Dr. Mahalingam College of Engineering and Technology

(An Autonomous Institution)

Pollachi - 642 003

Curriculum and Syllabus for

B.E. INSTRUMENTATION AND CONTROL ENGINEERING

SEMESTER I to VIII

with effect from 2014-15

REGULATIONS 2014

DR MAHALINGAM MCET

COLLEGE OF ENGINEERING AND TECHNOLOGY

Enlightening Technical Minds

Programme : B. E. – Instrumentation and Control Engineering
Curriculum and Syllabus : Semesters I – VIII
Approved by Academic Council

Action	**Responsibility**	**Signature of Authorised Signatory**
Designed and Developed by	BoS Instrumentation and Control Engineering	
Complied by	Office of the Controller of Examinations	
Approved by	Principal	

DEPARTMENT INSTRUMENTATION AND CONTROL ENGINEERING

REGULATIONS 2014 - REVISION 0

Curriculum for B.E. Instrumentation and Control Engineering

Semester I

S.No	Course Code	Course Name	L	T	P	C	M
THEORY							
1	140CO0101	Technical English	2	0	2	3	100
2	140CO0102	Engineering Mathematics – I	3	1	0	4	100
3	140CO0103	Engineering Physics	3	0	0	3	100
4	140CO0104	Engineering Chemistry	3	0	0	3	100
5	140CO0105	C Programming	3	0	0	3	100
6	140IC0106	Basics of Civil and Mechanical Engineering	3	0	0	3	100
PRACTICAL							
7	140IC0107	Engineering Practices Laboratory (Civil & Mechanical)	0	0	3	2	100
8	140CO0108	C Programming Laboratory	0	0	3	2	100
9	140CO0210	Engineering Physics and Chemistry Laboratory (Annual Pattern)	0	0	3	-	-

Semester II

S.No	Course Code	Course Name	L	T	P	C	M
THEORY							
1	140CO0201	Communication Skills	2	0	2	3	100
2	140CO0202	Engineering Mathematics – II	3	1	0	4	100
3	140CO0203	Material Science	3	0	0	3	100
4	140CO0204	Environmental Science	3	0	0	3	100
5	140IC0205	Electrical Circuit Analysis	3	1	0	4	100
6	140IC0206	Electronic Devices and Circuits	3	0	0	3	100
PRACTICAL							
7	140IC0207	Engineering Practices Laboratory (Electrical, Electronics and PC hardware)	0	0	3	2	100
8	140IC0208	Circuits and Devices Laboratory	0	0	3	2	100
9	140CO0209	Engineering Graphics	2	0	3	3	100
10	140CO0210	Engineering Physics and Chemistry Laboratory (Annual Pattern)	0	0	3	2	100

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Semester III

S.No	Course Code	Course Name	L	T	P	C	M
THEORY							
1	140IC0301	Engineering Mathematics – III	3	1	0	4	100
2	140IC0302	Thermal Engineering and Fluid Mechanics	3	1	0	4	100
3	140IC0303	Transducer Engineering	3	0	0	3	100
4	140IC0304	Object Oriented Programming Concepts	3	0	0	3	100
5	140IC0305	Electrical Machines	3	0	0	3	100
6	140IC0306	Electrical Measurements and Instruments	3	0	0	3	100
PRACTICAL							
7	140IC0307	Thermal Engineering and Fluid Mechanics Laboratory	0	0	3	2	100
8	140IC0308	Electrical Measurements and Instruments Laboratory	0	0	3	2	100
9	140IC0309	Electrical Machines Laboratory	0	0	3	2	100

Semester IV

S.No	Course Code	Course Name	L	T	P	C	M
THEORY							
1	140IC0401	Numerical Methods	3	1	0	4	100
2	140IC0402	Linear Integrated Circuits and Applications	3	0	0	3	100
3	140IC0403	Industrial Instrumentation-I	3	0	0	3	100
4	140IC0404	Communication Engineering	3	0	0	3	100
5	140IC0405	Digital Principles and Applications	3	0	0	3	100
6	140IC0406	Data Structures and Algorithms using C++	3	0	0	4	100
PRACTICAL							
7	140IC0407	Integrated Circuits Laboratory	0	0	3	2	100
8	140IC0408	Transducer and Signal Conditioning Laboratory	0	0	3	2	100
9	140IC0409	Data structures and Algorithms and Object Oriented Programming Laboratory	0	0	3	2	100

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Semester V

S.No	Course Code	Course Name	L	T	P	C	M
THEORY							
1	140IC0501	Analytical Instrumentation	3	0	0	3	100
2	140IC0502	Control Systems	3	1	0	4	100
3	140IC0503	Electronic Instrumentation	3	0	0	3	100
4	140IC0504	Industrial Instrumentation - II	3	0	0	3	100
5	140IC0505	Microprocessors and Microcontrollers	3	0	0	3	100
6	140IC0506	Power Electronics	3	1	0	4	100
PRACTICAL							
7	140IC0507	Microprocessors and Microcontrollers Laboratory	0	0	3	2	100
8	140IC0508	Industrial Instrumentation Laboratory	0	0	3	2	100
9	140IC0509	System Simulation Laboratory	0	0	3	2	100

Semester VI

S.No	Course Code	Course Name	L	T	P	C	M
THEORY							
1	140IC0601	Embedded System Design	3	0	0	3	100
2	140IC0602	Principles of Digital Signal Processing	3	1	0	4	100
3	140IC0603	Process Control	3	0	0	3	100
4	140IC0604	Virtual Instrumentation	3	0	0	3	100
5	XXX	Elective - I	3	0	0	3	100
6	XXX	Elective - II	3	0	0	3	100
PRACTICAL							
7	140IC0607	Process Control Laboratory	0	0	3	2	100
8	140IC0608	Virtual Instrumentation Laboratory	0	0	3	2	100
9	140IC0610	Mini Project	0	0	3	2	100

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Semester VII

S.No	Course Code	Course Name	L	T	P	C	M
THEORY							
1	140IC0701	Principles of Management	3	0	0	3	100
2	140IC0702	Logic and Distributed Control System	3	0	0	3	100
3	140IC0703	Digital Control and State Variable Methods	3	1	0	4	100
4	xxx	Elective – III	3	0	0	3	100
5	xxx	Elective – IV	3	0	0	3	100
PRACTICAL							
6	140IC0707	Industrial Automation Laboratory	0	0	3	2	100
7	140IC0708	Embedded System Design Laboratory	0	0	3	2	100
8	140IC0810	Project Work (Annual Pattern)	0	0	3	-	100

Semester VIII

S.No	Course Code	Course Name	L	T	P	C	M
THEORY							
1	140IC0801	Engineering Economics and Financial Accounting	3	0	0	3	100
2	xxx	Elective – V	3	0	0	3	100
3	xxx	Elective – VI	3	0	0	3	100
PRACTICAL							
4	140IC0810	Project Work (Annual Pattern)	0	0	12	8	200

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LIST OF ELECTIVES

S.No	Course Code	Course Name	L	T	P	C	M
		ELECTRONICS STREAM					
1	140IC9111	Digital Image Processing	3	0	0	3	100
2	140IC9112	VLSI Design	3	0	0	3	100
		INSTRUMENTATION STREAM					
3	140IC9113	Automobile and Aircraft Instrumentation	3	0	0	3	100
4	140IC9114	Biomedical Instrumentation	3	0	1	4	100
5	140IC9115	Fiber Optics and Laser Instruments	3	0	0	3	100
6	140IC9116	Instrumentation in Petrochemical Industries	3	0	0	3	100
7	140IC9117	Instrumentation System Design	3	0	0	3	100
8	140IC9118	Power Plant Instrumentation	3	0	0	3	100
9	140IC9119	Smart and Wireless Instrumentation	3	0	0	3	100
		CONTROL STREAM					
10	140IC9120	Advanced Process control	3	0	0	3	100
11	140IC9121	Industrial Drives and Control	3	0	0	3	100
12	140IC9122	Applied Soft Computing	3	0	0	3	100
13	140IC9123	Non Linear Control System	3	0	1	4	100
		MECHANICAL STREAM					
14	140IC9124	Micro Electro Mechanical Systems	3	0	0	3	100
15	140IC9125	Robotics and Automation	3	0	0	3	100
		NETWORK STREAM					
16	140IC9126	Wireless Sensor Networks	3	0	0	3	100
17	140IC9127	Industrial Data Communication Networks	3	0	0	3	100
		GENERAL STREAM					
18	140IC9128	Disaster Management	3	0	0	3	100
19	140IC9129	Professional Ethics and Human Values	3	0	0	3	100

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Semester I

Course Code: 140CO0101	**Course Title: TECHNICAL ENGLISH** (Common to all B.E / B.Tech Programmes Except AU and ME)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 2 : 0 : 2 : 3 : 100
Type: Lecture	**Total Contact Hours:** 60

Pre-requisites: The student should have undergone the course(s):
Nil

Course Outcomes:
At the end of the course students will be able to:

CO1. Employ appropriate vocabulary in different academic and professional contexts.
CO2. Comprehend lectures and technical oriented passages.
CO3. Apply suitable reading strategies to any science texts.
CO4. Speak effectively in real life and work related situations
CO5. Write grammatically correct sentences.

Course Content:

UNIT I FUNCTIONAL ENGLISH GRAMMAR **6+6**

Mechanical and grammatical structures of written English-Errors in writing mechanics -Errors in spelling-Usage and punctuation–Cohesion and Discourse-Sequencing of jumbled sentences using connectives-Embedded questions-Incorrect English (Indian Scenario)

UNIT II LISTENING & SPEAKING - PHONETICS **6+6**

Sounds of language -Sounds-phonemes -Organs of speech-Articulation-Consonants-vowels-International Phonetic Alphabets (IPA)-Stress and Tones-Stress, pause & intonation-Transcription-Listening Comprehension.

UNIT - III SPEAKING **6+6**

Language for social purpose – Conversation-Making Introductions -Inviting questions and responses-Expressing Opinions-Individual Presentation-Extempore-Telephonic conversation.

UNIT - IV GRAMMAR **6+6**

Prepositions -Sentence Pattern-Concord –Tenses-Articles -Active & Passive Voice-Comparative adjectives-Nominal Compounds-Modal Verbs-Writing definitions -Expressions of use and purpose-Expressions for compare and contrast- Phrasal verbs.

UNIT –V WRITING **6+6**

Instructions –Recommendations -Sequencing of Sentences-Paragraph Writing-Transcoding data - Note Making.

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Text Books:

1. NiraKonar, "Communication Skills for Professionals", PHI Learning Private Limited, New Delhi, 2009.

Reference Books:

1. Peter Roach, "English Phonetics and Phonology", Cambridge University Press, United Kingdom, 2004
2. Halliday.M.A.K, "An introduction to Functional English Grammar", Edward Arnold Publishers Ltd.U.S.A, 1985
3. Walter.E.Oliu, "Writing That Works- How to Write Effectively on the Job", St.Martin's Press, New York,1980
4. Raymond Murphy, "Murphy's English Grammar", Cambridge University Press, United Kingdom, 2004
5. Martin Hewings, "Advanced English Grammar", Cambridge University Press, 1999

Web References:

1. http://www.englishpage.com/grammar/index.html
2. UsingEnglish.com
3. http://www.perfect-english-grammar.com/
4. http://esl.fis.edu/grammar

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Course Code: 140CO0102	**Course Title: ENGINEERING MATHEMATICS- I** (Common to all B.E / B.Tech Programmes Except AU and ME)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 1 : 0 : 4 : 100
Type: Lecture	**Total Contact Hours: 60**

Pre-requisites: The student should have undergone the course(s):
Nil

Course Outcomes:

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

CO1. Use Eigen values and Eigen vectors of a real matrix to reduce quadratic form to canonical Form.

CO2. Write equations of sphere and cylinder under various geometrical conditions.

CO3. Use differential calculus concepts to derive equations of evolutes of curves.

CO4. Apply partial derivatives to calculate maxima and minima for functions of several variables

CO5. Apply multiple integrals to find area of plane curves and volume of solids.

Course Content:

UNIT I MATRICES **9+3**

Rank of a matrix (Revision)-Solution of system of equations-Characteristic equations-Eigen values and Eigen vectors of a real matrix-Geometrical meaning-Significance- Diagonalization by orthogonal transformation-Quadratic forms and Canonical forms-Transformation of quadratic forms to canonical forms through orthogonal transformation.

UNIT II THREE DIMENSIONAL ANALYTICAL GEOMETRY **9+3**

Direction cosines- Direction ratios-The plane and the straight line (Revision) - Sphere-Plane section of a sphere- Equation of a sphere through a circle-Tangent plane- Orthogonal spheres -Cylinder-Right circular cylinder.

UNIT - III DIFFERENTIAL CALCULUS **9+3**

Curvature in Cartesian and polar co-ordinates-Centre and radius of curvature-Circle of curvature-Evolutes of some standard curves (Parabola, Ellipse, Hyperbola, Astroid, Cycloid) – Envelopes.

UNIT - IV FUNCTIONS OF SEVERAL VARIABLES **9+3**

Partial derivatives (Revision)- Euler's theorem for homogenous functions-Total derivatives-Jacobians - Taylor's expansions- Maxima and minima for functions of two variables-Method of Lagrange's multipliers.

UNIT –V MULTIPLE INTEGRALS **9+3**

Double integration-Cartesian and polar coordinates-Change of order of integration-Transformation from Cartesian to polar, spherical and cylindrical coordinates-Triple integration in Cartesian Coordinates-Applications: Evaluating area and volume using multiple integrals.

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Text Books:

1. Veerarajan.T, "Engineering Mathematics", Updated 2nd Edition, Tata McGraw Hill, New Delhi,2010.
2. Ramakrishna Prasad.A, " Kreyszig's Engineering Mathematics I " , 1st Edition,Wiley India Pvt. Ltd., India, 2011.

Reference Books:

1. Venkatraman.M.K, "Engineering Mathematics-Volume I", 4th edition, National publishing company, Chennai, 2008.
2. Kandasamy.P,Thilagavathy. K., Gunavathy. K.,"Engineering Mathematics", Revised 9th Edition,S. Chand and Company Ltd., New Delhi, 2011.
3. Grewal.B.S. "Higher Engineering Mathematics", 40th Edition, Khanna Publications, New Delhi, 2007.
4. Louis.C.Barrett, Ray Wylie.C, "Advanced Engineering Mathematics", 6th Edition, McGraw-Hill Publishing Company Ltd, New Delhi, 2003.

Web References:

1. http://nptel.ac.in/
2. http://ocw.mit.edu/courses/mathematics
3. http://mathworld.wolfram.com/**FourierSeries**.html

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Course Code: 140CO0103	**Course Title: ENGINEERING PHYSICS** (Common to all B.E / B.Tech Programmes Except AU and ME)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):
Nil

Course Outcomes:

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

CO 1 To know the production and detection of ultrasonic.
CO 2 To know the working of laser and its applications
CO 3 To know the types of fibers, fabrication and its applications.
CO 4 To know the behavior of particle.
CO 5 Solving the miller indices and to know the crystal defects.

Course Content:

UNIT I ACOUSTICS AND ULTRASONICS 9

Acoustics: Sound intensity – Decibel - Reverberation - Sabines' formula. Factors affecting acoustics of buildings and remedies, Noise pollution and control, Noise control in machines. Ultrasonics: Magnetostriction and Piezoelectric generators. Detection and Properties of Ultrasonics – Cavitation - Industrial applications: Drilling, welding, soldering and cleaning – NDT: Pulse echo system, through transmission, resonance system - A, B and C scan displays with respect to flaw detection.

UNIT II LASERS 9

Laser principles: Stimulated and spontaneous emissions of radiations - Population inversion and pumping methods – Properties of lasers - Nd: YAG laser - He-Ne gas laser - CO_2 molecular laser and semiconductor lasers – Applications of Lasers: welding, drilling, cutting and heat treatment of materials. Holography: construction, reconstruction and applications - Medical applications of lasers (qualitative).

UNIT - III FIBER OPTICS 9

Principle of light propagation in optical fibres - Numerical aperture and acceptance angle -Types of fibres: based on material, refractive index, and mode of propagation. Fabrication of fibre using double crucible technique, splicing - Light sources: LD & LED. Detectors: PN, PIN & Avalanche photo diodes. Fibre optical communication systems and its advantages - Fibre optic sensors: temperature and displacement - Endoscope.

UNIT - IV QUANTUM PHYSICS 9

Schrodinger's wave equations: Time independent and time dependent - Physical significance of the wave function - Particle in a potential box - Electron microscopes: Scanning electron, transmission electron and Scanning transmission electron microscope.

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UNIT –V CRYSTAL STRUCTURE 9

Amorphous and Crystalline materials. Lattice - Unit cell - Bravais lattices. Crystal structures: SC, BCC, FCC and HCP – Calculation of number of atoms per unit cell, Coordination number, nearest neighbor distance, Atomic radius and packing factor - Diamond, NaCl structures. Miller indices – Interplanar distance Crystal defects: point, line and surface defects and their influence on the properties of materials (Qualitative).

Text Books:

1. Avadhanulu.M.N and Kshirsagar.P.G, "Text Book of Engineering Physics", S. Chand & Company Ltd., New Delhi, 2009.

Reference Books:

1. Palanisamy.P. K, "Engineering Physics", Scitech Publishers, Chennai, 2006.
2. Jayakumar.S, "Engineering Physics"', R.K. Publishers, Coimbatore, 2008.
3. Rajendran.V, "Engineering Physics", Tata McGraw-Hill Co, New Delhi, 2007.
4. Arthur Beiser, "Modern Physics", Tata McGraw-Hill Co, New Delhi, 2003

Web References:

1. http://www.physicsclassroom.com/
2. http://hyperphysics.phy-astr.gsu.edu/
3. http://www.tndte.com/TEXT%20BOOKS/Complete%20Books/Engineering%20Physics-I%20&%20II/Engineering%20Physics%20Sem%20-1%20&%202.pdf

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Course Code: 140CO0104	**Course Title: ENGINEERING CHEMISTRY** (Common to all B.E / B.Tech Programmes Except AU and ME)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):
Nil

Course Outcomes:

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

CO1. Explain the chemistry of water and specify the water treatment processes

CO2. Determine the rate of corrosion of a metal in a given environment and identify appropriate control techniques to avoid corrosion

CO3. Describe the efficiency of fuels in different states based on its composition and calorific value

CO4. Select a polymeric material for a specific engineering application

CO5. Select batteries based on the life cycle, working principle and their applications

Course Content:

UNIT I WATER TREATMENT TECHNOLOGY **9**

Introduction- Impurities in water- Effect of impurities in natural waters-hardness –estimation of hardness by EDTA method (problems). Boiler feed water – disadvantages of using hard water in boilers.Internal conditioning (phosphate, calgon and carbonate conditioning methods), External conditioning – demineralization process – desalination (reverse osmosis). Domestic and waste water treatment.

UNIT II CORROSION AND ITS CONTROL **9**

Chemical corrosion – Pilling - Bedworth rule – electrochemical corrosion –different types – galvanic corrosion – differential aeration corrosion – factors influencing corrosion, Corrosion control – sacrificial anode and impressed cathodic current methods – corrosion inhibitors-protective coatings– metallic coatings – electroplating (Au) and electroless (Ni) plating. Paint- drying action of paint and its constituents.

UNIT - III SURFACE CHEMISTRY AND INSTRUMENTAL METHODS OF ANALYSIS **9**

Surface chemistry: Adsorption- types – adsorption isotherm – Freundlich, Langmuir, application of adsorption technology in industries (ion exchange adsorption and adsorption chromatography).

Instrumental methods of Analysis: Beer –Lambert's Law –UV- VISIBLE, Flame Photometry, AAS, principle and Instrumentation (Block diagram only).

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NIT - IV FUELS AND LUBRICANTS 9

Coal – classification – Calorific value -proximate and ultimate analysis of coal (method only)- metallurgical coke – manufacture by Otto-Hoffmann method -Ordinary, Premium, White and Speed Petrol - Knocking – octane number and cetane number - Gaseous fuels- water gas, producer gas, CNG and LPG. Flue gas analysis – Orsat method.

Lubricants –classification and properties- (viscosity, viscosity index, flash and fire points, cloud and pour points).

UNIT -V ENGINEERING MATERIALS AND ENERGY STORAGE DEVICES 9

Abrasives –natural and synthetic abrasives – diamond, silicon carbide and boron carbide (properties and uses only).

Engineering Plastics- classification – preparation and uses of PVC, Teflon, polycarbonate, polyurethane, nylon-66, PET- Biodegradable plastics.

