures.

UNIT III MAGNETIC PARTICLE, EDDY CURRENT AND MAGNETIC FLUX LEAKAGE TESTING 9

Magnetic Particle Testing: Principle- magnetizing techniques- Procedure used for testing a component –Advantages, Limitations and applications

Eddy current Testing: Principles –Instrumentation for Eddy current testing – Inspection of ferromagnetic materials-Pulsed eddy current testing- Applications.

Magnetic Flux Leakage (MFL) Testing: Principle- Magnetizing and Demagnetizing methods – MFL sensors – Flaw detection and analysis in ferromagnetic specimen – advantages, Limitations and applications.

UNIT IV THERMOGRAPHY AND RADIOGRAPHY TESTING 9

Thermography: Principle- Detectors and Equipments for active thrermography –heating sources – applications-Thermal imaging for condition monitoring of Industrial Components

Radiography: Principle- Electromagnetic radiation sources – Radiographic imaging equipments various inspection techniques-Reading and interpretation of radiographs – safety in industrial radiography.

UNIT V INDUSTRIAL APPLICATIONS OF NON DESTRUCTIVE TESTING 9

Industrial Applications of Non Destructive Testing: Railways- Nuclear industry –Concrete structures -aircraft and aerospace industries –automotive industries-Selection of NDT methods –Codes, standards, specifications and Procedures.

L : 45 TOTAL : 45 PERIODS

TEXT BOOK

1. Baldev Raj, Jeyakumar, T., Thavasimuthu, M., “Practical Non Destructive Testing”, NarosaPublishing House, New Delhi, 2014.

REFERENCES

1. Charles J. Hellier, “Hand Book of Non-Destructive Evaluation”, The McGraw-Hill Companies, New York, 2012.
2. Christiane Maierhofer, Hans-Wolf Reinhardt and Gerd Dobmann, “Non-destructive evaluation of reinforced concrete structures”, Volume 2, CRC Press, New York, 2010.
3. Prasad J and C.G.K. Nair, “Non-Destructive Test and Evaluation of Materials”, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008.
4. V.M. Malhotra and N.J. Carino, "Handbook On Nondestructive Testing on Concrete", Second Edition, CRC Press, New York, 2004.
5. Peter J. Shull “Non Destructive Evaluation: Theory, Techniques and Application”, Marcel Dekker, Inc., New York, 2002.

13EICG SENSOR NETWORKS **L T P C**
3 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1 : discuss the fundamental concepts of wireless sensor networks.

CO2 : explain the capabilities and limitations of the sensor nodes in a sensor network and demonstrate the basic networking philosophy.

CO3: describe the prospective ideas of digital communications over wireless channels, different functions of the link-layer and various routing mechanisms.

CO4: extend their views to outline the naming and addressing issues in networking and application design methodologies.

UNIT I INTRODUCTION 9

Introduction to Sensor Networks - Unique constraints and challenges - Advantages of Sensor Networks : Energy Advantage, Detection Advantage - Sensor Networks Applications - Sensor Taxonomy - Tracking multiple objects - Sensor models.

UNIT II SENSOR NODE HARDWARE AND NETWORK ARCHITECTURE 9

Single-Node Architecture - Hardware Components - Energy Consumption of Sensor Nodes - Operating Systems and Execution Environments: Programming paradigms and DPM - Network Architecture - Sensor Network Scenarios - Optimization Goals and Figures of Merit - Design principles for WSN - Gateway.

UNIT III COMMUNICATION PROTOCOLS 9

Physical layer, MAC Protocols- Fundamentals, S-MAC Protocol, IEEE 802.15.4 standard, Link layer protocol-Error control, framing, link management, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

UNIT IV DEPLOYMENT AND CONFIGURATION 9

Naming and Addressing-Assignment of MAC address, content based and geographic addressing - Localization and positioning - Single hop and multi hop localization - Coverage and deployment.

UNIT V SENSOR NETWORK TOOLS 9

Sensor Node Hardware – Berkeley Motes - Sensor network Programming Challenges - Node-level software platforms - Node-level Simulators - State-centric programming.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. Holger Karl and Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks", John Wiley and Sons, 2007.
2. Feng Zhao, Leonidas Guibas, “Wireless Sensor Network”, Elsevier, 1st Edition, 2004 (ISBN: 13- 978-1-55860-914-3).

REFERENCES

1. Mohammad Ilyas and Imad Mahgoub, “Handbook of Sensor Networks: Compact Wireless and Wired Sensing Systems”, CRC Press, 2009.
2. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.

13EICH INDUSTRIAL CHEMICAL PROCESS L T P C
3 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1 : describe the process of wood extracts and the raw materials.

CO2 : analyze the various components and the extraction methods of synthetic detergents.

CO3 : explain the petroleum refining and products obtained from various processes.

CO4 : discuss the general properties of resins and the types of rubbers.

CO5 : illustrate the process description and functional block details of raw materials preparation for iron and steel.

UNIT I PULP, PAPER, SUGAR AND STARCH INDUSTRIES 9

Wood and Wood extracts – Wood Chemicals - Cellulose derivatives, Manufacture of pulp – different processes of pulping – Manufacture of paper – Manufacture of Boards Raw and refined sugar, by products of sugar industries, Starch and starch derivatives.

UNIT II OILS, FATS, SOAPS AND DETERGENT INDUSTRIES 9

Vegetable oils and animal fats – their nature analysis – extraction methods. Hydrogenation of oils – fatty acids and alcohols – waxes – soaps – synthetic detergents.

UNIT III PETROLEUM AND PETROCHEMICAL INDUSTRIES 9

Petroleum refining : physical and chemical conversion products – lubricating oils – petrochemical precursors - Methane – olefins – acetylenes and aromatics and products obtained from them by various unit processes.

UNIT IV RUBBER AND POLYMERS 9

Monomers – Thermosetting and Thermoplastic materials – General properties and Applications of Resins – Polymerization processes – different types - Natural rubber - Synthetic rubber such as SBR, NBR, CR - Fundamental methods of processing of synthetic Rubbers.

UNIT V IRON AND STEEL 9

The need for iron and steel in the civilised world : history of steel making – Process description in diagrammatic and functional block details – raw materials preparation – operation of Blast Furnace (BF) and auxiliary units including stoves – Basic oxygen Furnace (BOF) – Electric Furnace (EF) – Open Hearth Furnace (OHF) - relative merits of various steel making furnaces.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. Gopal, Dryden, C.E., “Outlines of Chemical Technology”, 3rd Edition, 2014.
2. Shreve's “Chemical Process Industries Handbook”, McGraw-Hill, 5th Edition, 1998.

REFERENCES

1. Kent and Riegel's “Hand Book of Industrial Chemistry and Biotechnology”, Springer, 11th Edition, 2007.
2. Liptak B.G., “Instrument Engineers Handbook”, Volume II, 2005.
3. Rao.M.andM.Sittig, Affiliated East-West press, 2nd Edition, 2002.