Energy storage devices – Dry cell–alkaline batteries–lead–acid, nickel–cadmium and lithium ion batteries. Fuel cells – (Hydrogen –oxygen fuel cell).

Text Books:

1. Jain.P.C and Monica Jain, "Engineering Chemistry" DhanpatRai Pub, Co., New Delhi,2002.

Reference Books:

1. Sharma.B.K, "Engineering chemistry" Krishna Prakasan Media (P) Ltd.,Meerut,2001.
2. Sivasankar.B, "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi,2008.
3. Roop Chand Bansal and MeenakshiGoyal, "Activated Carbon Adsorption", Taylor& Francis Group, LLC, 2005
4. Rajput.R.K, "Engineering Materials", S. Chand & Co. Pub. New Delhi, 2006
5. Samir Sarkar, "Fuels and Combustion", Orient Longman, India, 1996.

Web References:

1. www.nptel.ac.in/courses/122106028/
2. freevideolectures.com/Course/2263/Engineering-Chemistry-I
3. www.nith.ac.in/chem/chemistry.pdf

BoS Chairman

Course Code: 140CO0105	**Course Title: C PROGRAMMING** (Common to all B.E / B.Tech Programmes Except AU and ME)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):
Nil

Course Outcomes:

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

CO1. Enumerate the significant aspects of software development and problem solving techniques
CO2. Exhibit the various types of control flow in C language
CO3. Illustrate the effective usage of arrays, functions and structures in C.
CO4. Demonstrate the implementation of pointers in arrays, structures and functions.
CO5. Analyze file access methods and the features of preprocessor directives

Course Content:

UNIT I INTRODUCTION 9

Introduction to computers – Computer Software – Software development life cycle - Need for studying Computer Programming Languages - Problem Definition and Analysis -Flow Chart, Developing algorithm - Procedural Programming (modular and structural)- Compilers and Interpreters - Program compilation, execution, debugging, testing - C program development environment.

UNIT II C LANGUAGE BASICS 9

Overview of C – Constants, Variables and Data Types – Operators and Expressions – Managing Input and Output operators – Decision Making - Branching and Looping. Enumerated Data type, Renaming Data type with typedef – Type Casting.

UNIT - III ARRAYS, FUNCTIONS AND STRUCTURES 9

ARRAYS: Definition- Declaration- Initialization- Assignment- Processing array- Passing array to a function-Two and multi dimensional array

FUNCTIONS: Defining a function- Accessing a function-Passing argument to functions- Function prototypes- Nested function call - Storage classes. Handling of character strings.

STRUCTURES: Definitions - processing structure-User defined data types- - Passing structure to functions –Self referential structures- Nested structures. Defining a Union- Processing union- Structures and unions comparison- Bit fields.

UNIT - IV POINTERS 9

Pointer variable declaration- Initialization and assignment- Pointers to a function- Pointers and one dimensional array and multi dimensional array- Operating a pointers- Array of pointers- Passing function to other functions. Structures and pointers – Linked Lists.

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UNIT -V FILES 9

Introduction to files-File access-File organization-File operations (open, close, read, write, etc.)-Command line arguments. C Preprocessors – Features – Macro Expansion – File inclusion-Conditional compilation – Miscellaneous Directives – simple Header files functions.

Text Books:

1. Byron Gottfried, "Schaum's Outline of Programming with C", 2nd Edition, (Indian Adapted Edition), TMH publications, New Delhi, 2006.
2. YashwantKanetkar, "Let Us C", 5th Edition, BPB Publications, New Delhi,2004.

Reference Books:

1. Balagurusamy.E, "Programming in ANSI C" Tata McGRaw-Hill Publishing Company Limited,New Delhi2007
2. Herbert Schildt, "C – The Complete Reference", Fourth Edition, Tata McGraw Hill publishing Company, New Delhi, 2005.
3. Behrouz.A.Forouzan and Richard.F.Gilberg, "A Structured Programming Approach Using C", II Edition, Brooks-Cole Thomson Learning Publications,UK,2007.
4. Ashok.N.Kamthane, "Computer Programming", Pearson Education (India),New Delhi, 2008.

Web References:

1. Introduction to programming in C. URL: http://nptel.ac.in/courses/106104128/
2. Practical Programming in C URL: http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-087-practical-programming-in-c-january-iap-2010/lecture-notes/
3. www.iups.org/media/meeting_minutes/**C.pdf**

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Course Code: 140IC0106	**Course Title: BASICS OF CIVIL AND MECHANICAL ENGINEERING** (Common to CSE, IT, ECE, EEE, EIE and ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0:0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):
Nil

Course Outcomes:

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

CO 1: Outline the various Civil Engineering materials used in field and understand the importance of surveying

CO 2: Identify the principle behind architectural aspects involved in construction and Illustrate the techniques involved in construction of substructure and superstructure

CO 3: Recognize the various manufacturing process for making a product.

CO 4: Decide various parameters in designing air conditioning and refrigeration systems.

CO 5: Define the fundamentals of I.C Engine and its principle of working

Course Content:

A. CIVIL ENGINEERING

UNIT I CIVIL ENGINEERING MATERIALS & SURVEYING 8

Infrastructure projects- Role of civil Engineers, Basic areas in Civil Engineering and its scope - Civil Engineering Materials and classification - stones, bricks, sand, aggregate, cement & types of cement, mortar, concrete, concrete grades, types of concrete, Plain cement concrete (PCC) - Reinforcement cement concrete(RCC), surveying objectives and types, common methods and instruments for distance and angle measurements.

UNIT II PRINCIPLES OF ARCHITECTURAL DESIGN 7

Aesthetic qualities in building to include, unity, proportion, scale, balance, symmetry and rhythm – study of examples, Factors in architectural design, such as: requirements, circulation, anthropometrics, site & landscape, climate, space standards, safety regulations, layout regulations, building rules , Basic services – basics of interior design and landscaping, Integration of building services.

UNIT - III BUILDING COMPONENTS 8

Sub structure: Nature of soil – problems with soil, selection of foundation based on soil condition – functions of foundation, Bearing capacity - requirement of good foundations. Super structure: types of masonry – brick masonry, stone masonry, Beams, columns, Lintels & floors.

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UNIT - IV MANUFACTURING PROCESSES 8

Metal Forming - Forging, Rolling, Extrusion processes. Metal Casting - Foundry – Moulding and Casting Processes, Welding,Metal Machining – Turning, Milling, Grinding, Shaping, Planing.

UNIT -V REFRIGERATION AND AIR CONDITIONING 7

Refrigeration: Principle of vapor compression system – Layout of typical domestic refrigerator, Refrigerants – types and properties.

Air Conditioning: Air conditioning – Definition, working principle of Window and Split type room air conditioners.

UNIT -VI IC ENGINES 7

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

Text Books:

1. Jayagopal.L.S&Rudramoorthy.R, "Basic Civil and Mechanical Engineering",Vikas Publishing House, New Delhi, 2001.
2. Shanmugam.G and Palanichamy.M.S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi, 1996.

Reference Books:

1. Bindra.S.P and Arora.S.P,"The text book of Building construction", DhanpatRai Publications (P) Ltd., New Delhi, 2011.
2. Francis.D.K.Ching, " Architecture: Form, Space and Order ", VNR, New York, 1999.
3. Ananthanarayanan.P, "Basic Refrigeration and Air Conditioning", Tata McGraw Hill Publishing Co., New Delhi, 2003.
4. Srinivasan.S, "Automotive engineering" Tata McGraw Hill Publishing Co., New Delhi, 2003.

BoS Chairman

Course Code: 140IC0107	**Course Title: ENGINEERING PRACTICES LABORATORY** (Common to all B.E / B.Tech Programmes Except AU and ME)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):
Nil

Course Outcomes:

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

CO1. Know the use of hand tools and equipment's used in fabrication workshop.
CO2. Select the various tools and equipment's used in the fabrication workshop.
CO3. Make various models in carpentry, fitting, sheet metal, welding and plumbing.
CO4. Demonstrate the working of domestic appliances.

List of Experiments:

I. CIVIL ENGINEERING PRACTICE

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

(a) Plumbing Works:

1. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings.
2. Hands on exercise on basic pipe connections – mixed pipe material connection – pipe connections with different joining components.

(b) Carpentry works:

1. Study of the joints in roofs, doors, windows and furniture.
2. Hands-on-exercise: Wood work, joints by sawing, planning and cutting.
3. Demonstration on Carpentry using Power Tools only.

II MECHANICAL ENGINEERING PRACTICE

(a) Welding:

1. Study of welding processes, tools and safety aspects.
2. Hands on exercise for making butt joints, lap joints and tee joints using arc welding.
3. Hands on exercise on Gas welding practice.

(b) Sheet Metal Work:

1. Study of sheet metal works, tools and measuring instruments.
2. Hands on exercise on:
   (i) Forming & bending.
   (ii) Model making – Trays, Funnels, Cones etc.

(c) Machine assembly practice:

1. Centrifugal Pump

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(d) Demonstration on:

1. Turning, milling and drilling practices.
2. Smithy operations, upsetting, swaging, setting down and bending. Example
3. Foundry operations like mould preparation for gear and step cone pulley.
4. Fitting – Preparation of square fitting and vee – fitting models.
5. Air-conditioner.
6. Working of IC Engine

REFERENCES:

1. Jeyachandran.K, Natarajan.S. &Balasubramanian.S, "A Primer on Engineering Practices Laboratory", Anuradha Publications, 2007.
2. Rajendra Prasad.A&Sarma.P.M.M.S, "Workshop Practice", SreeSai Publication, 2002.
3. Kannaiah.P&Narayana.K.L, "Manual on Workshop Practice", Scitech Publications, 1999.

BoS Chairman

Course Code: 140CO0108	**Course Title: C PROGRAMMING LABORATORY** (Common to all B.E / B.Tech Programmes Except AU and ME)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- C Programming

Course Outcomes:

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

CO1. Evaluate complex expressions using apt operators and data types.

CO2. Differentiate the types of control flow in a program using decision making and looping statements

CO3. Be expertise in handling complex data types and operations using structures, arrays and functions

CO4. Design applications using file operations and pointers

List of Experiments:

1. Program to process Data types, formatting inputs and outputs.
2. Program using operators and Expression Evaluation
3. Program using decision making
4. Program using looping Statements.
5. Program using Functions
6. Program using Arrays
7. Program for String Handling
8. Program using Structures
9. Program using Pointers
10. Program on basic File Operations
11. Develop a mini project implementing the concepts from 1 to 10.

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SEMESTER II

Course Code: 140CO0201	**Course Title: COMMUNICATION SKILLS** (Common to all B.E / B.Tech Programmes Except AU and ME)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 2 : 0 : 2 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Technical English

Course Outcomes:

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

CO1 Use listening skills for academic and professional purposes

CO2 Inculcate and develop the habit of reading.

CO3 Speak effectively in real life situations.

CO4 Write letters and reports effectively in formal & business situations.

CO5 Use appropriate vocabulary in different business contexts

Course Content:

UNIT I LISTENING **6+6**

Listening to fill up gapped texts -Listening to identify context and Speaker's opinion-Note Taking-Listening to Conversation.

UNIT II READING **6+6**

Exposure to different reading techniques-Skimming, identifying the topic sentence and its role in each paragraph-Scanning - Inferring and identifying the lexical and textual message-Comprehension & Note Making.

UNIT - III SPEAKING **6+6**

Verbal and Non-verbal Communication-Introducing Oneself-Describing objects and Situations-Expressing opinions - Agreement & Disagreement-Group Discussion- Mock interview-Power Point Presentation-Soft Skills-Behavioral attitude, Dress code, Dining etiquette.

UNIT - IV TECHNICAL REPORT WRITING **6+6**

Writing Business Messages (Advertisement), Caption, Slogan Writing- Documentation-Preparation of Brochure, Pamphlets, notices, agenda, minutes- Writing Business Letters- calling for quotations, placing orders, a letter of complaint regarding manufacturing defects, seeking permission to use certain facilities in a company-Preparation of comparative statements-Letter of application - content, format & Resume writing- E-Mail, Memos & Proposals-Process Description, Analytical Writing, Argumentative Writing-Writing Instructions-Proof Reading.

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UNIT -V VOCABULARY **6+6**

Word formation-prefixes &suffixes - Abbreviations and Acronyms - Foreign Words and Phrases - British & American English -Idioms and phrases (computer- related) - Scientific and technical terms-jargons-Technical Register-Pairs of confused words.

Text Books:

1. Sangeetha Sharma &Binod Mishra, "Communication Skills for Engineers and Scientists", PHI Learning Private Limited, New Delhi, 2009.

Reference Books:

1. Halliday.M.A.K, An introduction to Functional English Grammar, Edward Arnold Publishers Ltd.,U.S.A,1985
2. Walter.E.Oliu., Writing That Works- How to Write Effectively on the Job, St.Martin's Press, New York, 1980
3. Joe Ayres, Effective Public Speaking, Brown Company Publishers, 1983
4. Richard Huseman, Business Communication-Strategies and Skills, Alger Press, 1988
5. Herta.A.Murphy, Effective Business Communication, McGraw-Hill Ryerson, 1990
6. Martin Hewings, Advanced English Grammar, CambridgeUniversity Press, 1999

Web References:

1. www.skillsyuneed.com/ips/**nonverbal**-communication.html
2. www.**skills**youneed.com/general/**soft-skills**.html
3. https://www.**english**club.com/**vocabulary/british-american**.html

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Course Code: 140CO0202	**Course Title: ENGINEERING MATHEMATICS-II** (Common to all B.E / B.Tech Programmes Except AU and ME)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 1 : 0 : 4 : 100
Type: Lecture	**Total Contact Hours:** 60

Pre-requisites: The student should have undergone the course(s):

- Engineering Mathematics – I

Course Outcomes:

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

CO1. Solve second and higher order linear ordinary differential equations.
CO2. Understand the concepts of vector differentiation and integration.
CO3. Use the functions of a complex variable and construct analytic functions.
CO4. Use the concept of complex integration to solve contour integrals.
CO5. Apply the Laplace transform techniques to solve differential equations.

Course Content:

UNIT I DIFFERENTIAL EQUATIONS 9+3

Second and third order linear differential equations with constant coefficients -Method of variation of parameters-Cauchy and Legendre's linear equations for variable coefficients-Simultaneous first order linear equations with constant coefficients.

UNIT II VECTOR CALCULUS 9+3

Gradient, divergence and curl, irrotational and solenoidal vector fields- Directional derivatives-Green's theorem in a plane (without proof)-Gauss divergence theorem (without proof) - Stoke's theorem (without proof)-Verification and evaluation of integrals using Green's, Gauss's and Stoke's theorem.

UNIT - III ANALYTIC FUNCTIONS 9+3

Function of a complex variable-Analytic function -Singular points –Cauchy Riemann equations-Sufficient conditions (without proof) – Properties-Construction of analytic functions-Conformal mapping: Bilinear transformation, Special mappings: $w = z + a,\ \ w = az,\ \ w = 1/z$.

UNIT - IV COMPLEX INTEGRATION 9+3

Taylor and Laurent expansions- Types of singularity -Cauchy's fundamental theorem (without proof) – Residues-Cauchy Residue theorem-Evaluation of integrals –Applications: Evaluation of real integrals using Contour integration with no poles on the real axis.

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UNIT -V LAPLACE TRANSFORM 9+3

Laplace transform-Conditions for existence-Transform of elementary functions- Properties-Transform of derivatives, integrals, unit step function and unit impulse function – Transformation of periodic functions-Inverse Laplace transform-Convolution theorem-Initial and final value theorems-Solution of linear ODE of second order with constant coefficients using Laplace transform.

Text Books:

1. Veerarajan.T, "Engineering Mathematics", Updated 2nd Edition, Tata McGraw Hill, NewDelhi, 2010.
2. Ramakrishna Prasad.A, "Kreyszig's Engineering Mathematics I", 1st Edition, Wiley India Pvt. Ltd., India, 2011.

Reference Books:

1. Venkatraman.M.K, "Engineering Mathematics-Volume II", 5th edition, National publishing company, Chennai, 2007
2. Kandasamy.P, Thilagavathy.K, Gunavathy.K,"Engineering Mathematics", Revised 9th Edition,S. Chand and Company Ltd., New Delhi, 2011.
3. Grewal.B.S, "Higher Engineering Mathematics", 40th Edition, Khanna Publications, New Delhi, 2007.
4. Louis.C.Barrett, Ray Wylie.C, "Advanced Engineering Mathematics", 6th Edition, McGraw-Hill Publishing Company Ltd, New Delhi, 2003.

Web References:

1. http://nptel.ac.in/
2. http://ocw.mit.edu/courses/mathematics
3. http://mathworld.wolfram.com/**laplace**.html

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Course Code: 140CO0203	**Course Title: MATERIAL SCIENCE** (Common to all B.E / B.Tech Programmes Except AU and ME)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):
Nil

Course Outcomes:

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

CO1. To know the properties of conducting and semiconducting materials
CO2. To know the properties and applications of magnetic and superconducting materials
CO3. To know the types of dielectric materials and its applications
CO4. To know the behavior of particle.
CO5. Knowing the new engineering materials and its applications

Course Content:

UNIT I CONDUCTING MATERIALS **9**

Formation of bands (qualitative) - Classification of solids based on bands – Classical free electron theory, Expression for electrical and thermal conductivity, Weidmann Franz law - Sources of resistivity - Mattheissen's rule. - Low and high resistivity materials and their applications.

UNIT II SEMICONDUCTING MATERIALS **9**

Intrinsic and extrinsic semiconductors - Expression for carrier concentration - Variation of carrier concentration and Fermi level with temperature for n – type - Elemental and compound semiconductors - Hall effect : Hall coefficient in extrinsic semiconductors, experimental determination of Hall coefficient and applications of Hall effect, LDR, Solar Cells and strain gauges.

UNIT - III MAGNETIC MATERIALS AND SUPERCONDUCTORS **9**

Introduction to magnetic materials - Ferromagnetic materials - Properties - Domain theory of ferromagnetism - Hysteresis - Hard and soft magnetic materials - Ferrites: structure and applications. Magnetic storage devices: magnetic recording and magneto optical recording – Materials for permanent magnets. Superconductors – Properties - Types of superconductors - High Tc superconductors - Applications: SQUID - Cryotron - Magnetic levitation.

UNIT - IV DIELECTRIC MATERIALS **9**

Polarization – Polarizability – Polarization vector, Electrical susceptibility, Dielectric constant - Polarization mechanisms (Qualitative) –Internal Field- Clausius Mossotti relation-Frequency and temperature dependence of polarization - Dielectric loss - Dielectric breakdown mechanisms – Ferro electric materials, Classification and its Properties –Piezoelectric materials – classification of Insulating materials.

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UNIT -V MODERN ENGINEERING MATERIALS 9

Shape Memory alloys (SMA): Characteristics, properties of NiTi alloy. Applications of SMA. Metallic glasses: Preparation, properties and applications. Nano Materials: Top down processes: Ball Milling - Bottom up processes: Physical vapor deposition, Nanomaterials, properties and applications (Qualitative). Carbon nanotubes: Fabrication - CVD, electric arc discharge method, Properties and applications.

Text Books:

1. Veerarajan.T, "Engineering Mathematics", Updated 2nd Edition, Tata McGraw Hill, NewDelhi, 2010.
2. Ramakrishna Prasad.A, "Kreyszig's Engineering Mathematics I", 1st Edition, Wiley India Pvt. Ltd., India, 2011.

Reference Books:

1. Venkatraman.M.K, "Engineering Mathematics-Volume II", 5th edition, National publishing company, Chennai, 2007
2. Kandasamy.P, Thilagavathy.K, Gunavathy.K,"Engineering Mathematics", Revised 9th Edition,S. Chand and Company Ltd., New Delhi, 2011.
3. Grewal.B.S, "Higher Engineering Mathematics", 40th Edition, Khanna Publications, New Delhi, 2007.
4. Louis.C.Barrett, Ray Wylie.C, "Advanced Engineering Mathematics", 6th Edition, McGraw-Hill Publishing Company Ltd, New Delhi, 2003.

Web References:

1. http://www.physicsclassroom.com/
2. http://hyperphysics.phy-astr.gsu.edu/
3. http://www.tndte.com/TEXT%20BOOKS/Complete%20Books/Engineering%20Physics-I%20&%20II/Engineering%20Physics%20Sem%20-1%20&%202.pdf

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Course Code: 140CO0204	**Course Title: ENVIRONMENTAL SCIENCE** (Common to all B.E / B.Tech Programmes Except AU and ME)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):
Nil

Course Outcomes:

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

CO1 Describe the ways to maintain ecological balance and preserve bio-diversity.
CO2 Explain the causes of pollution and the methods to reduce & recycle.
CO3 Describe the way from unsustainable to sustainable development through effective usage & conservation of energy.
CO4 Describe the global environmental issues and the laws passed to control it.
CO5 Describe the role of man & technology in environmental management

Course Content:

UNIT I ENVIRONMENTAL SCIENCE AND BIO SYSTEMS 9

Multidisciplinary nature of Environmental studies – Definition, Scope and Importance of Environmental studies – Natural resources– Over exploitation of resources and impacts. Ecosystem – Structure and function of an ecosystem – concept, structure and function with relevant examples- Food chain, Food web and Ecological pyramids. Biodiversity – Endemic, endangered and extinct species – Habitat – Hotspots – values of biodiversity -threats to biodiversity - conservation of biodiversity.

UNIT II ENVIRONMENTAL POLLUTION 9

Causes, effects and control of – Air pollution, Water pollution, Marine pollution, Thermal pollution, Noise pollution- solid waste management – types and sources of solid waste- 3R principles, advantages of recycling and waste utilization, E –waste, hazardous waste management.

UNIT - III ENERGY AND SUSTAINABILITY 9

Energy resources- types - the role of renewable sources of energy- Principle involved in energy conversion advantages and limitations of hydro energy, solar energy, wind energy, bio energy, geothermal energy, ocean energy. Sustainable development – equitable use of resources for sustainable development.

UNIT - IV GLOBAL ENVIRONMENTAL ISSUES AND LAWS 9

Facts and impacts of - Climate change, Global warming, ozone layer depletion, waste lands. Environmental disasters - disaster management approach. International Conventions, protocols for environmental protection. Environmental ethics - Environmental protection act in India - Role of Pollution control boards.

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UNIT -V HUMAN POPULATION AND ENVIRONMENT 9

Population growth, population explosion, environment and human health, Role of technology in environmental management. Public awareness, Eco-labeling. Role of NGO's in environmental management. Case studies.

Text Books:

1. Kaushik Anubha & Kaushik.C.P "Environmental Science and Engineering", 3 rd edition, reprint 2010, New Age International Publishers, New Delhi
2.

Reference Books:

1. William.P.Cunningham – "Principles of Environmental Science", Tata McGraw Hill, New Delhi, 2007
2. Linda.D.Williams – "Environmental Science Demystified", Tata McGraw Hill Publishing Company Limited , 2005,New Delhi,
3. Shyam Divan, Armin Rosencranz "Environmental Law and Policy in India –cases, materials and Statutes", Oxford University Press, New Delhi, 2001.
4. Gilbert.M.Masters, "Introduction to Environmental Engineering and Science", Second edition, Prentice –Hall of India private limited, New Delhi, 2004.
5. Tyler Miller.G, JR "Environmental Science ", 10th edition, Thomson Asia Private Limited, Singapore, 2004

Web References:

1. www.nptel.ac.in/courses/122106028/
2. freevideolectures.com/Course/2263/Engineering-Chemistry-I
3. www.nith.ac.in/chem/chemistry.pdf

BoS Chairman

Course Code: 140IC0205	**Course Title: ELECTRICAL CIRCUIT ANALYSIS** (Common to EIE and ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 1 : 0 : 4 : 100
Type: Lecture	**Total Contact Hours:** 60

Pre-requisites: The student should have undergone the course(s):
Nil

Course Outcomes:

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

CO1: Analyze DC circuit Theorems and network reduction techniques.
CO2: Analyze fundamental AC circuits.
CO3: Analyze the phenomenon of resonance in coupled circuits.
CO4: Analyze the transient response of series circuits.
CO5: Analyze the three phase circuits

Course Content:

UNIT I D.C. CIRCUIT ANALYSIS **12**

Charge and current, voltage, power, and energy – Ohm's law – Ideal voltage and current sources – Independent sources – Dependent sources – Circuit elements – Kirchhoff's Laws – Voltage and Current division in series and parallel circuits, Network reduction – Mesh and Nodal analysis with voltage and current sources – Circuit theorems:- Superposition, Thevenin's Norton's Reciprocity and Maximum Power Transfer – Source transformation – Y-Δ transformation.

UNIT II A.C.CIRCUIT FUNDAMENTALS AND ANALYSIS **12**

Sinusoidal voltage and current – RMS value – Form factor – Phasor representation of sinusoidal of voltages –Current and voltage relationship in R, L, and C circuits – Impedance and admittance, power factor concepts in RC, RL and RLC circuits – Impedance combinations – Real power, reactive power, complex power, apparent power – Kirchhoff's laws – Analysis of simple series and parallel circuits.

UNIT - III RESONANCE AND COUPLED CIRCUITS **12**

Resonance in parallel and series circuits – Half power frequencies – Bandwidth and Q factor of Resonant circuits – Mutual Inductance – Dot convention – Coefficient of coupling – Sinusoidal steady state analysis of network with coupled inductance.

UNIT - IV TRANSIENT ANALYSIS OF FIRST AND SECOND ORDER LINEAR CIRCUITS **12**

Source free RC and RL Circuit responses – Step response of RC and RL circuits – source free RLC series and parallel circuit responses – Step responses of RLC series and parallel circuits – Responses of RC, RL and RLC series circuits to sinusoidal excitation-Characteristics Impedance and Propagation Constant.

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UNIT -V THREE-PHASE CIRCUIT ANALYSIS **12**

Three-phase balanced and unbalanced voltage sources – Three - phase balance and unbalanced loads – Line voltage and phase voltage – Phasor diagram and Power in three - phase circuit – Three - phase circuit analysis with star and delta balanced and unbalanced loads – Phasor diagram – Power and power factor measurement in three-phase circuits.

Text Books:

1. Boylsted,R.L, "Essentials of Circuit Analysis", Prentice Hall, 2003.
2. Husain.A, "Networks and Systems", Khanna Publishers, 2000.

Reference Books:

1. HAYT.W.H.Jr,Kemmerly.J.E, and Durbin.S.M, "Engineering Circuit Analysis", Tata McGraw-Hill, New Delhi, 2002.
2. Alexander.C.K, Matthew.N.O, and Sadiku, "Fundamentals of Electric Circuits", Tata McGraw- Hill, New Delhi, 2003.
3. Decarlo.R.A and Lin.P.M, "Linear Circuit Analysis", OxfordUniversity Press, New Delhi,2001
4. Edminister.J.A, andNahvi,.M, "Electric Circuits", 4th Edition, Schaum's Outline series,McGrawHill, New Delhi,2002.

Web References:

1.www.nptel.ac.in

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Course Code: 140IC0206	**Course Title:** Electronic Devices and Circuits (Common to EEE and ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Basic knowledge of semiconductor physics.

Course Outcomes:

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

CO.1 Outline the basic structure of diodes and transistors and also differentiate the characteristics of various special diodes from pn junction diode.
CO.2 Compare and contrast the types of Field effect transistors and power devices.
CO.3 Analyze the design aspects of power amplifiers.
CO.4 Explain the operation of feedback amplifiers and oscillators.
CO.5 Discuss about the various applications of electronic devices.

Course Content:

UNIT I SEMICONDUCTOR DIODE AND BJT 9

PN Junction – Current components in a PN diode – Junction capacitance – Junction diode switching time – Zener diode – Varactor diode – Tunnel diode – Schottky diode – Transistor Structure – Basic Transistor operation – Transistor characteristics and parameters – The transistor as a switch, as an amplifier – Transistor bias circuits:-

Voltage divider bias circuits, base bias circuits, emitter bias circuits, collector feedback bias circuits – DC load line – AC load line- bias stabilization, thermal runaway and thermal stability.

UNIT II FET, UJT AND SCR 9

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

UNIT - III AMPLIFIERS 9

CE, CC and CB amplifiers - Small signal low frequency transistor amplifier circuits – h parameter representation of a transistor - Analysis of single stage transistor amplifier using parameters voltage gain, current gain, input impedance and output impedance frequency response - RC coupled amplifier. Classification of Power amplifiers:- Class A, B, AB and C Power amplifiers-Push-Pull and Complementary Symmetry Push-Pull amplifiers - Design of power output, efficiency and cross-over distortion.

UNIT - IV AMPLIFIERS AND OSCILLATORS 9

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

UNIT -V RC CICUITS AND POWER SUPPLIES 9

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

Text Books:

1. Millman and Halkias, "Electronic Devices and Circuits", Tata McGraw– Hill, New Delhi, 2007.
2. Boylsted and Nashelsky, "Electronic Devices and Circuit Theory", 6th Edition, Prentice Hall

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of India, New Delhi, 1999.
3. Floyd.T.L, "Electronic Devices" 6th Edition, Pearson Education, India 2003.

Reference Books:

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

Web References:

1. http://www.electronics-tutorials.ws/
2. http://www.learnabout-electronics.org/
3. http://www.nptel.ac.in/

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Course Code: 140IC0207	**Course Title: ENGINEERING PRACTICES LABORATORY (Electrical, Electronics and PC hardware)** (Common to all B.E / B.Tech Programmes Except AU and ME)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Nil

Course Outcomes:

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

CO1:Understand the basic circuit building components like resistor inductor, capacitor diode, transistor, transformers, sources logic gates and its symbols.

CO2: Understand the knowledge about basic concepts of electrical wiring and its types, circuit concepts and earthing and instruments

CO3: Acquire knowledge about various types of wiring accessories used for various types of wiring and home appliances construction and working principles

CO4: Understand the concept of computer hardware components and its uses, formatting and Partitioning HDD, Configuring CMOS-Setup, installation of Operating system

List of Experiments:

ELECTRICAL ENGINEERING PRACTICE

1. Electrical symbols, safety aspects of electrical wiring and earthing practices.
2. Introduction to the connection of voltmeter, ammeter and multimeter.
3. Stair case wiring, assembling and testing of a fluorescent lamp circuit & fault finding.
4. Domestic lighting circuits and use of megger.
5. Diagnosing simple faults in grinder, mixie, iron box, ceiling & table fans.
6. Introduction to types of fuses, MCB and types of wires and cables.

ELECTRONICS ENGINEERING PRACTICE

1. Symbols of basic electronic components and equipments.
2. Color coding of resistors and identification of capacitor values.
3. Study and method of using CRO, function generator, power supply units with fault identification and trouble shooting.
4. Study of AC signal parameters (amplitude, frequency, phase) using CRO.
5. Logic gates (AND, OR, NOT, NAND, NOR, EX-OR).
6. Soldering and testing a given simple electronic circuits using PCB.

COMPUTER HARDWARE

1 a) Study of PC hardware
b) Assembling the computer system

2 a) Formatting and Partitioning HDD
b) Configuring CMOS-Setup
c) Installation of OS

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REFERENCES:

1. Jeyachandran.K, Natarajan.S&Balasubramanian.S, "A Primer on Engineering Practices Laboratory", Anuradha Publications, Tamilnadu (India), 2007.
2. Jeyapoovan.T, M.Saravanapandian&Pranitha.S, "Engineering Practices Lab Manual", VikasPuplishing House Pvt.Ltd.,Uttar Pradesh (India), 2006.
3. Rourke.J&Zacker.C, "The complete reference", Tata McGraw Hill publishing company Ltd, Uttar Pradesh (India), 2001.
4. Gilster& Ron, "A Beginners Guide", Tata McGraw Hill publishing company Ltd, Uttar Pradesh (India), 2001.

BoS Chairman

Course Code: 140IC0208	**Course Title: CIRCUITS AND DEVICES LABORATORY** (Common to ECE, EEE, EIE and ICE)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

Nil

Course Outcomes:

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

CO1. Compute the voltage and current of a given circuit by verifying experimentally through theorems

CO2. Verify the characteristics of various electronic devices such as diodes and transistors

CO3. Plot the frequency response of series and parallel resonance circuits

CO4. Verify the characteristics of special electronic devices such as Photodiodes, Phototransistors, DIAC,TRIAC

List of Experiments:

1. Verification of KVL and KCL
2. Verification of Thevenin and Superposition Theorem.
3. Verification of Maximum power transfer and reciprocity theorems.
4. Frequency response of series and parallel resonance circuits.
5. Characteristics of PN and Zener diode
6. Characteristics of CE and CB configuration of a Transistor.
7. Characteristics of UJT and SCR
8. Characteristics of JFET
9. Characteristics of Diac and Triac.
10. Characteristics of Photo diode and Photo transistor.

REFERENCES:

1. Lab manual by ECE Department
2. David.A.Bell "Fundamentals of Electronic Devices and Circuits Lab manual" Fifth Edition, Oxford university Press, New Delhi,2009
3. Sasikala.B, Poornachandra Rao, "Handbook of experiments in Electronics and Communication Engineering" UBS Publisher's Distributors, Vikas Publishing House (P) Ltd. New Delhi, 2003.

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Course Code: 140CO0209	**Course Title: ENGINEERING GRAPHICS** (Common to all B.E / B.Tech Programmes Except AU and ME)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 2 : 0 : 3 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):
Nil

Course Outcomes:

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

CO1. Sketch different engineering curves

CO2. Generate multiple views of planes and solids using orthographic projection technique

CO3. Prepare development of lateral surfaces of objects

CO4. Prepare Drawings using CAD Package

Course Content:

UNIT I INTRODUCTION TO ENGINEERING GRAPHICS 15

Importance of graphics in engineering applications – General principles of engineering graphics – principles of orthographic projection – angles of projection - multiple views and their placement – layout of views.

Use of conventional drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning- Methods of Dimensioning.

Geometric shapes of objects - Mathematical representation of geometrical shapes - their engineering applications – Construction of polygonal shapes, their importance and application.

Conics sections – Construction of ellipse, Parabola and hyperbola by eccentricity method – construction of cycloid and involutes of square and circle – construction of spirals and helices – Meaning of tangents and normal to the above curves.

UNIT II PROJECTION OF LINES, PLANES AND SOLIDS 15

Projection of points and lines- Concept of polygonal surfaces and circular lamina inclined to both reference planes – Concept of true lengths and true inclinations.

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to two reference plane.

UNIT - III DEVELOPMENT OF SURFACES AND SECTIONS OF SOLIDS 15

Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones.

Need for sectioning of solids – Sectioning of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by cutting planes inclined to one reference plane and perpendicular to the other. – Orthographic views of sections of simple solids.

UNIT - IV ORTHOGRAPHIC AND ISOMETRIC PROJECTION OF SOLIDS 15

Orthographic projection of solids – Practices on three view projection of solids.

Isometric Projection of solids – practices on simple solids

UNIT -V SOLID MODELING AND CIVIL DRAWINGS 15

Need and advantages of modeling software over conventional drawing methods - Representation of three Dimensional objects –3D modeling techniques – constructive solid geometry (CSG) and boundary representation (BRep) techniques - Boolean operations, extrude, revolve, mirror, array, etc. Modeling of isometric views of engineering components.

Introduction to perspective projection .Meaning of house plans-different types representation of different details-meaning of area of a house and site.

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Reference Books:

1. Dhananjay.A.Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2. Bhatt.N.D, "Engineering Drawing "46th Edition, Charotar Publishing House , Gujarat, India, 2003
3. Basant Agarwal and Agarwal.C.M, "Engineering Drawing", Tata McGraw Hill PublishingCompany Limited, New Delhi, 2008.
4. Gopalakrishnan.K.R, "Engineering Drawing" (Vol. I&II), Subhas Publications, Chennai, 1998.
5. Natrajan.K.V, "A text book of Engineering Graphics", Dhanalakshmi Publisher, Chennai, 2006.
6. Manuals of 2D and 3D modeling software packages

BoS Chairman

Course Code: 140CO0210	**Course Title: ENGINEERING PHYSICS AND CHEMISTRY LABORATORY** (Common to all B.E / B.Tech Programmes Except AU and ME)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):
Nil

Course Outcomes:

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

CO1. Apply the concepts of physics to evaluate the engineering properties of materials through the hands on experience acquired.
CO2: Determine the analytical testing methods for chemical substances
CO3. Identify the equipment required for analysis of different substances
CO4. Acquire the skills to use the analytical equipment

List of Experiments:

A. ENGINEERING PHYSICS LABORATORY

1. Velocity of ultrasonic waves and compressibility of given liquid - ultrasonic interferometer
2. Wavelength of laser and particle size determination using laser
3. Insulation of thin wire – Interference technique
4. Thermal conductivity of insulator - Lee' disc method
5. Band gap of a Thermistor – Post office box
6. Resistivity of metal and alloy – Carey Foster's bridge
7. Band gap of a diode – Reverse characteristics
8. Thermal conductivity of metallic wire - Meter bridge method
9. Numerical aperture of the given optical fiber
10. Hysteresis Loss of a ferromagnetic material
11. Study of characteristics of given LDR
12. Efficiency of Solar Cell
13. Rigidity modulus of metallic wire -Torsional pendulum method
14. Young's modulus of the material - Cantilever method
15. Co-efficient of viscosity of the liquids
16. Hall coefficient determination
17. Dielectric constant determination

B. CHEMISTRY LABORATORY

WEIGHING AND PREPARATION OF STANDARD SOLUTIONS

Preparation of molar and normal solutions of oxalic acid, sodium carbonate and standard hard water.

WATER ANALYSIS

i) Determination of total, temporary and permanent hardness of water sample by EDTA method.
ii) Determination of Dissolved oxygen content by Winkler's method
iii) Determination of COD of waste water by dichromate method
iv) Determination of heavy metals in water by spectrophotometry (any one-Iron, Cr, Hg)

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VISCOMETRY

v) Determination of molecular weight of a polymer

ELECTROCHEMISTRY

vi) To determine the strength of given acid – pH metrically
vii)To determine the amount of ferrous ions by potentiometry
viii) Determination of emf of electrochemical cell
ix) Determination of corrosion rate – weight loss method
x) Determination of inhibitor efficiency – corrosion

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SEMESTER III

Course Code: 140IC0301	**Course Title: ENGINEERING MATHEMATICS–III** (Common to CSE, EEE, EIE, and ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 1 : 0 : 4 : 100
Type: Lecture	**Total Contact Hours:** 60

Pre-requisites: The student should have undergone the course(s):

- Engineering Mathematics I
- Engineering Mathematics II

Course Outcomes:

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

CO1.Describe vector spaces and its properties.
CO2. Compute the Fourier series expansion for given periodic functions.
CO3.Calculate Fourier transform for aperiodic functions.
CO4. Determine the solution of first and second order PDE.
CO5. Solve one dimensional wave equation, one dimensional heat and two dimensional heat flow equations.

Course Content:

UNIT I LINEAR ALGEBRA **9+3**

Vector spaces, subspaces, basis and dimension - Systems of linear equations, linear transformations - Kernel and Image - Geometric ideas - Inner product spaces - Orthogonality - Orthogonal basis- Reflections and Orthogonal maps of the plane - Orthogonal complements and Projections.

UNIT II FOURIER SERIES **9+3**

Fourier series – Dirichlet's conditions - Half range Fourier cosine and sine series - Parseval's identity - Fourier series in complex form - Harmonic analysis.

UNIT - III FOURIER TRANSFORMS **9+3**

Fourier transforms - Fourier cosine and sine transforms - inverse transforms - convolution theorem and Parseval's identity for Fourier transforms - Finite cosine and sine transforms.

UNIT - IV PARTIAL DIFFERENTIAL EQUATIONS **9+3**

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

UNIT -V APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION **9+3**

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

Text Books:

1. Venkataraman, M.K., "Engineering Mathematics Vol.4", National Publishing Company, 2004.
2. Veerarajan, T., "Transforms and Partial Differential Equations", Tata McGraw HillPublishing Company Limited, 2012
3. David C. Lay., "Linear Algebra and its applications," 3rd edition, Pearson Education India Ltd., 2003.

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Reference Books:

1. Grewal. B. S.,"Higher Engineering Mathematics", 40th edition, Khanna Publishers,2007, New Delhi.
2. Ramana. B.V., "Higher Engineering Mathematics", Tata Mc-GrawHill Publishing Company Limited, 2007, New Delhi.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th edition, Wiley India, 2007.

Web References:

1. elearning.vtu.ac.in/P5/enotes/MAT31/S1-ATE.**pdf**
2. www.tolani.edu/.../john_bird_**engineering_mathematics**_0750685557.**pd**
3. julianoliver.com/share/free...**books**/essential-**engineering-mathematics**.**pdf**

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Course Code: 140IC0302	**Course Title: THERMAL ENGINEERING AND FLUID MECHANICS** (Common to EEE, EIE and ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 1 : 0 : 4 : 100
Type: Lecture	**Total Contact Hours:** 60

Pre-requisites: The student should have undergone the course(s):
Nil

Course Outcomes:

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

CO 1: Understand the working principle and performance of IC engines for various power cycles.