13EICJ DIGITAL IMAGE PROCESSING L T P C
3 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: describe the fundamental of Image Processing.
CO2: explain the Image Transforms and Enhancement operations.
CO3: describe various Segmentation methods.
CO4: discuss the Degradation models, inverse and pseudo-inverse filtering.
CO5: explain the different image compression techniques.

UNIT I INTRODUCTION OF DIGITAL IMAGE FUNDAMENTALS 9

Introduction of object and Background in an image - Digital Image Representation - Fundamental Steps in Image Processing - Elements of a Digital Image Processing System. Digital Image Fundamentals : Elements of Visual Perception - A Simple Image Model - Sampling and Quantization - Some Basic Relationships between Pixels - Imagining Geometry.

UNIT II IMAGE TRANSFORMS AND ENHANCEMENT 9

Introduction to the Fourier Transform - The Discrete Fourier Transform - Some Properties of the Two Dimensional Fourier Transform - Other Separable Image Transforms. Image Enhancement : Spatial Domain Methods - Frequency Domain Methods - Some Simple Intensity Transformations - Histogram Processing - Image Subtraction - Image Averaging – Background - Smoothing Filters - Sharpening Filters - Lowpass Filtering - Highpass Filtering - Generation of Spatial Masks from Frequency Domain Specifications.

UNIT III IMAGE SEGMENTATION 9

Image Segmentation: Detection of Discontinuous - edge linking and boundary detection – thresholding – region - based segmentation.

UNIT IV IMAGE RESTORING 9

Degradations Model – Definitions - Degradation Model for Continuous Functions - Diagonalization of Circulant and Block Circulant Matrices - Circulant Matrices - Block Circulant Matrices - Effects of Diagonalization on the Degradation Model - Algebraic Approach to Restoration - Unconstrained Restoration - Constrained Restoration - Inverse Filtering – Formulation - Removal of Blur Caused by Uniform Linear Motion - Restoration in the Spatial Domain - Geometric Transformation.

UNIT V IMAGE COMPRESSION 9

Fundamentals – Coding Redundancy - Interpixel Redundancy - Psychovisual Redundancy - Fidelity Criteria. Image Compression Models - Elements of Information Theory. Measuring Information, Information Channel - Fundamental Coding Theorems - using Information Theory - Error Free Compression - Variable Length Codin - Bit-Plane Coding - Lossless Predictive Coding - Lossy Compression Lossy Predictive Coding, Transform Coding.

L: 45 TOTAL: 45 PERIODS

TEXT BOOK

1. Rafael. C. Gonzalez and Richard E.Woods, “Digital Image Processing”, 3rd Edition, Pearson Education, New Delhi, 2008.

REFERENCES

1. W.K.Pratt, “Digital Image Processing”,3rd Edition, John Wiley and sons, Inc. 2014.
2. M. Sonka et.al, “Image Processing, Analysis and Machine Vision”, 3/e, Thomson, Learning, India Edition, 2007.

13EICK SOLAR PHOTOVOLTAIC FUNDAMENTALS AND APPLICATIONS **L T P C 3 0 0 3**

(Common to Mechanical, EEE and EIE)

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO 1: understand the fundamentals of solar cells.

CO 2: recognize the various solar PV technologies and their up gradations along with their benefits.

CO 3: design and analyze on-grid and off-grid PV applications

CO 4: Realize cost benefit analysis of PV installations

UNIT I ESSENTIAL BASICS OF SOLAR CELL 9

Solar cell – physics - Photovoltaics in Global Energy Scenario - Fundamentals of Semiconductors, Energy band, Charge carriers - Motion, PN Junction diode, Solar cells – Design characteristics, Solar radiation.

UNIT II COMMERCIAL AND DEVELOPING TECHNOLOGIES 9

Commercial technologies - Mono crystalline and Multi crystalline, Silicon - Wafer based Solar cell, Thin film solar cells – A-Si, Cd-Te and CIGS, Concentrated PV cells, Developing technologies – Organic cells, Dye sensitized cells.

UNIT III SOLAR PV FOR ON-GRID APPLICATIONS 9

Solar cells to solar array – On-Grid PV system – With and Without storage – Balance of system - DC - DC converters - Inverters – Net Metering – Design and analysis - Performance evaluation and monitoring – Field visit – Grid tied PV power plant.

UNIT IV SOLAR PV FOR OFF-GRID APPLICATIONS 9

Off-Grid stand-alone PV system - System sizing – Module and Battery - Storage – Batteries for PV systems – Sun Tracking mechanism – Types of tracking – One-axis, Two-axis - Maximum power point tracking – Design and analysis – Performance evaluation and monitoring - Field visit – Off-grid PV system

UNIT V COST BENEFIT ANALYSIS FOR SOLAR PV INSTALLATIONS 9

Cost and manufacturability – Manufacturing economics – scaling – Pricing – Trends in retail pricing – energy economics – grid tied power plant –solar street lighting system

L: 45 TOTAL: 45 PERIODS

TEXT BOOK

1. Chetan Singh Solanki, “Solar Photovoltaics Fundamentals, Technologies and Applications”, 2nd Edition, Prentice Hall of India,

REFERENCES

1. James P. Dunlop, “Photovoltaic Systems”, 2nd Edition by, American Technical Publishers.
2. Eduardo Lorenzo, PROGENSA, “Solar Electricity – Engineering of Photovoltaic Systems.
3. Majid Ghassemi, Alma Cota, “SOLAR ENERGY - Renewable Energy and the Environment” Robert Foster, CRC Press.
4. www.pveducation.org

13EICL RENEWABLE ENERGY SYSTEMS **L T P C**
(Common to EEE and EIE) **3 0 0 3**

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: apply the solar energy concept in various applications.
CO2: explain the fundamentals of wind energy.
CO3: indicate the essential of biomass energy.
CO4: describe the importance of geothermal energy.
CO5: discuss the concept of ocean energy.

UNIT I SOLAR ENERGY COLLECTION, STORAGE AND APPLICATIONS 9

Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors - Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications - Solar heating / cooling technique - solar distillation and drying, photovoltaic energy conversion.

UNIT II WIND ENERGY 9

Sources and potentials -Horizontal and vertical axis windmills - Performance characteristics - Betz criteria - Wind Power estimation techniques - Principles of Aerodynamics of wind turbine blade - Various aspects of wind turbine design - Wind Turbine Generators: Induction, Synchronous machine - Constant V and F and variable - V and F generations - Reactive power compensation.

UNIT III BIO-MASS 9

Principles of Bio-Conversion - Anaerobic/aerobic digestion, types of Bio-gas digesters - gas yield - Combustion characteristics of bio gas - Utilization for cooking - I. C. Engine operation and economic aspects.

UNIT IV GEOTHERMAL ENERGY 9

Resources - methods of harnessing the energy - Various Types of Systems to use Geothermal Energy - Direct heat applications -Power Generation using Geothermal Heat - Sustainability of Geothermal Source - Status of Geothermal Technology - Economics of Geothermal Energy.