CO 2: Understand the working principle and performance of Steam Turbines

CO 3: Estimate the power requirement of reciprocating air compressors and COP of refrigeration systems

CO 4: Understand properties of fluids and classification of flows

CO 5: Explain the working of turbines and pumps and draw their performance curves

Course Content:

UNIT I BASIC CONCEPTS AND LAWS OF THERMODYNAMICS 8+3

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

UNIT II IC ENGINES & STEAM TURBINE 8+3

Air standard cycles: Otto, diesel and dual cycles and comparison of efficiency – Application of IC engines. Formation of steam – Properties of steam – Use of steam tables and charts – Steam power cycle (Rankine) – Steam turbines: Impulse and reaction principle.

UNIT - III COMPRESSORS, REFRIGERATION AND AIR CONDITIONING 10+3

Positive displacement compressors – Reciprocating compressors – Indicated power – Clearance volume – Various efficiencies – Clearance ratio – Volume rate – Conditions for perfect and imperfect inter cooling – Multi stage with inter cooling (Qualitative)– Construction and working principle of centrifugal and axial flow compressors.

Refrigeration – Various methods of producing refrigerating effects (RE) – Vapour compression cycle: P–H and T–S diagram – Saturation cycles – Air–conditioning systems, Types of air conditioning systems – Selection criteria for a particular application.

UNIT - IV FLUID PROPERTIES & FLOW THROUGH PIPES 10+3

Dimensions. Properties of fluids – Specific gravity, specific weight, viscosity, compressibility, vapour pressure and gas laws – capillarity and surface tension. Flow characteristics – concepts of system and control volume. Application of control volume to continuity equation, Momentum Equation, Darcy – Weisbach equation. Friction factor. Minor losses. Flow through pipes in series and in parallel.

UNIT -V TURBINE & PUMPS 9+3

Homologous units – Specific speed. Theory of turbo machines. Euler"s equation. Hydraulic efficiency. Velocity components at the entry and exit of the rotor – Velocity triangle for single stage radial flow and axial flow machines – Centrifugal pumps, turbines, performance curves for pumps and turbines. Reciprocating pumps – Indicator diagrams, Work saved by air vessels – Rotary pumps – Classification. Working and performance curves.

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Text Books:

1. Khurmi.R.S.& Gupta.J.K., "Thermal Engineering", S.Chand& Co. Ltd., 2006.
2. Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", Laxmi Publications (P) Ltd., New Delhi.

Reference Books:

1. Rogers and Mayhew, "Engineering Thermodynamics – Work and Heat Transfer", Pearson Education Pvt. Ltd., 2006.
2. Eastop and McConkey, "Applied Thermodynamics", Pearson Education Pvt. Ltd, 2002.
3. Nag.P.K., "Engineering Thermodynamics" Tata McGraw Hill, 2003.
4. Rajput, B.K. Sankaar, "Thermal Engineering", S.Chand& Co. Ltd., 2003.
5. Kumar. K.L., "Engineering Fluid Mechanics" Eurasia Publishing House (P) Ltd., 7th edition, 1995.

Web References:

1.www.accessengineeringlibrary.com
2. www. nptel.ac.in
3.www.engineeringtoolbox.com

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Course Code: 140IC0303	**Course Title: TRANSDUCER ENGINEERING** (Common to EIE and ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Engineering Physics

Course Outcomes:

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

CO1. Analyze the characteristics and performance of transducers.

CO2. Explain the principle and application of resistance transducers.

CO3.Describe the principle and application of variable inductance and capacitance transducers.

CO4. Select suitable transducer based on the application.

CO5. Illustrate the advanced types of transducers.

Course Content:

UNIT I CHARACTERISTICS OF TRANSDUCERS 9

Units and standards – Calibration methods – Static calibration – Classification of errors – Error analysis – Statistical methods and curve fitting – Odds and uncertainty – Classification of transducers-Static and dynamic characteristics – Mathematical model of transducer – Zero, I and II order transducers. Response to impulse, step, ramp and sinusoidal inputs.

UNIT II VARIABLE RESISTANCE TRANSDUCERS 9

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

UNIT - III VARIABLE INDUCTANCE AND CAPACITANCE TRANSDUCERS 9

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

UNIT - IV OTHER TRANSDUCERS AND SELECTION OF TRANSDUCERS 9

Piezoelectric transducer- operation and application- Hall Effect transducer – Different types of Photo detectors- Thermocouple- Selection of transducers – Data sheet interpretation.

UNIT -V SPECIAL TRANSDUCERS 9

Digital transducers – Smart sensors - Fiber optic sensors, Film sensors, MEMS – Nano sensors – Radar and its applications-Position sensing transducers – Vibration sensing transducers.

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Text Books:

1. Renganathan.S., "Transducer Engineering", Allied Publishers, 1999.

Reference Books:

1. Doebelin.E.A., 'Measurement Systems – Applications and Design', Tata McGraw Hill, New York, 2000.
2. Hermann K.P.Neubert, 'Instrument Transducers:an Introduction to their performance and design', Clarendon Press, 1975,2nd edition, Illustrated.
3. Patranabis.D., 'Sensors and Transducers', Prentice Hall of India, 1999.
4. John A. Allocca, Allean Stuart 'Transducer Theory and Applications', Reston publishing Company, 1984.

Web References:

1. nptel.ac.in/courses/112103174
2. http://nptel.ac.in/courses/108105064
3. http://nptel.ac.in/courses/112106140

BoS Chairman

Course Code: 140IC0304	**Course Title: OBJECT ORIENTED PROGRAMMING CONCEPTS** (Common to CSE, EEE, EIE and ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- C programming

Course Outcomes:

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

CO 1 Describe Object-oriented paradigm with their fundamentals.
CO 2 Implement OO concepts in C++.
CO 3 Implements the concepts of basic exception handling mechanisms.
CO 4 Outlines the file organization and the usage of file systems.
CO 5 Defines the fundamentals of Java programming.

Course Content:

UNIT I INTRODUCTION 9

Object-oriented paradigm, elements of object oriented programming – Merits and demerits of OO methodology – C++ fundamentals – data types, operators and expressions- control flow- arrays-strings- pointers and functions.

UNIT II PROGRAMMING IN C++ 9

Classes and objects – Access Specifiers - Constructors and Destructors- Inheritance– Polymorphism-Operator overloading-Virtual functions.

UNIT - III TEMPLATES AND EXCEPTION HANDLING 9

Function and class templates -Exception handling – try-catch-throw paradigm – exception specification – terminate and unexpected functions – Uncaught exception.

UNIT - IV FILE HANDLING 9

C++ streams – console streams – console stream classes-formatted and unformatted console I/O operations, manipulators - File streams - classes file modes file pointers and manipulations file I/O.

UNIT -V JAVA FUNDAMENTALS 9

An overview of Java, data types, variables and arrays, operators, control statements, classes, objects, methods – Inheritance-Exception Handling.

Text Books:

1. Herbert Schildt, "The Complete Reference:C++", Fourth edition, Tata McGraw Hill, Noida, 2007.
2. Deitel.H.M, Deitel.P.J, "Java: How to program", Fifth edition, Prentice Hall of India private limited,New Delhi, 2009.

Reference Books:

1. Ira Pohl, "Object oriented programming using C++", Pearson Education Asia, 2007.
2. Malik.D.S, "C++ Programming from Problem Analysis to Program Design", 3rd Edition, Thomson course Technology, New Delhi, 2007.
3. John.R.Hubbard, "Programming with C++", Schaums outline series,Tata McGraw Hill, New Delhi,2003.
4. Herbert Schildt, "The Complete Reference:Java2", Fifth edition,Tata McGraw Hill, Noida, 2007.

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Web References:

1. Introduction to C++ URL : http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-096-introduction-to-c-january-iap-2011/lecture-notes/,
2. Java lectures URL: http://www.cse.iitb.ac.in/~nlp-ai/java%20ppt/
3. Object-Oriented Programming with ANSI-CAxel-Tobias Schreiner , 1999http://www.cs.rit.edu/~ats/books/ooc.pdf

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Course Code: 140IC0305	**Course Title:** ELECTRICAL MACHINES
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Engineering Physics
- Basic Electrical and Electronics Engineering

Course Outcomes:

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

CO 1: Apply terminology, principles and theory relative to the operation of DC Generators and motor.

CO 2: Discuss transformer terminology, principles and theory, types relative to Industrial / Commercial power transformers

CO 3: Describe the working principle, construction, performance characteristics of Synchronous Generator and motor.

CO 4: Classify the different types of starter and various speed control techniques used for Three phase induction motor

CO 5: Explain the working principle, construction, performance characteristics ofsingle Phase induction motor and special machines.

Course Content:

UNIT I D.C. MACHINES **9**

Constructional details - EMF equation - Methods of excitation -Characteristics of series, shunt and compound generators - Armature reaction-Commutation - Principle of operation of D.C. motor - Back EMF and torque equation - Characteristics of series, shunt and compound motors -Speed control of DC shunt motors - Types of starters - Applications.

UNIT II TRANSFORMERS **9**

Constructional details – types - Principle of operation - EMF equation - Transformation ratio-Transformer on no load - losses - Testing of transformer - Equivalent circuit – phasor diagram - Regulation and efficiency- Autotransformer - Three phase transformer - connections - Scott connection.

UNIT - III INDUCTION MOTORS **9**

Construction – Types – Principle of operation of three phase induction motors –Torque equation-slip-torque characteristics- losses and efficiency - Starting methods -speed control – cogging and crawling – Induction generator - Linear induction motor.

UNIT - IV SYNCHRONOUS MACHINES **9**

Principle of alternators - Construction details - Types - Equation of induced EMF – Voltage regulation-parallel operation-Brushless alternators-Synchronous motor operating principle-Torque equation-Starting methods - 'V' and inverted 'V'curve hunting - Applications.

UNIT -V SINGLE PHASE INDUCTION MOTOR AND SPECIAL MACHINES **9**

Single phase induction motor - Construction and working principle-Double field revolving theory-Shaded pole motor - Repulsion motor-Universal motor – Stepper motor - Reluctance motor –SR motor- Hysteresis motor – PMDC –BLDC- Servo motors

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Text Books:

1 Kothari D.P. and Nagrath I.J., "Electrical Machines", Tata McGraw Publishing Company Ltd, second edition, 2007.

Reference Books:

1. Theraja, B.L. and Theraja, A.K "A Text book of Electrical Technology", Vol.II, S.C Chand and Co., New Delhi, 2007.
2. Del Toro, V., "Electrical Engineering Fundamentals", Prentice Hall of India, New Delhi, 1995.
3. Fitzgerald. A.E., Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill Publishing Company Ltd, 2003.
4. Cotton, H., "Advanced Electrical Technology", Sir Isaac Pitman and Sons Ltd., London, 1999.

Web References:

1. http://vlab.co.in/
2. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-685-electric-machines-fall-2013/
3. https://www.nptel.com

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Course Code: 140IC0306	**Course Title:** ELECTRICAL MEASUREMENTS AND INSTRUMENTS
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Basics of Electrical and Electronics engineering

Course Outcomes:

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

CO1: Illustrate the concepts of indicating instruments for voltage and current measurements.

CO2: Describe working principle involved in the different types of power and energy meters and instrument transformers

CO3: Discuss the working principle involved in the DC bridges and potentiometers.

CO4: Summarize the concepts used in Various AC bridges

CO5: Explain the concept of other electrical instruments like power factor and Frequency meter, synchroscopes.

Course Content:

UNIT I BASICS OF MEASUREMENTS AND INSTRUMENTS 9

Electrical, Mechanical and SI units-Definitions-Measurements-methods of measurements- Errors-classification of instruments- Galvanometer-d' Arsonval Galvanometer-Theory and application – Moving coil: PMMC and Dynamometer type instruments - Moving iron: attraction and repulsion type instruments, torque equations–Extension of range and calibration of ammeter, voltmeter-Instrument transformers.

UNIT II MEASUREMENT OF POWER AND ENERGY 9

Power in DC and AC circuits-Electrodynamometer wattmeters: Theory, construction, shape of scale, errors- LPF wattmeter-Measurement of power using Instrument transformers-Measurement of power in three phase circuits-Three phase wattmeter-Calibration of wattmeters. Single phase and polyphase induction type energy meters-Maximum demand indicators

UNIT - III POTENTIOMETERS AND RESISTANCE MEASUREMENT 9

DC potentiometer-basic circuit –Crompton's potentiometer-Applications. AC potentiometers-Polar and coordinate types-applications. Resistance measurement- Ammeter voltmeter method, Substitution method, Wheatstone bridge, Kelvin double bridge, ohmmeter, direct deflection method, meggar-Earth resistance measurement

UNIT - IV MEASUREMENT OF IMPEDANCE 9

AC bridges-measurement of inductance and capacitance- Maxwell's inductance bridge-wein's bridge-Hay's bridge-Schering bridge-Anderson bridge-Campbell bridge to measure mutual inductance – Universal Impedance Bridge.

UNIT -V OTHER ELECTRICAL INSTRUMENTS 9

Power factor meters- single phase and three phase electrodynamometer power factor meters - Frequency meters - vibrating read type and resonance type -synchroscopes- Phase sequence indicators - AC and DC current probes.

Text Books:

1. Sawhney A K, "A course in Electrical and Electronic Measurement and Instrumentation", DhanpatRai& Sons, NewDelhi, 18 th Edition ,2005
2. Kalsi H.S, "Electronic Instrumentation" Tata McGraw Hill, 2004

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Reference Books:

1. Gupta J.B, " A course in Electronic and Electrical measurements and Instrumentation", S.K.Kataria& sons, Delhi, 12th Edition, 2003
2. Nakra B C, Chaudry K K "Instrumentation, measurement and Analysis" Tata McGraw Hill, 1st edition 2003.
3. Martin V Ressland, "Electrical measurements Fundamentals, concepts applications" New age international(p) ltd publishers,2nd edition 2005

Web References:

1. www. nptel.ac.in
2. www.nptel.iitg.ernit.in
3. www.sciencedirect.com

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Course Code: 140IC0307	**Course Title: THERMAL ENGINEERING AND FLUID MECHANICS LABORATORY** (Common to EIE and ICE)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):
Nil

Course Outcomes:

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

CO1.Draw the valve and port timing diagram of IC engine.
CO2. Evaluate the performance of IC engines.
CO3. Evaluate the heat transfer coefficient using natural and forced convection apparatus.
CO4. Determine the flow rates and head losses in viscous and turbulent flows.
CO5. Evaluate the performance of hydraulic machinery such as pumps and turbines.

List of Experiments:

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

BoS Chairman

Course Code: 140IC0308	**Course Title: ELECTRICAL MEASUREMENTS AND INSTRUMENTS LABORATORY**
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Basic circuit connections.
- Theoretical knowledge on AC and DC bridges.

Course Outcomes:

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

CO1: Analyze the accuracy of measuring devices.
CO2: Measure Resistance, Inductance and Capacitance using Bridges
CO3: Analyze the various random errors using MATLAB
CO4: Calculate the power, power factor and iron loss

List of Experiments:

1. Measurements of Medium Resistance using Wheatstone Bridge
2. Measurement of Low Resistance using Kelvin Double Bridge
3. Calibration of Single Phase Energy meter.
4. Calibration of Wattmeter.
5. Measurement of Capacitance using Schering Bridge.
6. Measurement of Inductance using Anderson Bridge.
7. Calibration of Current Transformer and Potential Transformer.
8. Statistical analysis of Random Errors using MATLAB
9. DC Potentiometer
10. Study of RLC Transients using VI
11. Measurement of Three Phase Power and Power factor
12. Measurement of iron loss using Maxwell Inductance bridge

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Course Code: 140IC0309	Course Title: ELECTRICAL MACHINES LABORATORY
Core/Elective: Core	Credits (L:T:P:C:M) – 0 : 0 : 3 : 2 : 100
Type: Practical	Total Contact Hours: 45

Pre-requisites: The student should have undergone the course(s):

- Engineering Practices Laboratory
- Basics of Engineering Physics

Course Outcomes:

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

CO1. Compare the characteristics of DC machines by conducting different tests.
CO2. Analyze the characteristics of dc machines and transformers.
CO3. Understand and demonstrate the starters and speed control techniques of DC machines.
CO4. Compare the performance characteristics of single phase and three phase AC machines by conducting different tests

List of Experiments:

1. Open circuit and load characteristics of self - excited DC generator.
2. Open circuit and load characteristics of separately excited DC generator.
3. Load test on DC shunt motor.
4. Load test on DC series motor.
5. Swinburne's test on DC Machine.
6. Speed control of DC shunt motor.
7. Load test on single phase transformer.
8. Open circuit and short circuit test on single phase transformer.
9. Load test on three phase Alternator.
10. Load test on single-phase induction motor
11. Load test on three phase induction motor.
12. Study of starters.

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SEMESTER IV

Course Code: 140IC0401	**Course Title: NUMERICAL METHODS** (Common to CE, ECE, EEE, EIE, ICE and IT Programmes)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 1: 0 : 4 : 100
Type: Lecture	**Total Contact Hours:** 60

Pre-requisites: The student should have undergone the course(s):
Nil

Course Outcomes:

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

CO1: Solve the system of linear and calculate dominant eigen values of a matrix.

CO2: Determine the solution for a nonlinear equation and Fit a curve to the given numerical data

CO3: Use numerical techniques to interpolate ,differentiate and integrate for the given numerical data

CO4: Solve the first and second order initial value problems

CO5: Solve the first and second order boundary value problems for the boundary value problems

Course Content:

UNIT I SOLUTION OF SYSTEM OF LINEAR EQUATIONS 9+3

Solution of linear system - Gaussian elimination and Gauss-Jordan methods - LU - decomposition methods - Crout's method - Jacobi and Gauss-Seidel iterative methods - sufficient conditions for convergence - Power method to find the dominant eigen value and eigen vector.

UNIT II SOLUTION OF NON LINEAR EQUATIONS & CURVE FITTING 9+3

Solution of nonlinear equation - Bisection method - Regulafalsi method - Newton- Raphson method -Order of convergence of these methods- Curve fitting - Method of least squares and group averages

UNIT - III INTERPOLATION & NUMERICAL DIFFERENTIATION AND INTEGRATION 9+3

Newton's forward, backward and divided difference interpolation – Lagrange's interpolation – Numerical Differentiation and Integration – Trapezoidal rule – Simpson's 1/3 and 3/8 rules – Double integration-Trapezoidal rule.

UNIT - IV SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9+3

Numerical Solution of Ordinary Differential Equations- Euler's method - Euler's modified method - Taylor's method and Runge-Kutta method of fourth order to solve first order differential equations- and second order equations – Multi step methods - Milne's and Adams' methods.

UNIT -V SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS 9+3

Numerical solution of Laplace equation and Poisson equation by Liebmann's method - solution of one dimensional heat flow equation - Bender - Schmidt recurrence relation - Crank - Nicolson method - Solution of one dimensional wave equation.

BoS Chairman

Text Books:

1. Sastry S.S. "Introductory methods of Numerical Analysis", 3rd edition, PHI, 2003.
2. Grewal, B.S. and Grewal, J. S., "Numerical methods in Engineering and Science", 6th Edition, Khanna Publishers, New Delhi, 2004.
3. SankaraRao, K. "Numerical methods for Scientists and Engineers", 3rd Edition Prentice Hall of India Private Ltd., New Delhi, 2007.

Reference Books:

1. Gerald, C. F. and Wheatley, P. O., "Applied Numerical Analysis", 6th Edition, Pearson Education Asia, New Delhi, 2006.
2. Jain M. K., Iyengar, S. R. and Jain, R. K, "Numerical Methods for Scientific and Engineering Computation", Wiley Eastern Company.

Web References:

1. https://www.math.ust.hk/~machas/**numerical-methods.pdf**
2. www.techmat.vgtu.lt/~inga/Files/Quarteroni-SkaitMetod.**pdf**
3. ns.sjtu.edu.cn/people/mtang/**textbook.pdf**

BoS Chairman

Course Code: 140IC0402	**Course Title: LINEAR INTEGRATED CIRCUITS AND APPLICATIONS** (Common to EEE, EIE and ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Electron Devices
- Electronic Circuits

Course Outcomes:

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

CO1. Explain the IC fabrication process.

CO2. Explain the characteristics and frequency response of Op-Amp ICs.

CO3. Summarize the special applications of Op-Amp.

CO4. Illustrate the internal functional blocks and the applications of special ICs like Timers, VCO, PLL circuits, regulator Circuits.

CO5. Describe the Op-Amp based design.