UNIT V OCEAN ENERGY 9

Ocean Thermal Energy Conversion (OTEC) - Principles utilization - setting of OTEC plants - thermodynamic cycles - Tidal and wave energy: Potential and conversion techniques – mini - hydal power plants and their economics.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

1. Kothari D.P, Singal. K.C and Rakesh Ranjan, “Renewable Energy Sources and Emerging Technologies”, PHI Private Ltd., 2008.
2. Rai. G.D, “Non-Conventional Energy Sources”, Khanna Publishers, New Delhi, 1999.

REFERENCES

1. Sukhatme. S.P, “Solar Energy: Principles of Thermal Collection and Storage”, Tata McGraw Hill, 2008.

2. Tiwari. G.N, “Solar Energy –Fundamentals Design, Modeling and Applications”, Narosa Publishing House, New Delhi, 2002.
3. Garg. H.P and Jai Prakash, “Solar Energy: Fundamentals and Applications”, Tata McGraw Hill, 2000.
4. S.P. Sukhatme, “Solar Energy”, Tata McGraw Hill, 1997.
5. Godfrey Boyle, “Renewable Energy, Power for a Sustainable Future”, Oxford University Press, U.K., 1996.
6. Freris. L.L, “Wind Energy Conversion systems”, Prentice Hall, UK, 1990.
7. Twidell J.W and Weir. A, “Renewable Energy Sources”, EFN Spon Ltd., UK, 1986.

13EICM ENVIRONMENTAL INSTRUMENTATION **L T P C**
(Common to EIE and CIVIL) **3 0 0 3**

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO 1: discuss the fundamental blocks of Measurement system.
CO 2: explain the working and list the types of sensor and transducer.
CO 3: explain the causes and effects of water, air and noise pollution on environment.
CO 4: describe the working principle of instruments for quality of water, air and sound monitoring and measurement.
CO 5: select the appropriate instrument for specific application.
CO 6: list the manufacturers of instruments for environmental monitoring and measurement and control.

UNIT I INTRODUCTION 9

Definition: Measurement and Instrumentation, Block diagram of Measurement system – Types of Sensor and Transducer. Necessity of instrumentation and control for environment, sensor requirement for environment.

UNIT II WATER 9

Definitions - causes and effects of water pollution - Standards of raw and treated water - sources of water and their natural quality - effects of water quality - Water quality measurement: Thermal conductivity detectors - Opacity monitors - pH analyzers and their application - conductivity analyzers and their application.

UNIT III GROUND AND WASTE WATER 9

Level measurement in wells - laboratory analysis of ground water samples - instrumentation in ground water monitoring - instrumentation in assessment of soil and ground water pollution - Automatic waste water sampling - optimum waste water sampling locations - Instrumentation set up for waste water treatment plant - Latest methods of waste water treatment plants - Quality assurance of storage water.

UNIT IV AIR 9

Definitions - causes and effects of air pollution - air pollution from thermal power plant - Air sampling methods and equipments - analytical methods for air pollution studies - Measurement of ambient air quality - Flow monitoring: Air flow measurement - gas flow – non-open channel flow measurement.

UNIT V SOUND 9

Definitions - causes and effects of Noise Pollution and Its Monitoring - Ambient noise - Noise intrusions - impulsive noise - transient noise - airport noise - Sound level meters - Tape recorders - noise dosimeters - sound level monitors and acoustical calibrators - Field equipments for noise measurement.

L: 45 TOTAL : 45 PERIODS

TEXT BOOKS

1. E.O.Doebelin, Dhanesh N Manik, “Measurement Systems”, 6th Edition, TMcGH, 2011.
2. Randy.D.Down, Jay.H.Lehr, “Environmental Instrumentation and Analysis”, John Wiley and Sons, Hand book, 2005.

REFERENCES

1. A course manual: Instrumentation in Environmental Engg. NEERI Publications. Nagpur.
2. Handbook of Analytical Instruments, 2nd Edition, R.S. Khandpur, TMcGH, 2007.
3. Narendra.S.Goel, John.M.Norman, Taylor and Francis, “Instrumentation for Studying Vegetation Canopies for Remote Sensing in Optical and Thermal Infrared Regions”, 1990.

WEB REFERENCES

1. http://cafefoundation.org/v2/pdf_tech/Noise.Technologies/PAV.Environ.Noise.BandK.pdf
2. http://www.aweimagazine.com/article.php?article_id=148
3. ftp://ftp.energia.bme.hu/pub/hullgazd/Environmental%20Engineers'%20Handbook/Ch06.pdf

13EICN EXPERIMENTAL STRESS ANALYSIS L T P C
(Common to Civil and EIE) **3 0 0 3**

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1 : discuss on various strains measurement methods.
CO2 : classify the various measuring instruments in experimentation
CO3 : relate the concept of photo elasticity in calibration of photoelastic materials.
CO4 : analyze models based on various methods
CO5 : describe the advanced techniques in measurements.

UNIT I STRAIN MEASUREMENT METHODS 9

Strain gauges – basic characteristics – mechanical, optical, acoustic, electrical inductance and capacitance, pneumatic types – description and working principles – factors producing strain sensitivity – Gauge construction – temperature compensation – Gauge sensitivities and gauge factors – Strain rosettes –Calculation of principal strains and principal stresses.

UNIT II MEASURING INSTRUMENTS 9

Linear Variable Differential Transducer – Cathode Ray Oscilloscope – XY Plotter – Digital Data Acquisition System – Hydraulic Jacks – Pressure Jacks – load cells – Proving Rings – Vibration meter – Wind Tunnel – Calibration of Testing Instruments.

UNIT III PHOTO ELASTICITY 9

Two dimensional photo elasticity – Stress optic law – Polariscope – isoclinic and sochromatic fringes – compensators – Separation techniques – Model materials – Calibration of photo elastic materials.

UNIT IV MODEL ANALYSIS 9

Model analysis – Direct and Indirect models – laws of structural similitude – choice of scales – Model materials – Limitations of model studies –Buckingham pi theorem –Design of direct and indirect models – Begg's Deformeter and its applications.

UNIT V ADVANCED TECHNIQUES 9

Fundamentals of photo elastic coatings – Morie fringe and Brittle coating technique – crack detection techniques – Introduction to stress freezing technique. – Introduction to nondestructive testings – Holography

L : 45 TOTAL : 45 PERIODS

TEXT BOOKS

1. Dally and Railey, "Experimental stress analysis", 2003.
2. Richard G Budynas, "Advanced Strength and Applied Stress Analysis", Tata McGraw Hill Publishing company Ltd., New Delhi, 2011

REFERENCES

1. Sadhu Singh, "Experimental stress analysis", Khanna Publishers, New Delhi, 2005.
2. Dove and Adam, "Experimental stress analysis and Motion measurements",1989

13TD01E INDIAN BUSINESS LAWS L T P C
0 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO 1: explain the elements of a valid contract.

CO 2: discuss main provisions relating to Sale of Goods Act and Negotiable Instruments Act.

CO 3: explain provisions relating to incorporation and functioning of company and partnership firm.

CO 4: understand the fundamentals of Consumer Protection Act and Foreign Exchange Management Act.

CO 5: understand the basic knowledge of Information Technology Act and RTI Act.