Course Content:

UNIT I IC FABRICATION 9

IC classification, Fundamental of Monolithic IC technology, Basic Planar process: Epitaxial growth, Masking and Etching, Diffusion of impurities, Isolation techniques, Assembly processing and Packaging, Fabrication of IC based components: Active and Passive components, BJT, FET, MOSFET and CMOS – Fabrication of a typical circuit.

UNIT II CHARACTERISTICS AND BASIC APPLICATIONS OF OPAMP 9

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, offset voltage and current, CMRR, Slew rate - Frequency response of OP-AMP - IC 741 - Inverting amplifier, Non Inverting amplifier, Summer, Differential amplifier, Average amplifier, Differentiator, Integrator and Log/Antilog amplifier.

UNIT - III SPECIAL APPLICATIONS OF OPAMP 10

Instrumentation amplifier, First and Second order active filters, V/I & I/V converters, Comparators, Multivibrators, Waveform generators, Clippers, Clampers, Peak detector, Precision rectifier - S/H circuit, D/A converter: R-2R ladder and Weighted resistor types - A/D converter : Dual slope, Successive approximation and Flash types.

UNIT - IV SPECIAL FUNCTION ICs 9

555 Timer circuit – Functional block, characteristics & applications – 566 voltage controlled oscillator circuit – 565 Phase lock loop circuit functioning and applications, Analog multiplier ICs– IC voltage regulators: Fixed and Variable regulators – 78XX, 79XX, 317, 723 regulators, Switching regulator, Opto-Coupler ICs.

UNIT -V CASE STUDIES – OPAMP BASED DESIGNS 8

Design of Signal Conditioning circuits for Thermocouple, RTD, Strain gauge and LDR - Water level control - DC motor speed control.

BoS Chairman

Text Books:

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

Reference Books:

1. David A. Bell, 'Op-amp & Linear ICs', Prentice Hall of India, 2nd edition, 2005.
2. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', Tata McGraw Hill, 2003.
3. Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear ICs', Pearson Education, 4th edition, 2002.

Web References:

1. https://onlinecourses.nptel.ac.in/explorer

BoS Chairman

Course Code: 140IC0403	**Course Title: INDUSTRIAL INSTRUMENTATION – I** (Common to EIE and ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Transducer Engineering
- Engineering Physics

Course Outcomes:

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

CO1. Explain the principle and working of force, torque and velocity measuring instruments.

CO2. Describe the different measuring methods of acceleration, vibration and density.

CO3. Summarize the various techniques for pressure measurement.

CO4. Illustrate the temperature standards, calibration and signal conditioning for temperature measuring instruments.

CO5. Select a suitable temperature measuring instruments for the given application.

Course Content:

UNIT I MEASUREMENT OF FORCE, TORQUE AND VELOCITY 9

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

UNIT II MEASUREMENT OF ACCELERATION, VIBRATION AND DENSITY 9

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

UNIT - III PRESSURE MEASUREMENT 9

Units of pressure – Manometers – 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 and Resonator pressure sensor - Measurement of vacuum:- McLeod gauge, Thermal conductivity gauges and Ionization gauges:- Cold cathode type and hot cathode type - Testing and calibration of pressure gauges - Dead weight tester.

UNIT - IV TEMPERATURE MEASUREMENT 9

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

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UNIT -V THERMOCOUPLES AND RADIATION PYROMETERS 9

Thermocouples - Laws of thermocouple – Fabrication of industrial thermocouples – Signal conditioning - Isothermal block reference junctions – Cold junction compensation - High temperature Measurement – Radiation methods of temperature measurement – Radiation fundamentals - Total radiation pyrometers – Optical pyrometers - Two colour radiation pyrometers – Fiber Optic temperature measurement.

Text Books:

1. Doebelin. E.O., 'Measurement Systems – Application and Design', Tata McGraw Hill publishing company, 2004.
2. Jain. R.K., 'Mechanical and Industrial Measurements', Khanna Publishers, New Delhi,1999.

Reference Books:

1. Patranabis.D., 'Principles of Industrial Instrumentation', Tata McGraw Hill Publishing Company Ltd, 1996.
2. Sawhney.A.K. andSawhney.P., 'A Course on Mechanical Measurements, Instrumentation and Control', DhanpathRai and Co, 2004.
3. Nakra.B.C. &Chaudary.K.K., 'Instrumentation Measurement & Analysis', Tata McGraw Hill Publishing Ltd, 2004.
4. Singh.S.K., 'Industrial Instrumentation and Control', Tata McGraw Hill, 2003.

Web References:

1. http://nptel.ac.in/courses/108105064/
2. http://nptel.ac.in/courses/112106140

BoS Chairman

Course Code: 140IC0404	**Course Title: COMMUNICATION ENGINEERING** (Common to EIE and ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Electronic Devices and Circuits

Course Outcomes:

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

CO 1: Explain the basic concepts of analog modulation systems.

CO 2: Describe the different types of transmission lines and the basic idea of radio propagation.

CO 3: Explicate the different digital modulation schemes and the concept of Multiplexing.

CO 4: Elucidate the various satellite and data communication networks.

CO 5: Expound the fundamentals of communication systems and instrument interface

Course Content:

UNIT I ANALOG MODULATION SYSTEMS **9**

Time and frequency domain representation of signals, electromagnetic spectrum, amplitude modulation (AM) and demodulation, frequency modulation(FM) and demodulation, Phase modulation(PM),super heterodyne receiver, AM transmitter.

UNIT II TRANSMISSION MEDIUM **9**

Transmission lines – Types, equivalent circuit, losses, standing waves, impedance matching, bandwidth; radio propagation – Ground wave and space wave propagation, critical frequency, maximum usable frequency, path loss, white Gaussian noise.

UNIT - III DIGITAL COMMUNICATION **9**

Pulse code modulation (PCM), time division multiplexing (TDM), frequency division multiplexing (FDM) digital T-carrier system. Digital radio system. Digital modulation: Frequency shift keying (FSK) – Modulator and demodulator, phase shift keying (PSK) – Modulator and demodulator.

UNIT - IV SATELLITE AND DATA COMMUNICATIONS **9**

Kepler's Three laws of Planetary motion ,Orbital satellites, geostationary satellites, look angles, satellite system link models, satellite system link equations,Serial and Parallel communication: RS232, RS422, RS485,USB and Centronics.

UNIT -V COMMUNICATION FOR INSTRUMENT INTERFACE **9**

GPIB, PCI, PXI, I^2C, SPI, CAN, MOD Bus,VME Bus, VXI bus characteristics and IEEE488 standards.

Text Books:

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

BoS Chairman

Reference Books:

1. John Park, Steve Mackay, 'Practical Data acquisition for Instrumentation and Control Systems', Newness Publications, 1st edition, 2003
2. John Park, Steve Mackay, Edwin Wright, 'Practical Data Communication for Instrumentation and Control', Newness Publications, 1st edition, 2003
3. Kennedy.G., 'Electronic Communication Systems', McGraw Hill, 4th edition, 2002.
4. Krishna Kant , 'Computer based Industrial Control', Prentice Hall of India, 1997.

Web References:

1. http://www.nptel.ac.in/courses/117102059/8
2. http://www.nptel.ac.in/courses/117101051/18
3. http://www.nptel.ac.in/courses/117101054/

BoS Chairman

Course Code: 140IC0405	**Course Title: DIGITAL PRINCIPLES AND APPLICATIONS** (Common to EIE and ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Basic math functions and equivalents.
- Need to have basic understanding of digital systems, logic gates, combinational and sequential logic

Course Outcomes:

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

CO1. Explain about basics of digital electronics.
CO2. Solve problems related to number systems and Boolean algebra.
CO3. Identify, analyze and design combinational circuits.
CO4. Design various synchronous and asynchronous sequential circuits.
CO5. Explain the internal circuitry and logic behind any digital system.

Course Content:

UNIT I BOOLEAN ALGEBRA 9

Binary Numbers- Number Base Conversion- Signed Binary Numbers- Definitions of Boolean Algebra- Basic Theorems- Boolean functions- Canonical and standard forms- Digital Logic Gates-Fan in, Fan out and Noise Margin. Combinational circuits- Analysis Procedure-Design Procedure- Gate Level minimization- Map Method-Tabulation Method – Don't care condition.

UNIT II COMBINATIONAL LOGIC 9

Combinational logic circuit using basic Gates- NAND and NOR Implementation- Adders/Subtractors- Decoder-Encoder-Multiplexer-Demultiplexer - Binary Multiplier, Magnitude Comparator, Decoders. Encoders.

UNIT - III SYNCHRONOUS SEQUENTIAL LOGIC 9

Flip flops SR, JK, T, D and Master slave – Characteristic and excitation tables and equations – Level and Edge Triggering –Realization of one flip flop using other flip flops – Analysis and design of sequential circuits with state diagram, State table, State minimization and State assignment- Introduction to Arithmetic State Machine and ASM Chart.

UNIT - IV COUNTERS AND ASYNCHRONOUS SEQUENTIAL LOGIC 9

Ripple counters –Design of Synchronous counters, Ring counters and Sequence detector - Registers – shift registers- Universal shift register. Analysis of Asynchronous Sequential– primitive state / flow table – Minimization of primitive state table –state assignment – Excitation table - cycles – Races –Hazards: Static –Dynamic –Essential –Hazards elimination.

UNIT -V APPLICATIONS 9

Digital System Design Procedure - System Design: BCD to Seven Segment Code Converter - Running LED System - Timer using MSI circuits - Quiz First Press identifier – Pulse Width measurement Unit.

BoS Chairman

Text Books:

1. Morris Mano.M., Digital Design, 4th Edition Pearson Education Pvt. Ltd, 2008
2. Donald D. Givone, Digital Principles and Design, TMH, New Delhi, 2002

Reference Books:

1. Charles H.Roth. Fundamentals of Logic Design, Thomson Learning, 2003.
2. S. Salivahanan and S. Arivazhagan, Digital Circuits and Design, 2nd ed., Vikas Publishing House Pvt. Ltd, New Delhi, 2004
3. John .M Yarbrough, Digital Logic Applications and Design, Thomson- Vikas Publishing house, New Delhi, 2002
4. Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications, 6th Edition, TMH, New Delhi,2003

Web References:

1. www.nptel.ac.in/courses/

BoS Chairman

Course Code: 140IC0406	**Course Title: DATA STRUCTURES AND ALGORITHMS USING C++** (Common to EEE, EIE and ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 1: 0 : 4 : 100
Type: Lecture	**Total Contact Hours:** 60

Pre-requisites: The student should have undergone the course(s):

- C Programming

Course Outcomes:

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

CO1.Explain the concepts of stack, queue and their applications in code conversion.

CO2. Summarize the concepts of Linked List, Trees and their applications in searching and Sorting.

CO3. Describe the Graphs, Graph traversal techniques and shortest path algorithms.

CO4.Illustrate the different searching and sorting techniques with their efficiency.

CO5. Summarize the algorithm design techniques

Course Content:

UNIT I INTRODUCTION TO OBJECT ORIENTED PROGRAMMING AND LINEAR DATA STRUCTURES 9+3

Introduction – concepts of object oriented programming – ADTs – The List ADT (Array & Linked List Implementation) – The Stack ADT – Applications of Stack – The Queue ADT – Applications of Queue.

UNIT II HASHING AND PRIORITY QUEUES 8+3

Hashing – Separate chaining – Open addressing – Rehashing and Extendible hashing – Heap – Binary Heap – Applications of Priority Queues (The Selection Problem & Event Simulations) – d –heaps – Binomial Queues.

UNIT - III NON LINEAR DATA STRUCTURES 10+3

Trees – Binary trees – Binary Search Trees – AVL Trees. Graph – Definitions – Topological Sort – Shortest path algorithms (Dijkstra's Algorithm) – Minimum Spanning Trees (Prim's and Kruskal's Algorithm) – Introduction to NP Completeness.

UNIT - IV SEARCHING AND SORTING 9+3

Searching – Linear Search – Binary Search – Sorting – Insertion sort, Bubble sort, Shell sort, Heap sort, Merge sort, Quick sort and Bucket sort – External Sorting – running time analysis.

UNIT -V ALGORITHM DESIGN TECHNIQUES 9+3

Greedy Algorithm (Knapsack Problem) – Divide and Conquer (Euclidean algorithm) – Dynamic programming (Traveling salesman problem) – Backtracking (Eight queens Problem) – Branch and Bound (Job Scheduling).

BoS Chairman

Text Books:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 3rd edition, Pearson Education Asia, 2007.

Reference Books:

1. Michael T. Goodrich, "Data Structures and Algorithm Analysis in C++", Wiley student edition,2007.
2. Sahni, "Data Structures Using C++", The McGrawHill, 2006.
3. Jean – Paul Tremblay & Paul G.Sorenson, "An Introduction to data structures with applications", Tata McGraw Hill edition, 2nd edition, 2002.
4. John R.Hubbard, "Schaum's outline of theory and problem of data structure with C++", McGrawHill, 2000.
5. BjarneStroustrup, "The C++ Programming Language", Addison Wesley, 2000.

Web References:

1. www.tutorialspoint.com/cplusplus/cpp_object_oriented.htm
2. http://www.nptel.ac.in/syllabus/syllabus.php?subjectId=106106127
3. http://www.cosc.canterbury.ac.nz/mukundan/dsal/appldsal.html
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms.html.
5. http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms

BoS Chairman

Course Code: 140IC0407	**Course Title: INTEGRATED CIRCUITS LABORATORY** (Common to EIE and ICE)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Electron Devices
- Electronic Circuits

Course Outcomes:

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

CO1. Design the implementation of Boolean Functions using logic gates.

CO2. Apply practical knowledge on different operational amplifier applications.

CO3. Use Timer ICs for applications

List of Experiments:

1. Verification of logic gates and Implementation of Boolean Functions using logic gates.
2. Design of Adder/ Subtractor circuits.
3. a. Design of Code converters
   b. Design of Encoders and Decoders
4. Design of Counters
5. Design of Shift Registers
6. Design of Multiplexer/ De-multiplexer
7. Application of Op-Amp
   a. Inverter, Non-Inverter, summer, subtrator and average amplifier
   b. Practical Integrator/Differentiator
8. Instrumentation Amplifier
9. Design of Astable and Monostablemultivibrator using Timer IC.
10. I/V Converter and V / I Converter
11. Frequency multiplication using PLL.
12. Simulation of digital & analog circuits using spice S/W.

BoS Chairman

Course Code: 140IC0408	**Course Title: TRANSDUCER AND SIGNAL CONDITIONING LABORATORY** (Common to ICE and EIE)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:**

Pre-requisites: The student should have undergone the course(s):

- Electron Devices
- Basics of Electrical and Electronics Engineering

Course Outcomes:

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

CO1. Demonstrate the operating principle and working of different transducers used for physical quantity measurements.

CO2. Analyze the static and dynamic characteristics of transducers.

CO3. Design and develop the signal conditioning circuits for sensors.

List of Experiments:

1. Loading effect of potentiometer.
2. Strain gauge & load cell characteristics.
3. Characteristics of Capacitive transducers.
4. a.Characteristics of Photoelectric tachometer
   b.Characteristics of Piezoelectric transducers.
5. Characteristics of Hall effect transducers.
6. Characteristics of LVDT.
7. a.Characteristics of thermocouple,
   b.Characteristics of thermistor
   c.Characteristics of LDR.
8. Step response characteristics of RTD and thermocouple
9. P/I and I/P converters
10. Digital transducer – shaft angle encoder.
11. Signal conditioning circuit for temperature sensor
12. Signal conditioning circuit for optical sensor

BoS Chairman

Course Code: 140IC0409	**Course Title: DATA STRUCTURES AND ALGORITHMS AND OBJECT ORIENTED PROGRAMMING LABORATORY** (Common to ICE and EIE)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- C Programming
- C++ Programming

Course Outcomes:

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

CO1. Implement linear data structures using array and linked list

CO2. Implement non-linear data structures such as Trees and Graphs

CO3. Implement sorting and searching techniques.

List of Experiments:

1. Array implementation of List Abstract Data Type (ADT)
2. Linked list implementation of List ADT
3. Array implementations Stack ADT
4. Linked list implementations Stack ADT
5. Array implementations Queue ADT
6. Linked list implementations Queue ADT
7. Implement Quick Sort & Merge sort
8. Implementation of Multiple Inheritance using C++
9. Implementation of Function overloading Using C++
10. Implementation of Virtual Functions
11. Use of interfaces in Java
12. Developing packages in Java

BoS Chairman

SEMESTER V

Course Code: 140IC0501	**Course Title: ANALYTICAL INSTRUMENTATION** (Common to EIE and ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Engineering Chemistry

Course Outcome:

At the end of the course the learners will be able to:

CO1: Explain the principle, construction and working of colorimetric and Spectrophotometer.

CO2: Discuss the concept of different spectroscopy techniques and applications.

CO3: Apply instrumentation techniques in different chromatography.

CO4: Identify different types of electrodes used in pH meters and dissolved component analyzers.

CO5: Analyze the important methods of industrial gases, awareness and control of pollution in environment.

Course Content:

UNIT I COLORIMETRY AND SPECTROPHOTOMETRY 10

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

UNIT II SPECTROSCOPY 10

Nuclear radiations, Detectors: GM counter – Proportional counter – Solid state detectors – Gamma cameras – Raman spectroscopy - X-ray spectroscopy – Detectors – Diffractometers – Absorption meters. NMR – Basic principles – NMR spectrometer - Applications. Mass spectrometers – Different types – Applications

UNIT - III CHROMATOGRAPHY 8

Classifications – Gas chromatography - Sample Injection system– Detectors – Liquid chromatographs –High-pressure liquid chromatographs – Detectors –Applications.

UNIT - IV pH METERS AND DISSOLVED COMPONENT ANALYZERS 8

Principle of pH measurement, reference electrodes, measuring electrodes: hydrogen electrodes, glass electrodes, selective ion electrodes, ammonia electrodes, conductivity meters - dissolved oxygen analyzer – Sodium analyzer – Silicon analyzer.

UNIT -V INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING 9

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

BoS Chairman

Text Books:

1. R.S. Khandpur, 'Handbook of Analytical Instruments', Tata McGraw Hill publishing Co. Ltd., 2009.
2. H.H. Willard, L.L. Merritt, J.A. Dean, F.A. Settle, 'Instrumental Methods of Analysis', CBS publishing & distribution, 1995.

Reference Books:

1. Bela G. Liptak, 'Analytical Instrumentation', Chilton Book Company, United states, 2000.
2. Robert D. Braun, 'Introduction to Instrumental Analysis', McGraw Hill, Singapore, 1987.
3. G.W. Ewing, 'Instrumental Methods of Analysis', McGraw Hill, 1992.
4. D.A. Skoog and D.M. West, 'Principles of Instrumental Analysis', Holt, Saunders Publishing, 1985.

Web References:

1. http://nptel.ac.in/courses/103108100/5
2. http://nptel.ac.in/courses/103108100/31
3. http://nptel.ac.in/courses/103108100/25
4. http://www.nptel.ac.in/courses/108105063/pdf/L-08(SS)(IA&C)%20((EE)NPTEL).pdf
5. http://nptel.ac.in/courses/102103047/PDF/mod4.pdf

BoS Chairman

Course Code: 140IC0502	**Course Title: CONTROL SYSTEMS** (Common to ICE and EEE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 1: 0 : 4 : 100
Type: Lecture	**Total Contact Hours:** 60

Pre-requisites: The student should have undergone the course(s):

- Mathematics
- Circuit Theory

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Analyze electromechanical systems by mathematical modeling.
CO2: Determine transient and steady state response of systems using standard test input signals.
CO3: Determine the system behavior by using frequency response analysis.
CO4: Analyze the linear systems for steady state errors, absolute and relative stability.
CO5: Identify and design a suitable compensator system satisfying requirements.

Course Content:

UNIT I SYSTEMS AND THEIR REPRESENTATION 12

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

UNIT II TIME RESPONSE 12

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

UNIT - III FREQUENCY RESPONSE 12

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

UNIT - IV STABILITY OF CONTROL SYSTEM 12

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

UNIT -V COMPENSATOR DESIGN 12

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

BoS Chairman

Text Books:

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

Reference Books:

1. K. Ogata, 'Modern Control Engineering', 4th edition, PHI, New Delhi, 2002.
2. Norman S. Nise, 'Control Systems Engineering', 4th Edition, John Wiley, New Delhi, 2007.
3. Samarajit Ghosh, 'Control systems', Pearson Education, New Delhi, 2004.
4. M. Gopal, 'Control Systems, Principles and Design', Tata McGraw Hill, New Delhi, 2002.
5.