UNIT I THE INDIAN CONTRACT ACT, 1872

Definition of a Contract and its essentials - Formation of a valid Contract - Offer and Acceptance, Consideration - Capacity to Contract - Free consent - Legality of object - Discharge of a Contract by performance - Impossibility and Frustration - Breach, Damages for breach of a contract - Quasi contracts - Special Contracts - Contract of Indemnity and Guarantee - Contract of Bailment and Pledge - Contract of Agency.

UNIT II THE SALE OF GOODS ACT, 1930

Definition of a Contract of Sale - Conditions and Warranties - Passing of Property - Right of Unpaid Seller against the Goods - Remedies for Breach - The Negotiable Instrument Act, 1881 Definition and characteristics - Kinds of negotiable instruments - Promissory Note - Bill of Exchange and Cheques - Holder and Holder in due course - Negotiation, Presentment, Discharge from Liability - Noting and Protest – Presumption - Crossing of Cheques - Bouncing of Cheques.

UNIT III THE COMPANIES ACT, 1956

Nature and Definition of a Company - Registration and Incorporation - Memorandum of Association - Articles of Association – Prospectus - Kinds of Companies - Directors: Their powers and duties – Meetings - Winding up - The Indian Partnership Act, 1932 - Definition of Partnership and its essentials - Rights and Duties of Partners: Types of Partners - Minor as a partner - Doctrine of Implied Authority - Registration of Firms - Dissolution of firms - Limited Liability Partnership Act, 2000.

UNIT IV THE CONSUMER PROTECTION ACT, 1986

Aims and Objects of the Act - Redressal Machinery and Procedure for complaints under the Act – Remedies – Appeals - Enforcement of orders and Penalties - Foreign Exchange Management Act 2000 - Definition and Main Provisions.

UNIT V THE INFORMATION TECHNOLOGY ACT

Definition, Digital Signature - Electronic Governance – Attribution - Acknowledgment and Dispatch of Electronic Records - Sense Electronic Records and Sense Digital Signatures - Regulation of Certifying Authorities Digital Signature Certificates - Duties of Subscribers - Penalties and Offences - The Right to Information Act, 2005 - Right to know - Salient Features of the Act - Obligation of Public Authority - Designation of Public Information Officer - Request for obtaining information - Duties of a PIO - Exemption from Disclosure of Information - Partial Disclosure of Information - Information Commissions - Powers of Information Commissions - Appellate Authorities – Penalties - Jurisdiction of Courts.

TEXT BOOKS

1. Kuchhal M.C, “Business and Industrial Laws”, 3rd Edition, JBA Publishers, New Delhi, 2013.
2. Gulshan S.S, “Merchantile Law”, 3rd Edition, JBA Publishers, New Delhi, 2007.

REFERENCES

1. Mulla D.F, “The Sale of Goods Act and the Indian Partnership Act”, 10th Edition, LexisNexis Ltd., India, 2012.
2. Dabas J, “Negotiable Instruments Act”, 2nd Edition, JBA Publishers, New Delhi, 2013.
3. Avtar S, “The Principles of Mercantile Law”, 9th Edition, Eastern Book Company, India, 2011.

13TD02E LEADERSHIP AND PERSONALITY DEVELOPMENT L T P C
0 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO 1: identify the various leadership skills.
CO 2: understand group dynamics and factors influencing the team performance.
CO 3: describe the personality dimensions based on personality theories.
CO 4: explain personality determinants and personality types.
CO 5: apply effective training program for personality development.

UNIT I INTRODUCTION

Leadership – Meaning, Concepts and Myths about Leadership, Components of Leadership- Leader, Followers and Situations - Leadership Skills – Basic Leadership Skills - Building Technical Competency - Advanced Leadership Skills - Team Building for Work Teams - Building High Performance Teams.

UNIT II TEAMS AND LEADERSHIP

Assessing Leadership & Measuring Its Effects - Group- Nature, Size, Roles, Norms, Cohesion, and Stages of Group Development - Teams and their Leadership – Effective Team Characteristics and Team Building - Ginnetts Team Effectiveness Leadership Model.

UNIT III PERSONALITY

Personality - Meaning, Concept, Personality Patterns, Symbols of Self, Moulding the Personality Pattern, Persistence & Change - Personality & Personal Effectiveness - Psychometric Theories – Cattele and Big Five - Psychodynamic Theories - Carl Jung and MBTI - Transactional Analysi - Johari – Window - Personal Effectiveness.

UNIT IV PERSONALITY DETERMINANTS

Personality Determinants – Heredity and Environment – Types of personality.

UNIT V PERSONALITY TRAINING

Concept, Role, Need, Importance and types of personality Training - Understanding Process of Learning - Developing an Integrated Approach of Learning in Training Programme - Training Needs Assessment.

TEXT BOOKS

1. Yukl G, “Leadership in Organisations”, 8th Edition, Pearson Education Ltd., England, 2013.
2. Lall M, Sharma S, “Personal Growth Training & Development”, Kindle Edition, USA, 2009.

REFERENCES

1. Janakiraman B, “Training and Development”, Wiley Dream tech, Biztantra, 2005.
2. Pareek U, “Understanding Organizational Behaviour”, 2nd Edition, Oxford University Press, USA, 2007.

13TD03E INTERNATIONAL BUSINESS MANAGEMENT L T P C
0 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO 1: understand the global business environment.

CO 2: explain the impact of economic, legal, cultural, geographical and political factors on international business.

CO 3: discuss the issues and problems of Multinational Enterprises.

CO 4: discuss the role of various international financial institutions.

CO 5: discuss about important aspects of WTO and GATT agreement.

UNIT I INTERNATIONAL BUSINESS ENVIRONMENT

International Business Environment - Globalization - Forces, Meaning, Dimensions and Stages in Globalization - Trading Environment of International Trade - Tariff and Non-tariff Barriers - Trade Blocks.

UNIT II RISK ANALYSIS AND PRACTICES

Country Risk Analysis - Political, Social and Economic - Cultural and Ethical practices - Responsibilities of International Business - Economic crisis in foreign countries.

UNIT III MULTINATIONAL ENTERPRISES

Managing Multinational Enterprises - Problems and Potential - Multinational Service Organizations - Indian companies becoming multinationals - Potential, Need and Problems.

UNIT IV INTERNATIONAL FINANCIAL MANAGEMENT

Introduction to International Financial Management - Balance of Trade and Balance of Payment - International Monetary Fund, Asian Development Bank and World Bank - Financial Markets and Instruments - Introduction to Export and Import Finance - Methods of Payment in International Trade.

UNIT V INTERNATAIONAL AGREEMENT

General Agreement on Trade and Tariffs, (GATT) - World Trade Organization - Seattle and Doha Round of Talks - Dispute Settlement Mechanism under WTO - Problems of Patent Laws - International Convention on Competitiveness - Global Sourcing and its Impact on Indian Industry - Globalization and Internal Reform Process.

TEXT BOOKS

1. Bhalla V.K, Shivaramu S, “International Business Environment”, 9th Edition, Anmol Publications Pvt. Ltd., Delhi, 2005.
2. Apte P.G, “International Financial Management”, 5th Edition, Tata McGraw Hill, India, 2008.
3. Cherulinam F, “International Business”, 5th Edition, Prentice Hall of India, New Delhi, 2010.

REFERENCES

1. Rao, Rangachari, “International Business”, Himalaya Publishing House, New Delhi, 2010.
2. Hill C, “International Business”, 10th Edition, Tata McGraw Hill Education, New Delhi, 2014.
3. Daniels J.D, “International Business Environment”, 15th Edition, Prentice Hall of India, New Delhi, 2014.

13TD04E	BASICS OF MARKETING	L T P C
		0 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO 1: describe the basic concepts of marketing.
CO 2: discuss the significance of consumer behavior and market segmentation.
CO 3: discuss brand, trade mark, after- sales service and product life cycle concepts.
CO 4: formulate strategies for pricing and channels of distribution.
CO 5: analyze and selection of best promotional technique.

UNIT I INTRODUCTION

Nature and Scope of Marketing - Importance of Marketing – Concepts: Traditional and Modern - Selling Vs. Marketing - Marketing Mix - Marketing Environment.

UNIT II CONSUMER BEHAVIOR AND MARKET SEGMENTATION

Nature, Scope and Significance of Consumer Behavior - Market Segmentation - Concept and Importance - Bases for Market Segmentation.

UNIT III PRODUCT PLANNING

Concept of Product - Consumer and Industrial Goods - Product Planning and Development - Packaging - Role and Functions - Brand Name and Trade Mark - After- Sales Service - Product Life Cycle Concept.

UNIT IV PRICING AND PHYSICAL DISTRIBUTION

Price - Importance of Price in the Marketing Mix - Factors Affecting Price of a Product/Service - Discounts and Rebates - Distribution Channels - Concept and Role - Types of Distribution Channels - Factors Affecting Choice of a Distribution Channel - Retailer and Wholesaler - Distributions Channels and Physical Distribution.

UNIT V PROMOTION

Definition - Methods of Promotion - Optimum Promotion Mix - Advertising Media - Their Relative Merits and Limitations - Characteristics of an Effective Advertisement - Personal Selling - Selling as a Career - Classification of a Successful Sales Person - Functions of Salesman.

TEXT BOOKS

1. Etzel M.J, Walker B.J, Stanton W.J, “Fundamentals of Marketing”, 13th Edition, McGraw Hill, New York, 2004.
2. Tanner J, Raymond M, “Principles of Marketing”, University of Minnesota Libraries Publishing, New York, 2015.

REFERENCES

1. Rajan Nair N, Varma M.M, “Marketing Management”, 2nd Edition, S.Chand & Sons, New Delhi, 2005.
2. Ramaswamy V.S, Namakumari S, “Marketing Management", 3rd Edition, Macmillan India Limited, London, 2002.

13TD05E RETAILING AND DISTRIBUTION MANAGEMENT L T P C
0 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO 1: explain the concepts of retailing and distribution management.
CO 2: analyze and solve retailers' problems to make decisions in retail organizations.
CO 3: plan and formulate strategy for retail management process.
CO 4: discuss about various distribution technology and stores management.
CO 5: analyze the issues and challenges in Logistic Management

UNIT I INTRODUCTION

Meaning and Nature of Distribution and Retail Industry - Future of Retailing and Distribution in India - Distribution Channels – Concept, Role and Types - Factors Affecting Choice of Distribution Channel.

UNIT II TYPES OF RETAILING

Stores Classified by Owners - Stores Classified by Merchandising Categories - Wheel Of Retailing - Traditional Retail Formats Vs. Modern Retail Formats in India - Store and Non-Store Based Formats - Cash and Carry Business - Retailing Models – Franchiser Franchisee, Directly Owned - Wheel of Retailing and Retailing Life Cycle – Issues in Retailing.

UNIT III MANAGEMENT OF RETAILING OPERATIONS

Meaning - Functions of Retail Management - Strategic Retail Management Process - Retail Planning - Importance and Process - Developing Retailing Strategies.

UNIT IV TECHNOLOGY IN DISTRIBUTION

Bar-Coding – RFID – Electronic Payment Systems - Store Administration - Floor Space Management – Managing Store Inventories and Display Action Plans - Pricing Strategies and Location Strategies.

UNIT V LOGISTICS OF RETAIL MANAGEMENT

Components and Functions; Distribution Related Issues and Challenges - Gaining Competitive Advantage through Logistics Management.

TEXT BOOKS

1. Agrawal D. K., “Distribution & Logistics Management: A Strategic Marketing Approach”, Macmillan Publishers India Limited, New Delhi, 2007.
2. Berman B, Evans J.R, “Retail Management – A Strategic approach”, 12th Edition, Pearson Education Ltd., England, 2013.
3. Cox R, Brittan P, “Retailing an introduction, Financial Times Management”, 5th Edition, Pearson Education Limited, England, 2004.

REFERENCES

1. Rushton A, Croucher P, Baker P, “The Handbook of Logistics & Distribution Management”, Kogan Page Limited, London, 2006.
2. Coughlan A.T, Anderson E, Stern L.W, El-Ansary A.I, “Marketing Channels", 7th Edition, Prentice Hall, New Jersey, 2006.
3. Sinha P. K, Uniyal D.P, “Managing Retailing”, Oxford University Press, India, 2007.

13TD06E **INTERNATIONAL ECONOMICS** **L T P C**
0 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO 1: discuss the impact of globalization.

CO 2: identify and analyze different theoretical models of international economics in light of 'real world' situations.

CO 3: examine the consequences of trade policies.

CO 4: explain the importance of international financial markets.

CO 5: discuss the important aspects of international banking.

UNIT I INTRODUCTION

Background of International Business Economics - Globalization and International Business – The Emergence of Global Institutions – Drivers of Globalizations - The Globalization Debate.

UNIT II THE INTERNATIONAL TRADE THEORY

The Law of Comparative Advantage – The Demand and Supply, Offer Curves - The Terms of Trade – Factor Endowments and the Heckscher – Ohlin Theory – Implications of Trade Theories - Economics of Scale - Imperfect Competition.

UNIT III INTERNATIONAL TRADE POLICY

Trade Restrictions - Tariffs, Non –Tariff Trade Barriers - Tariff Vs. Quota - The New Protectionism – Economic Integration - Custom Unions and Free Trade Areas - Major Regional Trade Agreements - Foreign Exchange Market – Types of Foreign Exchange Transactions – Reading Foreign Exchange Quotations – Forward and Futures Market – Foreign - Currency Options – Exchange Rate Determination – Arbitrage – Speculation and Exchange - Market Stability.

UNIT IV WORLD FINANCIAL ENVIRONMENT

Global Foreign Exchange Markets – Economic Theories of Exchange - Rate Determination - International Regime for FDI and MNC - Consequences of Economic Globalization.

UNIT V INTERNATIONAL BANKING

Reserves, Debt and Risk - Nature of International Reserves – Demand for International Reserves – Supply of International Reserves – Gold Exchange Standard – Special Drawing Rights – International Lending Risk – The Problem of International Debt – Financial Crisis and The International Monetary Fund – Eurocurrency Market.