Web References:

1. http://www.nptel.ac.in/courses
2. https://www.rose-hulman.edu

BoS Chairman

Course Code: 140IC0503	Course Title: ELECTRONIC INSTRUMENTATION
Core/Elective: Core	Credits (L : T : P : C : M) – 3 : 0: 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Pre-requisites: The student should have undergone the course(s):

- Transducer Engineering
- Measurements and Instrumentation

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Understanding the basic concepts of various analog instruments.
CO2: Understanding the basic concepts of digital measuring instruments.
CO3: Analysis the different types of oscilloscopes and wave analyzer.
CO4: Apply the real time models in recorders and display devices.
CO5: Distinguish the characteristics of different signal interference.

Course Content:

UNIT I ANALOG METERS **9**

Electronic analog meters: DC and AC voltmeters - True R.M.S. voltmeters - A.C. current measurements - multimeters – component measuring instruments: Q-meter - vector impedance meter-power meter.

UNIT II DIGITAL INSTRUMENTS **9**

Digital voltmeters and multimeter –Digital phase meters – Digital tachometers –F/V and V/F conversion techniques– Digital frequency, period and time measurements – Low frequency measurements – Automatic time and frequency scaling – Sources of error – Noise – Inherent error in digital meters, hidden errors in conventional ac measurements – RMS detector in digital multimeters.

UNIT - III OSCILLOSCOPE AND WAVE ANALYZER **10**

Cathode Ray oscilloscopes - Typical measurements using CRO - CRT screen characteristics – CRO Circuits- CRO Triggering - special probes - high frequency considerations Sampling oscilloscope - digital storage oscilloscope- Modes of operation-Acquisition Methods-DSO Applications-Wave analyzer -harmonic distortion analyzer- spectrum analyzer –Logic analyzer.

UNIT - IV RECORDERS AND DISPLAY DEVICES **9**

Recorders - moving coil, potentiometric, event recorders - X-Y plotters - U.V.recorders - Magnetic tape recorders, digital recorders- LED: Digital Alpha Numeric Displays – 7 Segment displays – Dot matrix displays - LCD Display: Alpha Numeric Displays.

UNIT -V SIGNAL INTERFERENCE **8**

Interference and screening – energy coupling principles – grounding – electrostatic and electromagnetic interference and shielding

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Text Books:

1. Cooper.W.D and Helfrick.A.D, 'Modern Instrumentation and Measurement Techniques', Third Edition, Prentice-Hall of India, 2008.
2. Kalsi.H.S, 'Electronics Instrumentation', Tata McGraw Hill, 2005.

Reference Books:

1. A.K.Sawhney, 'A Course in Electrical and Electronics Measurement and Instrumentation', Dhanpat Rai & Co P Ltd, 2013
2. Bouwens.A.J, 'Digital Instrumentation', McGraw Hill, 2008
3. Patranabis.D, 'Principles of Electronic Instrumentation', PHI Learning Pvt Ltd, 2008.

Web References:

1. www.nptel.ac.in
2. www.gupshupstudy.com
3. https://studypoint4u.wordpress.com
4. www.eltronicschool.com
5. https://www.scribd.com

BoS Chairman

Course Code: 140IC0504	**Course Title: INDUSTRIAL INSTRUMENTATION – II** (Common to ICE and EIE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Transducer Engineering
- Engineering physics
- Material science

Course Outcomes:

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

CO1: Explain the various level measurement techniques adopted in industries.
CO2: Compare and contrast the different types of mechanical flow meters and their installation.
CO3: Describe the area flow meters, mass flow meters and electrical type flow meters.
CO4: Select the suitable flow meters for various applications.
CO5: Elucidate the viscosity, humidity and moisture measurements.

Course Content:

UNIT I LEVEL MEASUREMENT **9**

Gauge glass techniques coupled with photoelectric readout system – Float type level indication – Different schemes – Level switches, level measurement using displacer and torque tube. Boiler drum level measurement – Differential pressure method – Hydra step systems – Electrical types of level gauges using resistance, capacitance, nuclear radiation, RADAR and ultrasonic sensors

UNIT II VARIABLE HEAD TYPE FLOW METERS **8**

Units and terms - Theory of fixed restriction variable head type flow meters – Orifice plate – Venturi tube – Flow nozzle – Dall tube – installation of head flow meters –5 valve way Manifolds– Piping arrangement for different fluids – Pitot tube

UNIT - III QUANTITY METERS, AREA FLOW METERS AND MASS FLOW METERS **10**

Positive displacement flow meters – Constructional details and theory of operation of mutating disc, reciprocating piston, oval gear and helix type flow meters – Inferential meter – Turbine flow meter – Rotameter – Theory and installation – Angular momentum mass flow meter – Coriolis mass flow meters – Thermal mass flow meters – Volume flow meter plus density measurement – Calibration of flow meters – Dynamic weighing method

UNIT - IV ELECTRICAL TYPE FLOW METER **9**

Principle and constructional details of electromagnetic flow meter – Different types of excitation schemes used – Different types of ultrasonic flow meters – Laser doppler anemometer systems – Vortex shedding flow meter – Target flow meter – Solid flow rate measurement – Guidelines for selection of flow meter

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UNIT -V MEASUREMENT OF HUMIDITY AND MOISTURE 9

Viscosity – units – terms – Say bolt viscometer – Rotameter type viscometer Humidity terms – Dry and wet bulb psychrometers – Hot wire electrode type hygrometer – Dew cell – Electrolysis type hygrometer – Commercial type dew point meter – Moisture terms – Different methods of moisture measurement – Moisture measurement in granular materials, solid penetrable materials like wood, web type material.

Text Books:

1. D. Patranabis, 'Principles of Industrial Instrumentation', Tata McGraw Hill, New Delhi, 2010.
2. R.K. Jain, 'Mechanical and Industrial Measurements', Khanna publishers, New Delhi, 2013.

Reference Books:

1. A.K. Sawhney and P. Sawhney, 'A Course on Mechanical Measurement, Instrumentation and Control', Dhanpa tRai and Co, 2004.
2. D.P.Eckman, 'Industrial Instrumentation', Wiley Eastern Limited, 2005.
3. Alan S. Morris, 'Principles of Measurement and Instrumentation', Prentice Hall of India, 2003.
4. B.C. Nakra and K.K. Chaudry, 'Instrumentation, Measurement and Analysis', Tata McGraw Hill, 2004.
5. B.G.Liptak, 'Instrument Engineers Hand Book (Measurement)', Chilton Book Co., 1994.

Web References:

1. http://www.nptel.ac.in/courses/108105064/
2. http://www.pacontrol.com/industrial-instrumentation.html
3. http://www.endress.com/en/Field-instruments-overview

BoS Chairman

Course Code: 140IC0505	**Course Title: MICROPROCESSORS AND MICROCONTROLLERS** (Common to EEE, EIE and ICE)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:**45

Pre-requisites: The student should have undergone the course(s):

- A fundamental understanding of Analog and Digital Electronics.
- Linear Integrated circuits and applications

Course Outcomes:

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

CO 1: Summarize the architecture of 8085 and 8086 processors
CO 2: Write assembly language programs for 8085 microprocessor
CO 3: Explain the function of interfacing devices used with 8085 microprocessor
CO 4: Describe the 8051 microcontroller and its applications.
CO 5: Illustrate the architecture of PIC microcontroller and applications of 8051.

Course Content:

UNIT I INTRODUCTION **9**

8085: Architecture - Signals– Memory interfacing – I/O Devices Interfacing – Timing Diagram – Interrupt structure, 8086 Architecture.

UNIT II PROGRAMMING OF 8085 PROCESSOR **9**

Addressing modes and Instruction sets – Assembly language format – Data transfer, data Manipulation & control instructions – Programming: Loop structure with counting & Indexing - Subroutine instructions stack-Code Conversions.

UNIT - III PERIPHERAL INTERFACING **9**

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

UNIT - IV MICRO CONTROLLER 8051 **9**

Architecture - Addressing modes and Instruction Sets – Interrupt structure – Timer –I/O ports – Serial communication, Simple programming.

UNIT -V INTRODUCTION TO ADVANCED PROCESSORS & APPLICATIONS OF 8051 **9**

Interfacing: LCD, ADC, DAC, Sensors, Stepper Motor, Keyboard and DC motor speed control. PIC microcontroller-CPU Architecture and instruction set.

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Text Books:

1. R.S. Gaonkar, 'Microprocessor Architecture Programming and Application', 5th edition, Wiley Eastern Ltd., New Delhi., 2002
2. Kenneth J Ayala, 'The 8051 Micro controller', Thomson Delmer Learning, 2004
3. Ajit pal, 'Microcontrollers, Principles and Applications' — PHI Ltd., - 2011.

Reference Books:

1. A.K. Ray and K.M. Bhurchandi, 'Advanced Microprocessors and peripherals', 2nd Edition, Tata McGraw-Hill, 2006.
2. Muhammad Ali Mazidi & Janice Gilli Mazidi, 'The 8051 Micro Controller and Embedded Systems', Pearson Education, 2007.
3. John B.Peatman, 'Design with PIC microcontrollers', Pearson Education, New Delhi, 2004.

Web References:

1. http://www.nptel.ac.in/downloads/106108100/
2. http://www.ustudy.in/ece/mpmc/u1

BoS Chairman

Course Code: 140IC0506	**Course Title: POWER ELECTRONICS** (Common to EEE, EIE and ICE)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 1 : 0 : 4 : 100
Type: Lecture	**Total Contact Hours:**60

Pre-requisites: The student should have undergone the course(s):

- Electron Devices & Circuits

Course Outcomes:

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

CO 1: Classify the characteristics of various power semiconductor devices.
CO 2: Analyze and design the AC/DC rectifier circuits.
CO 3: Illustrate the different topologies of DC/DC converter circuits
CO 4: Compare and contrast the different PWM techniques of Inverter circuits
CO 5: Demonstrate the basic concepts in AC/AC converter circuits.

Course Content:

UNIT I POWER SEMI-CONDUCTOR DEVICES **12**

Introduction -Power Diode:V-I characteristics, reverse recovery characteristics and types – Thyristor family (SCR, TRIAC and GTO): Basic structure, static and dynamic characteristics, device specifications and ratings, methods of turn-on and turn-off - gate triggering circuit using UJT, commutation circuits, series and parallel connections and protection circuits – Power Transistors: Basic structure, static and dynamic characteristics of Power MOSFET and Power IGBT.

UNIT II AC-DC CONVERTERS **15**

Single Phase: Principle of phase angle control, Half wave rectifier with R and RL loads, function of freewheeling diode, semi-converter (Asymmetrical and Symmetrical configurations), Fully controlled converter with R and RL loads, Estimation of average load voltage and rms load voltage, Performance parameters, single-phase dual converter and effect of source inductance, Simple Problems. Three Phase: Operation of half wave converter, half controlled and fully controlled converters with R and RL loads, Estimation of average load voltage, Simple Problems.

UNIT - III DC-DC CONVERTERS **12**

Choppers: Step-down and step-up chopper, Forced commutation techniques, Time ratio control and current limit control - Simple Problems.
Switching regulators: Principle of operation of Buck regulator, Boost regulator and Buck-boost regulators, SMPS - Simple Problems.

UNIT - IV DC-AC CONVERTER **12**

Types – Single phase and three phase bridge inverters: basic circuit and operation, Voltage control of single-phase inverters – Control of AC output voltage - Harmonic reduction. – HVDC SYSTEMS – UPS.

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UNIT -V AC-AC CONVERTER 9

Single phase and three phase AC voltage controllers: Basic circuit operation, sequence control and multi stage sequence control – Cycloconverter: single phase and three phase cycloconverters – Matrix converters – Applications: Tap changing transformers, AC circuit breakers.

Text Books:

1. Muhammad H. Rashid, "Power Electronics: Circuits, Devices and Applications", Pearson Education, 3rd Edition, 2011.
2. *M.D.Singh and K.B.Khanchandani, "Power Electronics", Tata McGraw-Hill, New Delhi, 2006.*
3. Bimal K Bose, "Modern Power Electronics & Ac Drives", Phi Learning Pvt: Ltd-New Delhi, 2002.

Reference Books:

1. Ned Mohan, T.M.Undeland, W.P.Robbins, "Power Electronics: Converters, applications and design", 3rd Edition, John wiley and Sons, 2006.
2. Joseph Vithayathil, "Power Electronics: Principles and applications", *Tata McGraw-Hill, New Delhi,* 2010.
3. Lander : Power Electronics, 3rd Edition, T*ata McGraw Hills Publishing Company Limited, New Delhi* 1994.

Web references:

1. http://www.nptel.ac.in/courses
2. https://www.rose-hulman.edu
3. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-334-power-electronics-spring-2007/download-course-materials/

BoS Chairman

Course Code: 140IC0507	**Course Title: MICROPROCESSORS AND MICROCONTROLLERS LABORATORY** (Common to EEE, EIE and ICE)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Digital Electronics
- Microprocessors And Microcontrollers

Course Outcomes:

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

CO1: Apply the fundamentals of assembly level programming (ALP) of basic microprocessors and microcontrollers

CO2: Develop ALP for 8085/8086/8051

CO3: Interface with standard microprocessor interfaces including serial ports, digital-to-analog converters and analog-to-digital converters.

CO4: Analyze problems and apply a combination of hardware and software to address problem by programming.

List of Experiments:

1. Programming for 8/16 bit Arithmetic operations Using 8085
   Addition / subtraction / multiplication / division.
2. Programming with control instructions Using 8085
   Ascending / Descending order.
   Maximum / Minimum of numbers.
   ASCII / BCD code conversions.
3. Programming for Arithmetic operations Using 8086
   Addition / subtraction / multiplication / division.
4. A/D Interfacing.
5. D/A Interfacing.
6. Traffic light controller using 8085/8051.
7. Interfacing experiments using 8251, 8254.
8. Programming for 8/16 bit Arithmetic operations Using 8051
   Addition / subtraction / multiplication / division.
9. Interfacing and Programming of Servo Motor Speed control using 8051.
10. Interfacing and Programming of Stepper Motor control using 8085/8051.
11. Interfacing and Programming of LCD Using 8051.
12. Keyboard / Display Interface using 8279.

BoS Chairman

Course Code: 140IC0508	**Course Title: INDUSTRIAL INSTRUMENTATION LABORATORY** (Common to EIE and ICE)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Industrial Instrumentation I &II
- Transducer Engineering

Course Outcomes:

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

CO1: Demonstrate the working of measuring instruments used for of physical quantity measurement like pressure, temperature, flow and level.

CO2: Determine the discharge coefficient of given head type flow meter by suitable procedure.

CO3: Calibrate and identify the error present in the measuring instrument.

List of Experiments:

1. Measurement of flow using Venturi meter and Orifice meter.
2. Calibration of Pressure gauge using dead weight tester.
3. Calibration of Temperature sensor (RTD).
4. Torque measurement in circular shaft using strain gauge.
5. Viscosity measurement of liquids using saybolt viscometer.
6. Level measurement using D/P Transmitter.
7. Measurement of absorbance of a sample using UV – Visible spectrophotometer.
8. pH meter standardization and measurement of pH values of solutions.
9. Measurement of liquid level using displacer torque tube.
10. Calibration of flow transmitter (Wheel flow meter).
11. Calibration of Pressure Transmitter.
12. Vibration measurement.

BoS Chairman

Course Code: 140IC0509	**Course Title:** SYSTEM SIMULATION LABORATORY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Control Systems
- Electrical Machines

Course Outcomes:

At the end of the course learners will be able to:

CO1: Demonstrate the digital control system.
CO2: Determine the mathematical model of various systems.
CO3: Analyze the linear systems in Time and Frequency domain.
CO4: Design the Compensators for system requirement.

List of Experiments:

1. Digital speed control system.
2. Digital position control system.
3. Transfer function of DC motor
4. Transfer function of DC generator
5. Transfer function of SYNCHROS
6. Characteristics of AC servo motor
7. Linear system analysis (Time domain analysis, Error analysis) using MATLAB.
8. Stability analysis (Bode, Root Locus) of Linear Time Invariant system using MATLAB
9. Response of PID controller for a first order system with dead time using MATLAB.
10. Response of PID controller for a second order system using MATLAB
11. Stability analysis (Nyquist) of Linear Time Invariant system using MATLAB
12. Design of Compensators using MATLAB package.

BoS Chairman

SEMESTER VI

Course Code: 140IC0601	**Course Title:** EMBEDDED SYSTEM DESIGN (Common to EEE, EIE and ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Digital Electronics and Linear Integrated Circuits
- Microprocessor and Microcontrollers

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Understand the basic functions, components and importance of Embedded systems

CO2: Select the Features of PIC controller for real time applications

CO3: Apply the Real Time Models based on application area

CO4: Distinguish where and when to use an OS and RTOS

CO5: Analyze the Hardware and Software modules present in Embedded System

Course Content:

UNIT I INTRODUCTION 9

Embedded System – Classification of Embedded System – Processors in the embedded system – Processor and Memory organization – DMA – Timer and Counting devices – Device drivers and interrupt service mechanism

UNIT II PIC CONTROLLER 9

PIC 16F8XX – Pin diagram – Registers – Program and Data Memory– I/O Ports – Serial Port expansion – SPI and I^2C – Timers – ADC – Interrupts

UNIT III REAL TIME MODELS 9

State Machine and Concurrent Process model: Types of models – FSM – HCFSM and State chart Language – Program state machine model – Concurrent Process – communication among process – Synchronization among process – Data flow model

UNIT IV REAL TIME OPERATING SYSTEMS 9

RTOS - Real time kernel, OS tasks, task states, task scheduling, interrupt processing, Clocking, communication and synchronization, control blocks, memory requirements and control, kernel services

UNIT V CASE STUDIES 9

Case Studies of Embedded System Design – Automatic Chocolate Vending machine – Digital Camera – Adaptive Cruise Control System in a Car – Smart Card

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Text Books:

3. RajKamal, "Embedded Systems Architecture, Programming and Design", Tata McGraw hill Publishing Company Ltd, Second Edition, 2008
4. John.B.Peatman, "Design with Microcontrollers", Pearson Education, 2002.

Reference Books:

5. Frank Vahid, Tony Givargis, "Embedded Systems Design", Wiley India, 2006
6. Tammy Noergaard, "Embedded Systems Architecture", Elsevier, 2005.
7. Tim Wilhurst, "An Introduction to the Design of Small Scale Embedded Systems, Palgrave, 2004
8. Ajay V. Deshmukh, "Microcontrollers Theory and Applications", Tata McGraw Hill Publishing Company Ltd, 2008

Web References:

3. http://www.nptel.ac.in/courses
4. https://www.edx.org/course/embedded-systems-shape-world
5. http://www.barrgroup.com/Embedded-Systems/Books

BoS Chairman

Course Code: 140IC0602	**Course Title:** PRINCIPLES OF DIGITAL SIGNAL PROCESSING (Common to EEE, EIE and ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0: 1 : 4 : 100
Type: Lecture	**Total Contact Hours:** 60

Pre-requisites: The student should have undergone the course(s):

- Engineering Mathematics – III

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Generate various discrete time signals using MATLAB Software and analyse their behavior For different test conditions.

CO2: Perform linear and Circular Convolutions between discrete time signals using MATLAB Software as well as DSP Processor, TMS329C50.

CO3: Analyze signal reconstruction of band limited continuous time signals from its discrete time version based on sampling theorem using MATLAB Software.

CO4: Compute DFT of a discrete time sequence using MATLAB Software as well as DSP Processor, TMS329C50.

CO5: Design digital filters like FIR and IIR using MATLAB Software.

Course Content:

UNIT I DISCRETE TIME SIGNALS AND SYSTEMS 12

Need and benefits of Digital Signal Processing - Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance - classification of signals: continuous and discrete, energy and power - mathematical representation of signals - Typical signal processing operations: convolution, correlation and transformation - Analog to Digital conversion of signals - sampling, signal reconstruction, signal quantization and encoding.

UNIT II DISCRETE TIME SYSTEM ANALYSIS 12

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

UNIT III DISCRETE TRANSFORMS 12

DFT – Definition - properties, Computation of DFT using FFT algorithm – DIT & DIF -FFT using radix 2 – Butterfly structure; Computation of IDFT using DFT

UNIT IV DESIGN OF DIGITAL FILTERS 12

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

UNIT V PROGRAMMABLE DIGITAL SIGNAL PROCESSOR 12

Introduction to programmable DSP's – An overview of TMS320F281X – TMS320F281X Assembly Language Instructions – Application programs in TMS320F281X.