TEXT BOOKS

1. Krugman P.R, Obstfeld M, "International Economics Theory and Policy", 8th Edition, Prentice Hall, Boston, 2008.
2. Carbaugh R.J, "International Economics", 15th Edition, South Western College publication, USA, 2014.

REFERENCES

1. Daniels J, Radebaugh L, Sullivan D, Salwan P, "International Business", 12th Edition, Pearson Education, New Delhi, 2010.
2. Suranovic S, "International Economics: Theory and Policy", Flat World Knowledge, USA, 2010.

13TD07E INDIAN ECONOMY L T P C
0 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO 1: discuss the current economic development in India
CO 2: describe the key indicators of estimation of national income
CO 3: explain elementary concepts of economic planning and development in India
CO 4: discuss the concept of public finance and preparation of budget
CO 5: discuss the influence of infrastructure growth on economic development

UNIT I ECONOMIC DEVELOPMENT

Meaning - Measurement of Economic Development - Characteristic of underdeveloped and developed economies - Causes for Indian economic underdevelopment - Major issues in development - Strategies for economic development Import substitution and Export oriented strategies - Determinants of economic development.

UNIT II NATIONAL INCOME

The National Income and its estimates in India - Limitations of National income estimation - Trends in National income of India: Growth and Structure - Inter-state variations in National income - Income distribution - Measurement of poverty in India.

UNIT III ECONOMIC PLANNING

Planning and economic development in India - Planning models in India (Elementary concepts) - Capital formation - Growth of Public and Private sector in India – Industrial policies an assessment - Capital formation and domestic saving.

UNIT IV INDIAN PUBLIC FINANCE

Budgetary policies of the central government - Composition and trends in public revenue and expenditure - Expenditure control and government consumption expenditure - concepts of Budgetary deficits and implications - state budget.

UNIT V INFRASTRUCTURE AND ECONOMIC DEVELOPMENT

Power and energy - Transport system in India's economic development - Communication system in India - Urban infrastructure - Science and technology - Private investment in infrastructure - Outlook and prospects.

TEXT BOOKS

1. Dutt R, Sundaram K.P.M, "Indian Economy", S.Chand and Co., New Delhi, 2006.
2. Agarwal A.N, Agarwal M.K, "Indian Economy: Problems of Development and Planning", 41st Edition, New Age International Ltd., New Delhi, 2016.

REFERENCES

1. Arvind P, "India: The Emerging Giant", Oxford University Press, USA, 2008.
2. Government of India, Economic Survey, (2010 -11 to 2014 -15).

13TD08E RURAL ECONOMICS L T P C
0 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO 1: discuss the role and importance of agriculture in economic development of India.
CO 2: describe the impact of agricultural forming in rural employment, wage policy, technological change and green revolution.
CO 3: analyze the relationship between rural and urban society.
CO 4: recognize the formation and system of rural social institutions.
CO 5: compare the social changes in the rural society after modernization and globalization.

UNIT I INTRODUCTION

Nature and Scope of Rural Economy - Importance of Agriculture in Economic Development of India - Nature of Land Problems - Evolution of Policy – Land Tenure System - Land Reform Measures.

UNIT II AGRICULTURE AND FARMING

Agricultural Holdings - Fragmentation and Sub-Division of Holdings, Cooperative Farming-Rural Labour Problems - Nature of Rural Unemployment - Employment and Wage Policy - Sources of Technological Change and Green Revolution.

UNIT III RURAL SOCIETY

Rural Society Structure and Change - Village and its Social Organization - Indian Village and its Types - Rural-Urban Continuum and Rural-Urban Relationships.

UNIT IV RURAL SOCIAL INSTITUTIONS

Rural Social Institutions - Family, Property, Caste, Class, Agrarian Structure - Indebtedness and Poverty - Jajmani System - Religion, Village, Panchayat Raj and Community Development Programmes – Problems.

UNIT V SOCIAL CHANGES

Social Change in Rural India-Impact of Westernization - Secularization, Urbanisation, Industrialisation, Migration, Transportation, Modernization of Indian Rural Society - Post Modernization and Globalization and Indian Villages.

TEXT BOOKS

1. Carver T.N, “The Principles of Rural Economics”, Ginn and company, USA, 1911.
2. Desai A.R, “Rural Sociology in India”, 5th Edition, Popular Prakashan Ltd., Mumbai, 2011.

REFERENCES

1. Dube S.C., “India’s changing villages”, Psychology Press, UK, 2003.
2. Datt R, Sundharam K.P.M, Datt G, Mahajan A,“Indian Economy”, 72nd Edition, S.Chand & Co., New Delhi, 2016.
3. Chaudhari, C.M., “Rural Economics”, Sublime Publication, Jaipur, 2009.

13TD09E INTERNATIONAL TRADE L T P C
0 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO 1: discuss the importance of international trade in developing countries.

CO 2: describe the impact of Trade agreements in international Business environment.

CO 3: explain the role of foreign exchange and their impact on trade and investment flows.

CO 4: discuss the benefits of Multinational Corporation in Internal Trade

CO 5: analyze the key role of globalisation in Indian economy.

UNIT I INTRODUCTION

International Marketing - Trends in International Trade - Reasons - Global Sourcing and Production Sharing - International Orientations - Internationalization Stages and Orientations - Growing Economic Power of Developing Countries – International Business Decision.

UNIT II INTERNATIONAL BUSINESS ENVIRONMENT

Trading Environment - Commodity Agreements – State Trading - Trading Blocks and Growing Intra-Regional Trade - Regional Groupings – SAARC, BRICS, ECM, ASEAN - Trade Liberalization - The Uruguay Round-Evaluation – UNCTAD – GATT – WTO.

UNIT III INTERNATIONAL FINANCIAL ENVIRONMENT

International Money and Capital Markets - Foreign Investment Flows – Pattern, Structure and Effects - Movements in Foreign Exchange and Interest Rates and their Impact on Trade and Investment Flows - Exchange Rate Mechanism and Arrangement.

UNIT IV MULTINATIONAL CORPORATIONS

Definition - Organizational Structures - Dominance of MNC's - Recent Trends - Code of Conduct - Multinationals in India - Issue in Investment, Technology Transfer, Pricing and Regulations - International Collaborations and Strategic Alliances.

UNIT V INDIA IN THE GLOBAL SETTING

India an Emerging Market - India in the Global Trade - Liberalization and Integration with Global Economy - Factors Favouring and Resisting Globalization - Trade Policy and Regulation in India - Trade Strategies - Export-Import Policy - Regulation and Promotion of Foreign Trade in India.

TEXT BOOKS

1. Daniels J.D, Radebaugh L.H, Sullivan D.P, "International Business: Environment and Operations", 12th Edition, Prentice Hall, USA, 2009.
2. Ricky W.G, Michael W.P, "International Business: A Managerial Perspective", Prentice Hall, USA, 2009.

REFERENCES

1. Bhattacharya B, Varshney R.L, "International Marketing Management", 25th Revised Edition, S. Chand & Sons, New Delhi, 2015.
2. Verma M.L, "International Trade", Common wealth Publisher, New Delhi, 2010.

13TD10E GLOBAL CHALLENGES AND ISSUES L T P C
0 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO 1: understand the various global issues.
CO 2: demonstrate a reasonable understanding of environmental debates and issues.
CO 3: explain the developmental issues relating to food, health and energy.
CO 4: demonstrate the economical issues in international trade.
CO 5: describe the civilization issues relating to human rights and social justice.

UNIT I SECURITY ISSUES

Nuclear Issues - Global and South Asian Context - Small Weapons Proliferation and Internal Arms Race - Chemical and Biological Weapons – Terrorism - Causes, Consequences And Trends - Cyber Terrorism – Counter Terrorism.

UNIT II ENVIRONMENTAL ISSUES

Global Warming and Climate Change - Threats to Bio-Sphere and Space - Pollutions, De-Forestation, Solid, Chemical and Nuclear Wastes and their Management - Preserving the Green Cover and Wild Life.

UNIT III DEVELOPMENTAL ISSUES

Food Security - Poverty and Hunger - Energy Security - Supply and Demand - Traditional and Alternative Sources of Energy – ITER - Health Security – Health for all - Development Vs. Environment - Sustainable Development.

UNIT IV ECONOMIC ISSUES ON INTERNATIONAL TRADE

International Trade - GATT, WTO - Regional Associations - ECM, ASEAN, OPEC, BRICS - Financial Crisis - ASEAN, Mexico and Greece - Global Issues in Trade and Commerce.

UNIT V CIVILIZATION ISSUES

Human Rights - Issues Relating to Freedom of Speech and Expression - Right to Self Determination - Preservation of Cultures and Cultural Diversities - Rights of Women and Children - Dividends of Globalization and Social Justice – Good Governance.

TEXT BOOKS

1. Payne R, “Global Issues”, 4th Edition, Pearson Education Ltd., New York, 2013.
2. Owens P, Baylis J, Smith S, “The Globalization of World Politics”, 3rd Edition, Oxford University Press, USA, 2013.

REFERENCE

1. Chirco J.A, “Globalization: Prospects and Problems”, Sage Publications, New Delhi, 2013.

13TD11E INDIAN CULTURE AND HERITAGE L T P C
0 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: describe Indian culture, civilization and its features.

CO2: demonstrate stone age, Indian races and their contribution in pre-historic culture.

CO3: explain historical development of Indian culture.

CO4: explain the significance, conditions and development of Vedic culture.

CO5: analyze the advent of Islam and European culture.

UNIT I INTRODUCTION

Introduction to Culture - Meaning and Scope - Culture and Civilization - General Characteristics Features of Indian Culture - Geographical Impact on Indian Culture.

UNIT II PRE-HISTORIC CULTURE

Dravidian Culture - Old Stone Age - New Stone Age - Metal Age - Indian Races and their Contribution to Indian Culture.

UNIT III HISTORICAL DEVELOPMENT OF INDIAN CULTURE

Indus Valley Culture - City Planning - Social and Religious Conditions - Vedic and Later Vedic Cultures - Dharmasastras and Caste Systems - Comparison of Indus and Vedic Culture - Importance of Indus Valley and Vedic Cultures.

UNIT IV CULTURE IN SANGAM AGE AND POST SANGAM AGE

Sangam Literature - Society - Political and Economical Conditions - Trade - Religion and Fine Arts.

UNIT V ADVENT OF ISLAM AND EUROPEAN CULTURE

Impact on Indian Culture and Heritage – Reform Movements - Brahma Samaj, Ariya Samaj, Self Respect Movement – Post Colonial Development.

TEXT BOOKS

1. Luniya B.N, “Evolution of Indian Culture”, Lakshmi Narain Agarwal Publishers, Agra, 1986.
2. Jeyapalan N, “History of Indian culture”, Atlantic publishers, New Delhi, 2001.
3. Sharma H.C, “Indian Culture and Heritage”, Neha Publishers & Distributors, New Delhi, 2012.

REFERENCES

1. John G.A, “Dictionary of Indian Philosophy (Sanskrit-English)”, University of Madras, Madras, 1998.
2. Misra R.S, “Studies in philosophy and Religion”, Bharathiya Vidya Prakasans, Varanasi, 1991.
3. Misra S.K, “Culture and Rationality”, Sage publications India pvt. Ltd., New Delhi, 1988.
4. Suda J.P, “Religious in India”, Sterling Publishers Pvt. Ltd., New Delhi, 1978.

13TD12E INDIAN HISTORY L T P C
0 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: illustrate the basics of Indian cultural heritage.
CO2: describe interaction between Ancient Indian cultural heritage and Islamic culture.
CO3: demonstrate Innovation by rulers of medieval period in the area of Administration, and their contact with the Europeans.
CO4: analyse modern Indian movements, Economic history and Impact of the British rule on India.
CO5: demonstrate the concepts of Indian National Movement and the history of freedom struggle in India.

UNIT I ANCIENTY INDIAN CULTURE

Ancient Indian Cultural Heritage - Social, Political, Legal and in the Area of Religion and Philosophy.

UNIT II LAW RELATING TO CULTURE

Law Givers and Dispute Resolution Systems in Ancient India (Administration of Justice in Ancient India - Pre-Islamic Period) - Law Relating to Culture - The Advent of Islam - Interaction between Ancient Indian Cultural Heritage and Islamic Culture - The Emergence of Synthetic Indian Culture.

UNIT III ADMINISTRATION IN ANCIENT INDIA

Innovation by Rulers of Medieval Period in the Area of General and Revenue Administration - District Administration - Court Systems - Indian Contact with the Europeans.

UNIT IV SOCIO-ECONOMIC HISTORY

Socio-Religious Reform Movements in Modern India and its Legal Culture - Economic History of India During British Period - Impact of the British Rule on India – Education.

UNIT V EUROPEAN CULTURE IMPACT

Impact of European Culture and Liberal Thought on India – The Indian National Movement - The History of Freedom Struggle in India upto 1947.

TEXT BOOKS

1. Sreenivasa M.H.V, “History of India Part I and II”, JBA Publishers, New Delhi, 2015.
2. Agarwal R.C, Bhatnagar M, “Constitutional Development and National Movement of India”, S. Chand Publishers, New Delhi, 2005.

REFERENCES

1. Altekar S, “State and Government in Ancient India”, Motilal Banarsidass Publishers, New Delhi, 2002.
2. Majumdur R.C, “History and Culture of the Indian People”, Vol. 2, The Age of Imperial Unity, Bharatiya Vidya Bhavan, New Delhi, 2001

13TD13E SUSTAINABLE DEVELOPMENT AND PRACTICES L T P C
0 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO 1: recognize the sustainable development and the way to achieve the sustainable development.
CO 2: outline the concept, factors governing the sustainability and their linkages.
CO 3: explain the environmental impact assessment and environmental audit.
CO 4: describe the environmental planning and managing the resources.
CO 5: acquire the knowledge about the environmental problems and their solutions.

UNIT I SUSTAINABLE DEVELOPMENT

Need for Sustainability - Nine Ways to Achieve Sustainability - Economics as the Dismal Science - Population, Resources and Environment.