BoS Chairman

Text Books:

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, 4th Edition2007.
2. B. Venkataramani, M. Bhaskar, 'Digital Signal Processors, Architecture, Programming and Applications', Tata McGraw Hill, New Delhi, 2002.

Reference Books:

1. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', Tata McGraw Hill, New Delhi,III edition,2008.
2. S. Salivahanan, A. Vallavaraj, C. Gnanapriya, 'Digital Signal Processing', Tata McGraw Hill, New Delhi,second edition,2010.
3. www.ti.com/ TMS320F281X data sheet

Web References:

1. http://www.nptel.ac.in/courses

BoS Chairman

Course Code: 140IC0603	**Course Title:** PROCESS CONTROL (Common to EIE and ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Industrial Instrumentation
- Control system

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Study modeling and systems dynamic behavior
CO2: Understand the principle operation of final control elements including converters and actuators
CO3: Design and analyse the performance of controllers
CO4: Demonstrate different control schemes for obtaining process requirements
CO5: Demonstrate the dynamic behavior and its control techniques of the selected processes

Course Content:

UNIT I MATHEMATICAL MODELING OF PROCESSES 9

Introduction of process control – Degrees of Freedom - Dynamic behavior of first-and second-order systems. Mathematical models for process dynamic behavior - Mathematical model of first order liquid level and thermal processes – Higher order process – Process with dead time- Interacting and non-interacting systems – Continuous and batch process – Servo and regulatory operation.

UNIT II FINAL CONTROL ELEMENT 9

I/P Converter – Types of actuators – Pneumatic Control valves parts and its operation - Control valves characteristics – Classification of control valves – Types - Control valve sizing – Valve positioner - Cavitation and flashing – Selection of control valves

UNIT III CONTROLLER CHARACTERISTICS AND TUNING 9

Basic control action – Discontinuous and Continuous controller modes – Composite controllers PI, PD and PID – Electronic controllers to realize various control actions – Performance criteria – IAE, ISE, ITAE and ¼ decay ratio – Tuning of controllers – Ziegler-Nichol's method and Cohen-Coon method.

UNIT IV CONTROL SYSTEMS WITH MULTIPLE LOOPS 9

Multivariable control loops - Cascade control – Feed forward control – Ratio control – Selective control systems – Split range control – internal Model control - Adaptive and inferential control – Model Predictive control.

UNIT V DYNAMICS AND CONTROL – CASE STUDY 9

Dynamics and control of Heat exchanger – Dynamics and control of Distillation process - Dynamics and control of chemical reactors

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Text Books:

1. G. Stephanopoulos, 'Chemical Process Control', Prentice Hall of India, New Delhi, 1990
2. Donald R. Coughanowr, 'Process Systems Analysis and Control' McGraw hill International edition, 2005

Reference Books:

1. Bela.G. Liptak, 'Process Control', Chilton Book Company, 1994.
2. Curtis D. Johnson, 'Process Control Instrumentation Technology', 7th Edition, Pearson Education, New Delhi, 2002 / PHI.
3. B. Wayne Bequette, 'Process Control: Modelling, Design and Simulation', Prentice hall professionals, 2003
4. K. Krishnaswamy, 'Process control', New Age International 2008
5. Donald P. Eckman, 'Automatic Process Control', Wiley Eastern Ltd., New Delhi, 1993

Web References:

1. nptel.ac.in/courses/103103037/
2. textofvideo.nptel.iitm.ac.in/103105064/lec1.pdf

BoS Chairman

Course Code: 140IC0604	**Course Title:** VIRTUAL INSTRUMENTATION (Common to EEE and ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Fundamental knowledge in c language

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Define the concept of Graphical system and its functional blocks
CO2: Develop virtual instruments with LabVIEW graphical programming tools
CO3: Identify appropriate tools for Arrays, Strings and File I/O tasks
CO4: Select Data acquisition system interfaces based on the requirement
CO5: Illustrate major applications of LabVIEW in real time environment

Course Content:

UNIT I GRAPHICAL SYSTEM DESIGN **8**

Graphical System Design Model – Virtual Instrumentation – Virtual Instrument and Traditional Instrument – Hardware and software in virtual instrumentation – Virtual instrumentation for test, control and Design – Conventional and Graphical programming

UNIT II LabVIEW BASICS I **10**

Front Panel and Block Diagram – Tools, Controls and Functions palette. Modular programming – SubVI. Structures – FOR, WHILE Loops, Case, Sequence, event structures, Formula node

UNIT III LabVIEW BASICS II **9**

Arrays, Clusters, Strings, File I/O, Time and Dialog controls, Waveform chart, Graph, XY Graph and operations. Report generation, Web Publishing tool

UNIT IV DATA ACQUISITION SYSTEM **9**

Instrument control: GPIB – VISA – Instrument drivers – Serial Port communication. Data Acquisition: Review of Transducers and signal conditioning, DAQ hardware – AI, AO, DIO. DAQ Assistant and configuration

UNIT V LabVIEW APPLICATIONS **9**

LabVIEW RT, Process control applications, Physical applications, Speed control, Data visualization, Imaging and Sound. Level, flow, temperature process, Bio Medical application - Pulse rate.

BoS Chairman

Text Books:

1. Jovitha Jerome, 'Virtual Instrumentation using LabVIEW' PHI Learning Private Limited, New Delhi, Second Printing, 2011
2. Gary W Johnson, Richard Jennings, 'LabVIEW Graphical Programming' Fourth Edition, McGraw Hill, 2006.

Reference Books:

1. Sanjay Gupta, Joseph John, 'Virtual Instrumentation using LabVIEW' Tata McGraw Hill, 5th Reprint, 2010
2. Robert H Bishop. 'Learning with LabVIEW 2009' Pearson Education, 2010.

Web References:

1. https://www.ni.com/company/standardize.htm
2. https://www.ni.com/getting-started/labview-basics/

BoS Chairman

Course Code: 140IC0607	**Course Title:** PROCESS CONTROL LABORATORY (Common to EIE and ICE)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Industrial Instrumentation Lab
- System Simulation Lab

Course Outcomes:

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

CO1: Demonstrate the dynamic behavior of the processes
CO2: Design and verify the PID controller for different order processes
CO3: Demonstrate the closed loop behavior of the flow, level, pressure and temperature processes
CO4:Determine characteristics of control valves
CO5: Demonstrate advanced control loops by using CSTR and distillation processes

List of Experiments:

1. Higher order systems - Interacting and non-interacting systems
2. Response of P+I+D controller using MATLAB
3. Design of Electronic PID Controller
4. PID Controller tuning with performance criteria using MATLAB
5. Closed loop response of flow control loop and characteristics of flow transmitter
6. Closed loop response of level control loop and characteristics of level transmitter
7. Closed loop response of temperature control loop
8. Closed loop response of pressure control loop and characteristics of pressure transmitter
9. Characteristics of control valve with and without positioner
10. Ratio and cascade complex control loop
11. Distillation temperature control using PID controller
12. Closed loop response of CSTR dynamics and control

BoS Chairman

Course Code: 140IC0608	**Course Title:** VIRTUAL INSTRUMENTATION LABORATORY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- System Simulation Lab

Course Outcomes:

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

CO1: To use graphical programming language (LabVIEW) create simple virtual instruments.

CO2: Design applications by selecting proper Data Acquisition.

List of Experiments:

1. Creating simple VIs, Editing and Debugging
2. Creating SubVI
3. Array manipulation using FOR loop
4. Timed WHILE loop configuration
5. Illustrating digital logic circuits: MUX, DEMUX
6. Traffic light control using SEQUENCE structure
7. Waveform Chart and graph operations with interfacing conventional Instruments
8. Record creation using strings
9. Differentiator and Integrator using NI ELVIS
10. Temperature signal interface using USB 6009
11. CRO and Function generator interface using M Series DAQ card.
12. Audio signal processing using Speedy 33.

BoS Chairman

Course Code: 140IC0610	**Course Title: MINI PROJECT**
Core/Elective: Core	**L : T : P : C : M** – 0 : 0: 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Course Outcomes:

CO1: Demonstrate the understanding of the engineering principles in multidisciplinary environment.

CO2: Communicate effectively with proper aids and documents.

CO3: Perform effectively as a member in a team to complete the project successfully.

CO4: Comply with code of conduct and professional ethics in developing and completing the project.

CO5: Develop project that give sustainable solutions within societal and environmental contexts for problems related to Instrumentation and Control Engineering.

BoS Chairman

SEMESTER VII

Course Code: 140IC0701	**Course Title:** PRINCIPLES OF MANAGEMENT (Common to ECE, EEE, EIE and ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Technical Communication
- Communication Skills
- Environmental Science

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Discuss and communicate the evolution of management thinking.
CO2: Understand and practice the importance of planning and organizing.
CO3: Evaluate leadership styles to anticipate the consequences of each leadership style.
CO4:Analyze and formulate best control methods
CO5: Understand the importance of Motivation, Globalization and Liberalization.

Course Content:

UNIT I INTRODUCTION **9**

Historical developments – approaches to management – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organization

UNIT II MANAGERS AND ENVIRONMENT **9**

Social responsibility–Planning – Objectives – Setting Objectives – Process of Managing through Objectives – Strategies- Policies & Planning Premises- Forecasting Techniques – Decision-making

UNIT III FUNCTIONAL AREA OF ORGANISATION **9**

Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process – Techniques

UNIT IV MOTIVATION AND DIRECTIONS **9**

Objectives– Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment – Communication-Types

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

BoS Chairman

Text Books:

1. Harold Kooritz& Heinz Weihrich 'Essentials of Management', Tata McGraw- Hill-7th Edition-2007.
2. Tripathy PC And Reddy PN, 'Principles of Management', Tata McGraw-Hill 1999

Reference Books:

1. Joseph L Massie, 'Essentials of Management', Prentice Hall of India- (Pearson) 4th Edition-2003.
2. Decenzo David- Robbin Stephen. A, 'Personnel and Human Reasons Management', Prentice Hall of India- 1996.
3. Robbins, 'Principles of Management', Pearson education -2005

Web References:

1. http://www.nptel.ac.in/courses
2. https://www.edx.org/Principles+Of+Management

BoS Chairman

Course Code: 140IC0702	**Course Title:** LOGIC AND DISTRIBUTED CONTROL SYSTEM (Common to EIE and ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Digital Principles and Applications

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Paraphrase different digital controllers and SCADA systems
CO2: Explain components and Programming of PLC
CO3: Demonstrate PLC based control system
CO4: Explain parts and Communication used in DCS
CO5: Describe different interfaces used in DCS

Course Content:

UNIT I COMPUTER CONTROLLED SYSTEM **9**

Basic building blocks of computer control system – Data acquisition system – Direct digital control System – Supervisory Control- Evolution of PLC's – PLC Architecture –I/O Devices- Advantages over relay logic.

UNIT II PLC PROGRAMMING **9**

PLC programming languages – Ladder diagram – Programming timers and counters – Instructions in PLC –Logical Instructions, Program control instructions, math instructions, sequencer instructions – Applications of PLC –Elevator System – Boiler Temperature and level control - Introduction to FBD.

UNIT III SUPERVISORY CONTROL AND DATA ACQUISITION SYSTEM **9**

SCADA: - Hardware and software, Remote terminal units, Master station, Communication architectures - open SCADA protocols – DNP3 and 60870 - Case Study: Water Industry Application of DNP3 and SCADA.

UNIT IV DISTRIBUTED CONTROL SYSTEM **9**

Evolution – Building blocks – Field controlled units – Operator stations – Data highways – Redundancy concepts – Communication in DCS – DCS system integration with PLC and computers.

UNIT V INTERFACES IN DCS **9**

Operator interfaces – Low and High level operator interfaces — Engineering interfaces – Low and High level engineering interfaces

BoS Chairman

Text Books:

1. Frank D.Petruzella, 'Programmable Logic Controllers', Fourth edition, Tata McGraw Hill, 2010
2. Clarke, G., Reynders, D. and Wright, E., "Practical Modern SCADA Protocols: DNP3,60870.5 and Related Systems", Newnes, 1st Edition, 2004
3. Michael P. Lukas, 'Distributed Control System', Van Nostrand Reinhold CO, Newyork, 1986

Reference Books:

1. John W. Webb, Ronald A. Reis 'Programmable Logic Controllers and Applications', PHI Learning, Fifth Edition, 2009.
2. T. Hughes, 'Programmable Logic Controllers', ISA press, 4th edition, 2008.
3. S.K Singh, 'Computer Aided Process Control', Prentice Hall of India, 2005.
4. Krishna Kant, 'Computer based Industrial Control', Prentice Hall of India, Second Edition, 2010.

Web References:

1. http://nptel.ac.in/courses/108105062/
2. http://www.plcs.net/contents.shtml

BoS Chairman

Course Code:140IC0703	**Course Title:** DIGITAL CONTROL AND STATE VARIABLE METHODS (Common to ICE and EIE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 1: 0 : 4 : 100
Type: Lecture	**Total Contact Hours:** 60

Pre-requisites: The student should have undergone the course(s):

- Engineering Mathematics / Equivalent Subjects
- Control Systems
- Digital Signal Processing

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Distinguish the conventional and state variable approaches.
CO2: Solve the problems on discrete systems.
CO3: To analyze the real time problems using discrete data system.
CO4: Being able to design the digital controller and its algorithms.
CO5: Analyze the various system stabilities using liapunov technique.

Course Content:

UNIT I DISCRETE STATE SPACE MODEL **12**

Limitations of conventional control theory - Concepts of state, State variables and state model – state model for linear time invariant systems: State space representation using physical-Phase and canonical variables.

UNIT II SYSTEM RESPONSE **12**

Transfer function from state model - Transfer Function matrix - Decomposition of transfer functions-Direct, cascade and parallel decomposition techniques - Solution of state equation - State transition matrix computation.

UNIT III ANALYSIS OF DISCRETE DATA SYSTEM **12**

State-space representation of discrete data systems – Selection of sampling process – Selection of sampling period – Review of z-transform – Pulse transfer function – Modified z-transform - Stability of discrete data system – Jury's stability test

UNIT IV DESIGN OF DIGITAL CONTROLLER **12**

Digital PID – Position and velocity form – Deadbeat's algorithm – Dahlin's algorithm – Kalman's algorithm – Dead time compensator: Smith predictor

UNIT V LIAPUNOV STABILITY **12**

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.

BoS Chairman

Text Books:

1. Gopal M, "Digital Control and State Variable Methods", Tata McGraw-Hill Publishing Company Limited, New Delhi, India, Second Edition, 2012.
2. Katsuhiko Ogata, "Modern Control Engineering", Prentice Hall of India Private Ltd., New Delhi, Third Edition, 2009.

Reference Books:

1. Nagrath I J and Gopal M, "Control Systems Engineering", New Age International Publisher, New Delhi, 2010.
2. Nise S Norman, "Control Systems Engineering", John Wiley & Sons, Inc, Delhi, Third edition, 2010.
3. Benjamin C Kuo, "Automatic Control Systems",John Wiley & Sons, Inc., Delhi, 2009.
4. Thomas Kailath, "Linear Systems", Prentice Hall, 1980

Web References:

1. www.gcebargur.ac.in
2. www.goodreads.com/59581.
3. nptel.ac.in/courses/108103008/25
4. web.mit.edu/2.14/StateSpace.pdf
5. www.nptelvideos.in/control-engineering.htm

BoS Chairman

Course Code: 140IC0707	**Course Title:** INDUSTRIAL AUTOMATION LABORATORY (Common to EIE and ICE)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Control Engineering
- Logic and Distributed Control System

Course Outcomes:

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

CO1: Design digital control algorithms for the given process
CO2: Demonstrate PLC and NI ELVIS based closed loop control of process
CO3: Create simple programs in Human Machine Interfaces

List of Experiments:

1. Design of Discrete P+I+D controller for a Second order system
2. Design of dead beat / Dahlin algorithms.
3. Programming of Programmable logic controller.
4. Computer controlled liquid level system using PLC.
5. Computer controlled thermal system using PLC.
6. Control of Bottle filling system using PLC.
7. Closed loop response of level process
8. Closed loop response of Pressure process
9. Closed loop response of flow process
10. Closed loop response of Thermal process
11. Distributed Control System
12. HMI

BoS Chairman

Course Code: 140IC0708	**Course Title:** EMBEDDED SYSTEM DESIGN LABORATORY (Common to EIE and ICE)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Microprocessor and Microcontroller Laboratory
- C programming Laboratory

Course Outcomes:

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

CO1: Infer wide knowledge in the architecture of microcontroller used

CO2: Develop skills on Programming and understand the operation of Timers / counters, registers and RTC

CO3: Experiment on various input sensors, output display devices and Communication protocols

CO4: Being able to design small software/hardware systems

CO5: Design real time embedded systems using the concepts of RTOS.

List of Experiments:

1. Activation of LED and Generating delay for buzzer using timer.
2. Interfacing of Matrix keyboard and display the data on LCD using microcontroller.
3. Display the IC based temperature sensor's signal on LCD using microcontroller
4. Design of Real Time Clock using microcontroller
5. Digital Voltmeter using microcontroller
6. Design of Calculator using microcontroller
7. Design of Digital PID controller using microcontroller
8. Control of DC motor via hyper terminal using microcontroller
9. Transmit and receive sensor data using RF communication
10. Round robin scheduling using RTOS
11. Cooperative scheduling using RTOS
12. Elevator Simulation by using RTOS.

BoS Chairman

Course Code:140IC0810	Course Title: PROJECT WORK (ANNUAL PATTERN)
Core/Elective: Core	**L : T : P : C : M** – 0 : 0 : 3 : - : 100
Type: Practical	**Total Contact Hours:** 45

Course Outcomes:

CO1: Demonstrate the understanding of the engineering principles in multidisciplinary environment.

CO2: Communicate effectively with proper aids and documents.

CO3: Perform effectively as a member in a team to complete the project successfully.

CO4: Comply with code of conduct and professional ethics in developing and completing the project.

CO5: Develop project that give sustainable solutions within societal and environmental contexts for problems related to Instrumentation and Control Engineering.

BoS Chairman

SEMESTER VIII

Course Code: 140IC0801	**Course Title:** ENGINEERING ECONOMICS AND FINANCIAL ACCOUNTING (Common to CSE, ECE, EEE, EIE and ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Principle of Management

Course Outcomes:

At the end of the course the learners will be able to:

CO 1: Discuss about managerial economics and different elements of cost
CO 2: Describe about different market structures
CO 3: Identify the suitable cost estimation procedure
CO 4: Understand the types of costing methods
CO 5: Apply the knowledge on cost accounting

Course Content:

UNIT I INTRODUCTION TO ECONOMICS 8

Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics - Elements of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis- V ratio, Elementary economic Analysis – Material selection for product Design selection for a product, Process planning

UNIT II VALUE ENGINEERING 10

Make or buy decision, Value engineering – Function, aims, and Value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor-Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.

UNIT III CASH FLOW 9

Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.

UNIT IV REPLACEMENT AND MAINTENANCE ANALYSIS 9

Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset – capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely.

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UNIT V DEPRECIATION 9

Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation-Sum of the years digits method of depreciation, sinking fund method of depreciation/ Annuity method of depreciation, service output method of depreciation- Evaluation of public alternatives- introduction, Examples, Inflation adjusted decisions – procedure to adjust inflation, Examples on comparison of alternatives and determination of economic life of asset.

Text Books:

1. PanneerSelvam, R, "Engineering Economics", Prentice Hall of India Ltd, NewDelhi, 2001

Reference Books:

1. Chan S.Park, 'Contemporary Engineering Economics', Prentice Hall of India, 2002
2. Donald.G. Newman, Jerome.P.Lavelle, 'Engineering Economics and analysis' Engg. Press, Texas, 2002
3. Degarmo, E.P., Sullivan, W.G and Canada, J.R, 'Engineering Economy' Macmillan, New York, 1984
4. Grant.E.L.,Ireson.W.G., and Leavenworth, R.S, 'Principles of Engineering Economy', Ronald Press, New York,1976.
5. Smith, G.W., 'Engineering Economy', Lowa State Press, Iowa, 1973.

Web References:

1.nptel.ac.in/syllabus/syllabus_pdf/105103023.pdf

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Course Code: 140IC0810	**Course Title: PROJECT WORK (ANNUAL PATTERN)**
Core/Elective: Core	**L : T : P : C : M** – 0 : 0 : 12 : 8 : 200
Type: Practical	**Total Contact Hours:** 180

Course Outcomes:

CO1: Demonstrate the understanding of the engineering principles in multidisciplinary environment.

CO2: Communicate effectively with proper aids and documents.

CO3: Perform effectively as a member in a team to complete the project successfully.