UNIT II CHALLENGES OF SUSTAINABLE DEVELOPMENT

Concept of Sustainability - Factors Governing Sustainable Development - Linkages among Sustainable Development, Determinants of Sustainable Development - Case Studies on Sustainable Development.

UNIT III ENVIRONMENT IMPACT ASSESSMENT AND AUDIT

Concepts-process-evaluation methodology-EIA and EMS integration-setting up of audit programme - typical audit process - carrying out the audit-benefits of environmental auditing-environmental audit programmes in India.

UNIT IV ENVIRONMENTAL PLANNING

Introduction - Perspective of Environmental Planning - land resource development planning - Planning and managing the natural resources - landscape ecological planning - information and decision of environmental planning - Land use policy in India.

UNIT V ENVIRONMENTAL EDUCATION

Knowledge about the environment - Knowledge about the environment and population growth - Knowledge about the solution and environmental problems - Environmental education (EE) – Strategies for EE – Models for future Environmental Education Systems.

TEXT BOOKS

1. Rogers P, Jalal K.F, Boyd J.A, “An introduction to sustainable development”, Earthscan Publications Ltd., UK, 2006.
2. Santra S.C,” Environmental Science”, 3rd Edition, New Central Book Agency (P) Ltd., London, 2013.

REFERENCES

1. Stavins R.N. “Economics of the Environment: Selected Readings”, 5th Edition, W.W. Norton and Company, New York, 2005.
2. Sachs J.D, “The Age of Sustainable Development”, Columbia University Press, New York, 2015.

13TD14E WOMEN IN INDIAN SOCIETY L T P C
0 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: Demonstrate historical perspective about women in Indian society.
CO2: Explain social problems of women.
CO3: Understand the legislation for women protection in India.
CO4: Demonstrate the involvement of women literacy, career and politics.
CO5: Analyse the role of NGO's in women empowerment.

UNIT I INTRODUCTION

A Historical Perspective - Early Vedic, Colonial and Modern Periods - Position of Women in Contemporary India.

UNIT II SOCIAL ISSUES

Issues of Girl Child - Female Infanticide and Foeticide, Sex Ratio, Child Marriage, Dowry and Property Rights - Women's Health and Birth Control - Reproduction - Violence against Women - Domestic Violence - Female Headed Households - Women in the Unorganized Sector of Employment - Women's Work- Status and Problems - Problems of Dalit Women.

UNIT III PROTECTIVE LEGISLATION FOR WOMEN

Protective Legislation for Women in the Indian Constitution - Anti Dowry, SITA, PNDT, And Prevention Sexual Harassment At Workplace (Visaka Case) - Domestic Violence(Prevention) Act.

UNIT IV WOMEN AND EDUCATION

Formal and Non-Formal Literacy - Post Literacy - Vocational Training - Dual Career Modernization – Women and Politics - Political Status - Global Movements and Indian Movements.

UNIT V ROLE OF NGO'S IN WOMEN EMPOWERMENT

Gender Economy - All India Women's Conference (AIWC) – Women's India Association (WIA) - National Council of Women in India (NCWIE) - Indian Association of Women's Studies – Women Development Cells - Self Help Groups.

TEXT BOOKS

1. Majumdar M, "Social Status of Women in India", Wisdom Press, New Delhi, 2012.
2. Harish R, Harishankar V.B, "Re-Defining Feminisms", Rawat Publications, Jaipur, 2011.

REFERENCES

1. Rathod P.B, "An Introduction to Women's Studies", ABD Publishers, Jaipur, 2010.
2. Ray R, "Hand Book of Gender", Oxford University Press, New Delhi, 2012.

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13TD15E INDIAN CONSTITUTION L T P C
0 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: describe the basic understanding of the Indian Constitution.
CO2: understand the structure and functions of parliament.
CO3: demonstrate the organization and working of the Judiciary.
CO4: understand the structure and functions of state legislature.
CO5: understand the 73rd and 74th Constitutional Amendments.

UNIT I INDIAN CONSTITUTION

Salient Features - Preamble - Fundamental Rights – Directive Principles of State Policy - Fundamental Duties.

UNIT II PARLIAMENTARY SYSTEM

Powers and Functions of President and Prime Minister - Council of Ministers - The Legislature Structure and Functions of Lok Sabha and Rajya Sabha – Speaker.

UNIT III THE JUDICIARY

Organisation and Composition of Judiciary - Powers and Functions of the Supreme Court - Judicial Review – High Courts.

UNIT IV STATE GOVERNMENTS

Powers and Functions of Governor and Chief Minister – Council of Ministers - State Legislature.

UNIT V LOCAL GOVERNMENTS

73rd and 74th Constitutional Amendments – Federalism - Center – State Relations.

TEXT BOOKS

1. Basu D.D," Introduction to Indian Constitution", Prentice Hall of India, New Delhi, 2015.
2. Gupta D.C, "Indian Government and Politics", Vikas Publishing House, New Delhi, 2010.

REFERENCES

1. Pylee M.V, "Introduction to the Constitution of India", Vikas Publishing House, NewDelhi, 2011.
2. Kashyap S, "Our Constitution", National Book Trust, New Delhi, 2010.

13TD16E BIO MECHANICS IN SPORTS L T P C
0 0 0 3

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1**:** discuss the basics of biomechanics in sports & movement technique accurately.
CO2**:** discuss the basics of linear kinematics and its applications in the field of sports.
CO3: demonstrate the linear kinematics in the field of sports.
CO4**:** discuss the basics of angular kinematics and its applications in the field of sports.
CO5: demonstrate the angular kinematics in the field of sports.

UNIT I INTRODUCTION

Meaning, Aim and Objectives, Importance of Biomechanics in Sports - Types of Motion Linear, Angular, Curvilinear and Circular Motion.

UNIT II LINEAR KINEMATICS

Speed, Velocity, Acceleration, Motion, Projectile Motion – Application of Linear Kinematics in The Field of Physical Education and Sports.

UNIT III ANGULAR KINEMATICS

Angular Speed - Angular Velocity - Angular Acceleration - Relationship between Linear and Angular Motion – Application of Angular Kinematics in the Field of Physical Education and Sports.

UNIT IV LINEAR KINETICS

Mass, Weight, Force, Pressure, Work, Power, Energy, Impulse, Momentum, Impact, Friction, Newton's Law of Motion - Law of Inertia and Types of Inertia.

UNIT V ANGULAR KINETICS

Levers, Equilibrium and Centre of Gravity – Friction and its Types, Centrifugal and Centripetal Force Bio Mechanical Principles Involved in Designing Sports Equipments.

TEXT BOOKS

1. Singh S.K, "Biomechanics in Sports", Neha Publishers & Distributors, New Delhi, 2009.
2. McGinnis P.M, "Biomechanics of Sports and Exercise", 2nd Edition, Human Kinetics Publishers, USA, 2004.

REFERENCES

1. Saxena A, "Biomechanics in Sports", Neha Publishers & Distributors, New Delhi, 2011.
2. Heyward V.H, Gibson A.L, "Advanced Fitness Assessment and Exercise Prescription", 7th Edition, Human Kinetics, USA, 2014.