CO4: Comply with code of conduct and professional ethics in developing and completing the project.

CO5: Develop project that give sustainable solutions within societal and environmental contexts for problems related to Instrumentation and Control Engineering.

BoS Chairman

ELECTIVES

Course Code: 140IC9111	**Course Title:** DIGITAL IMAGE PROCESSING (Common to EEE, EIE and ICE)
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Principles of Digital Signal Processing

Course Outcomes:

At the end of the course the learners will be able to:

CO1.Explain various digital image processing fundamentals like visual perception, colour models and 2-D quantization.

CO2.Compute various 2-D image transforms.

CO3.Assessdifferent image enhancement and restoration techniques.

CO4. Apply various image segmentation and representation techniques.

CO5. Encode source signals using different coding techniques.

Course Content:

UNIT I DIGITAL IMAGE FUNDAMENTALS **9**

Elements of digital image processing systems- Elements of visual perception- psycho visual model-brightness- contrast- hue- saturation- mach band effect- Color image fundamentals - RGB- HSI models- Image sampling- Quantization-Two dimensional mathematical preliminaries.

UNIT II IMAGE TRANSFORMS **9**

1D DFT- 2D transforms – DFT- DCT- Discrete Sine, Walsh- Hadamard- KL transforms and their properties - Haar Wavelet Transform.

UNIT III IMAGE ENHANCEMENT AND RESTORATION **9**

Spatial domain enhancement: gray level transformations - histogram modification and specification techniques- Image averaging- Directional Smoothing- Median- Geometric mean- Harmonic mean- Contra harmonic and Yp mean filters. Image Restoration: degradation model- Unconstrained and Constrained restoration-Wiener filtering- Geometric transformations: spatial transformations- Gray-Level interpolation

UNIT IV IMAGE SEGMENTATION AND REPRESENTATION **9**

Point- line and edge detection- Edge linking- Region based segmentation: Region splitting and merging. Image representation: chain codes – polygonal approximations – signatures –boundary segments – skeletons.

UNIT V IMAGE COMPRESSION **9**

Need for data compression-Error free compression: variable length coding, bit plane coding, LZW coding. Lossy compression: Transform coding, wavelet coding. Overview of Compression standards: binary image compression standard, still image compression standards.

BoS Chairman

Text Books:

1. Rafael C. Gonzalez and Richard E. Woods, 'Digital Image Processing', 2nd Edition, Pearson Education, 2008.
2. Anil K. Jain, 'Fundamentals of Digital Image Processing', Prentice Hall of India, 2002.

Reference Books:

1. Jayaraman, S., Essakirajan, S., and Veerakumar, T., 'Digital Image Processing', Tata Mc Graw Hill, New Delhi, 2010.
2. David Salomon, 'Data Compression – The Complete Reference', 3rd edition, Springer VerlagNewyork, 2006.
3. William K-Pratt, 'Digital Image Processing', 4th edition, John Wiley and Sons, 2007.
4. Kenneth R. Castleman, 'Digital Image Processing', Pearson Education, 1996.

Web References:

1.www.nptel.ac.in

BoS Chairman

Course Code: 140IC9112	**Course Title:** VLSI DESIGN (Common to EEE, EIE and ICE)
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Digital Principles and Applications

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Describe the MOS transistors and circuit layout in static CMOS logic style.
CO2: Identify the characteristics of MOS inverters and estimate power consumption of a VLSI chip.
CO3: Construct layouts for the logic circuit incorporating technology-specific layout rules.
CO4: Extract analog parasitic elements from the layout and explain the chip technology scaling process.
CO5: Design elementary data paths for microprocessors viz., moderate-speed adders, Subtractors and multipliers.

Course Content:

UNIT I MOS TRANSISTOR THEORY 9

VLSI Design Flow- Basic MOS Transistors – NMOS, CMOS Fabrication- MOS Transistor Operation- Threshold Voltage-Derivation of Drain Current - Channel length modulation - Body Effect – Transconductance - DC model of MOS transistor.

UNIT II INVERTERS 9

NMOS Inverter - Resistive Load Inverter Circuit - NMOS Inverter with Depletion NMOS as a Load - CMOS Inverter - Latch-up in CMOS Circuit - CMOS Transmission Gate - Tristate Inverter - Power Dissipation in CMOS Circuits

UNIT III LOGIC DESIGN WITH MOSFETS 9

MOSFETS as Switches - Basic Logic Gates in CMOS: NOT- NOR - NAND and other Complex gates - MOS Layers - Stick diagram - Design Rules and Layout Diagram - Physical design of Simple Logic Gates

UNIT IV BASIC CIRCUIT CONCEPTS 9

Sheet Resistance - Capacitance Calculation- Delay Unit τ - Driving Large Capacitive Loads- Propagation Delays - Wiring Capacitances- Scaling of MOS circuits

UNIT V SUBSYSTEM DESIGN 9

Introduction - Design of Adders: Parallel Adder - Manchester Carry Chain Adder - Carry Skip Adder - Carry Select Adder - Carry Look Ahead adder - Design of Multipliers: array Multiplier - Serial Parallel Multiplier - Baugh wooly multiplier - Booth Multiplier - Design of ALU – FPGA: Architecture and Programming Technologies.

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Text Books:

1. Kiran Kumar VG and Nagesh, "Fundamentals of CMOS VLSI Design", Pearson Education, 2nd Edition, 2012
2. Smith,Jr "Principles of CMOS VLSI Design: System Perspec Verilog", Addison Wesly,2000

Reference Books:

1. Neil Weste and David Harris, CMOS VLSI Design: A Circuits and Systems Perspective, third edition, Addison Wesley, 2010
2. Douglas. A. Pucknell, Kamran Eshraghian, "Basic VLSI Design, "Prentice Hall, Third Edition, 1995.

Web References:

1.www.**nptel**.ac.in/courses/117101058/
2.textofvideo.**nptel**.iitm.ac.in/117106092/lec1.**pdf**

BoS Chairman

Course Code: 140IC9113	**Course Title:** AUTOMOBILE AND AIRCRAFT INSTRUMENTATION (Common to EIE and ICE)
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Electrical Measurements and Instruments
- Analytical Instrumentation

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Contrast between different Automobile measuring devices
CO2: Summarize different sensors and actuators used in Automobiles
CO3: Explain the instruments used for emission Measurement
CO4: Describe on gyroscopic theory for aircraft
CO5: Recognize the Aircraft Navigation system

Course Content:

UNIT I MEASURING DEVICES IN AUTOMOBILES 9

Selection of measuring instrument, requirements of measurement such as precision, accuracy, errors, sensitivity, readability and reliability – Devices to measure temperature and pressure of the working fluid, coolant, air and fuel flow into the engine - Indicating and integrating instruments – Vibrometer, Accelerometer, vibration and pressure pickups, vibration test methods and counters.

UNIT II SENSORS AND ACTUATORS 9

Introduction to basic sensor arrangement – types of sensors – Oxygen sensors, crank angle position sensors – Fuel metering / vehicle speed sensor and detonation sensor – Altitude sensor – Flow sensors – Throttle position sensors – Solenoids, stepper motors, relays – Electronic dash board systems – GPS.

UNIT III INSTRUMENTATION FOR EMISSION MEASUREMENT 9

Test procedures – NDIR analyzers – Flame ionization detectors – Chemiluminescent analyzers – Gas chromatograph – Smoke meters – Emission – Standards.

UNIT IV FLIGHT INSTRUMENTATION & GYROSCOPIC INSTRUMENTS 9

Classification of aircraft instruments – Instrument displays, panels, cockpit layout – Altimeters – Airspeed indicators – Machmeters – Accelerometers – Gyroscopic theory – Directional gyro indictor – Artificial horizon – Turn and slip indicators.

UNIT V AIRCRAFT COMPUTER SYSTEMS 9

Terrestial magnetism – Aircraft magnetism- Direct reading magnetic components – Compass errors – Gyromagnetic compass – Performance margin indicators – Safe take off indicators - Aircraft take off monitoring systems – Autopilot and navigation systems.

BoS Chairman

Text Books:

1. Ribbens. B, 'Understanding Automotive Electronics', 5th Edition, Butterworth, Heinemann Woburn, 2012.
2. Robert C. Nelson, 'Flight stability and Automatic control', 2nd Edition, McGraw Hill International, 1998.

Reference Books:

1. Springer and Patterson, 'Engine Emission', Plenum Press, 1990.
2. Pallett E.H.J, 'Aircraft Instruments – Principles and Applications', Pitman and sons, 1981.

Web References:

1. https://www.araiindia.com/facilities_electronics.asp#8
2. https://www.eol.ucar.edu/aircraft-instrumentation

BoS Chairman

Course Code: 140IC9114	**Course Title:** BIOMEDICAL INSTRUMENTATION
Core/Elective : Elective	**Credits (L : T : P : C : M)** – 3 : 0: 1 : 4 : 100
Type: Lecture	**Total Contact Hours:** 60

Pre-requisites: The student should have undergone the course(s):

- Transducer Engineering

Course Outcomes:

At the end of the course the learners will be able to:

CO1.Explain the physiology of human heart, lung & brain.
CO2.Explain the principle and biomedical applications of different types of transducers.
CO3.Compare and contrast the types of Electro Physiological Measurements.
CO4.Explain the concept of medical assisting and therapeutic equipment.
CO5.Explain the concept of modern methods of imaging techniques.

Course Content:

UNIT I PHYSIOLOGY AND TRANSDUCERS **9**

Cell and its structure – Action and resting – Potential propagation of action potential – Sodium pump – Nervous system – CNS – PNS – Nerve cell –Synapse – Cardio pulmonary system – Physiology of heart and lungs –Circulation and respiration – Transducers – Different types – Piezoelectric, ultrasonic, resistive, capacitive, inductive transducers – selection criteria.

UNIT II ELECTRO – PHYSIOLOGICAL MEASUREMENTS **9**

Basic components of a biomedical system – Electrodes – Micro, needle and surface electrodes – Amplifiers – Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier. ECG – PCG – EEG – EMG – ERG – Lead systems and recording methods – Typical Waveforms.

UNIT III NON-ELECTRICAL PARAMETER MEASUREMENTS **9**

Measurement of blood pressure – Cardiac output – Cardiac rate – Heart sound –Respiratory rate – Gas volume –- pH of blood, ESR, GSR measurements – Plethysmography

UNIT IV ASSISTING AND THERAPEUTIC EQUIPMENTS **9**

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

UNIT V MEDICAL IMAGING AND PMS **9**

X-ray machine _ Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography – Different types of biotelemetry systems and patient monitoring – Electrical safety.

Built in Laboratory Component: **15**

List of experiments:

1. Measurement of Blood Pressure and respiration rate
2. ECG recording and analysis
3. PCG recording and analysis
4. EEG simulation and analysis
5. EMG recording and analysis
6. Recording of various physiological parameters using Patient Monitoring System

BoS Chairman

Text Books:

1. R.S.Khandpur, 'Hand Book of Bio-Medical instrumentation', Tata McGraw Hill Publishing Co Ltd., 2004.
2. Leslie Cromwell, Fred J.Weibell, Erich A. Pfeiffer, 'Bio-Medical Instrumentation and Measurements', II edition, Pearson Education, 2002 / PHI.

Reference Books:

1. J.Webster, 'Medical Instrumentation', John Wiley & Sons, 2009.
2. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.
3. L.A. Geddes and L.E.Baker, 'Principles of Applied Bio-Medical Instrumentation', John Wiley & Sons, 1989.
4. C.Rajarao and S.K. Guha, 'Principles of Medical Electronics and Bio-medical Instrumentation', Universities press (India) Ltd, Orient Longman ltd, 2001.

Web References:

1. www.eeeuniversity.com/2013/08/ei2311-**biomedical-instrumentation**.html
2. **nptel**.ac.in/courses/102103017/**pdf**/
3. www.biomed.mtu.edu/

BoS Chairman

Course Code: 140IC9115	**Course Title:** FIBER OPTICS AND LASER INSTRUMENTS (Common to EIE and ICE)
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Material Science

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Apply the basic concepts of optical fibres and their properties.
CO2: Describe the Industrial applications of optical fibres.
CO3: Interpret the Laser fundamentals.
CO4: Estimate the adequate knowledge about Industrial application of lasers
CO5: Express about Medical applications of Lasers.

Course Content:

UNIT I OPTICAL FIBRES AND THEIR PROPERTIES **12**

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

UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBRES **9**

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

UNIT III LASER FUNDAMENTALS **9**

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

UNIT IV INDUSTRIAL APPLICATION OF LASERS **6**

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 MEDICAL APPLICATIONS OF LASER **9**

Medical applications of lasers, laser and tissue interactive – Laser instruments for surgery, Lasers in dentistry, Urology, Orthopedics, neurosurgery, removal of tumors of vocal cards, brain surgery, plastic surgery, gynecology and oncology

BoS Chairman

Text Books:

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

Reference Books:

1. Donald J.SterlingJr, 'Technicians Guide to Fibre Optics', Fourth Edition, Vikas Publishing House, 2004.
2. M. Arumugam, 'Optical Fibre Communication and Sensors', Anuradha Agencies, 2002.
3. John F. Read, 'Industrial Applications of Lasers', Academic Press, 2000.
4. G. Keiser, 'Optical Fibre Communication', McGraw Hill, Fourth Edition, 2010.

Web References:

1. www.nptel.ac.in

BoS Chairman

Course Code: 140IC9116	**Course Title:** INSTRUMENTATION IN PETROCHEMICAL INDUSTRIES (Common to EIE and ICE)
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Analytical Instrumentation / Equivalent subject
- Industrial Instrumentation-I
- Industrial Instrumentation - II

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Explain the basic processing in petroleum industry.
CO2: Explain the operations in petroleum industries.
CO3: Identify chemicals obtained from petroleum products.
CO4: Describe the measurement techniques for various parameters in petrochemical industry.
CO5: Identify various control loops in Petrochemical Industry.

Course Content:

UNIT I PETROLEUM PROCESSING 7

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

UNIT II OPERATIONS IN PETROLEUM INDUSTRY 10

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

UNIT III CHEMICALS FROM PETROLEUM PRODUCTS 10

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

UNIT IV MEASUREMENTS IN PETROCHEMICAL INDUSTRY 9

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

UNIT V CONTROL LOOPS IN PETROCHEMICAL INDUSTRY 9

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

Text Books:

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

BoS Chairman

Reference Books:

1. Austin G.T. Shreeves, 'Chemical Process Industries', McGraw Hill International Student edition, Singapore, 2012.
2. Bela.GLiptak, 'Instrumentation in Process Industries', Chilton Book Company, 1994.

Web References:

1. www.nptel.ac.in

BoS Chairman

Course Code: 140IC9117	**Course Title:** INSTRUMENTATION SYSTEM DESIGN (Common to EIE and ICE)
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Transducer Engineering
- Industrial Instrumentation – I
- Process Control

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Design the concepts of pressure and level measurement devices.

CO2: Construct the signal conditioning circuits using controller concept.

CO3: Predictthe design of valves and study need of P&I diagrams

CO4: Design the concepts of Alarm and Annunciator circuits

Course Content:

UNIT I DESIGN OF TRANSDUCERS 9

An overview of static and dynamic performance characteristics of instruments. Selection criteria for flow, temperature, level, and pressure transducers. Design considerations for transducers such as thermocouple, RTD, orifice plates, Calibration and installation procedure for thermocouple and RTD

UNIT II PRESSURE AND LEVEL 9

Design of Pressure Gauge, Bellows, Bourdon Tube, and Diaphragm based Pressure - Level Instrumentation Design – Design of Air purge system for level measurement

UNIT III CONTROLLERS AND SIGNAL CONDITIONING 9

Electronic P+I+D controllers- design - adjustment of set point, bias and controller settings – Signal conditioning elements - Deflection Bridges, Amplifiers, AC. Carriers systems, Current Transmitters, Analog to Digital Conversion, Sampling

UNIT IV CONTROL VALVES 9

Control valves - design of actuators and positioners - types of valve bodies- valve characteristics materials for body and trims- sizing of control valves , Piping and Instrumentation diagrams, ISA symbols, PI diagrams of typical process plants.

UNIT V ALARMS AND ANNUNCIATORS 9

Design of logic circuits for alarm and Annunciator circuits- Design of microprocessor based Instrumentation systems, design of interfacing circuits and data acquisition - microprocessor based P+I+D controller

BoS Chairman

Text Books:

1. D. M. Considine, Process/Industrial Instruments and Control Handbook, Fourth Edition, McGraw-Hill Inc.,2009.
2. C. D. Johnson, Process Control Instrumentation Technology, Fourth Edition, PHI, 2008.

Reference Books:

1. N. A. Anderson, Instrumentation for Process Measurement and control, Chilton Company, 2002.
2. J. P. Bentley, Principles of Measurement Systems, Longman Inc., 2000.
3. Bela. G. Liptak, Instrument Engineers Handbook, Vol. I and II, Third Edition, Chilton and Book Company, 2006.
4. T. R. Padmanabhan, Industrial Instrumentation: Principles and Design, Springer Verlag Publications, 2000.

Web References:

1.**nptel**.ac.in/courses/112101096/
2.**nptel.iit**g.ernet.in/Courses(Video).php

BoS Chairman

Course Code: 140IC9118	**Course Title:** POWER PLANT INSTRUMENTATION (Common to EEE, EIE and ICE)
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Transducer engineering
- Analytical Instrumentation
- Industrial Instrumentation
- Process Control

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Explain overview of different methods of power generation and boiler process
CO2: Illustrate the various measurements involved in power generation plants.
CO3: Explicate the applications of analyser in power plant.
CO4: Apply the different control schemes for boiler control loops.
CO5: Elucidate the methods of monitoring parameters of turbines and their control.

Course Content:

UNIT I OVERVIEW OF POWER GENERATION 9

Brief survey of methods of power generation – Hydro, Thermal, Nuclear, Solar and Wind power plants – Thermal power plants – Block diagram – Details of boiler accessories – P & I diagram of boiler – Cogeneration - Importance of instrumentation in power generation.

UNIT II MEASUREMENTS IN POWER PLANTS 9

Flow measurement of feed water, fuel, air and steam with correction factor for temperature – Measurement of steam temperature – Three elements Drum level measurement – Steam pressure measurement –Radiation measurement – Smoke and Dust Monitoring.

UNIT III ANALYSERS IN POWER PLANTS 9

Flue gas oxygen analyser – Analysis of impurities in feed water and steam – Dissolved oxygen analyser – Chromatography for gas analysis – pH meter – Fuel analyser – Pollution monitoring instruments.

UNIT IV CONTROL LOOPS IN BOILER 9

Combustion control – Air/Fuel ratio control – Furnace draft control – Drum level control – Main steam and reheat steam temperature control – Super heater control - attemperator - Air temperature control - Deaerator control - Interlocks in boiler operation – Implementation using DCS.

UNIT V TURBINE AND CONDENSER – MONITORING AND CONTROL 9

Speed, Vibration, Shell temperature Monitoring and Control – Steam pressure control – Lubricant oil temperature control – Cooling system. Condenser – Temperature monitoring – Reuse water control.

BoS Chairman

Text Books:

3. Arora.S.C, Domkundwar.S, Domkundwar.A.V, 'A course in Power Plant Engineering', Dhanpat Rai & Co. (P) Ltd, Fifth revised and enlarged edition, 2012.
4. Sam G. Dukelow, 'The Control of Boilers', Instrument Society of America, 1991.

Reference Books:

6. S.M. Elonka and A.L. Kohal, 'Standard Boiler Operations', Tata McGraw Hill, New Delhi, 1994.
7. R.K.Jain, 'Mechanical and Industrial Measurements', Khanna Publishers, New Delhi, 2007.

Web References:

1.**nptel**.ac.in/courses/108106074/chapter1.**pdf**

BoS Chairman

Course Code: 140IC9119	**Course Title:** SMART AND WIRELESS INSTRUMENTATION (Common to EIE and ICE)
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Sensors and Transducers
- Communication Engineering

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Design self-diagnosing instrumentation system
CO2: Understand the structure of Wireless Sensor Network (WSN)
CO3: Analyze the issues in power efficient in WSN
CO4: Know the S/W development for analysing data on WSN

Course Content:

UNIT I SENSORS FUNDAMENTAL 9

Sensor Classification-Thermal Sensors-Humidity Sensors-Capacitive Sensors-Planar Inter digital Sensors-Planar Electromagnetic Sensors-Light Sensing Technology-Moisture Sensing Technology-Carbon Dioxide (CO2) Sensing Technology-Sensors Parameters-TEDS

UNIT II WIRELESS SENSORS AND SENSORS NETWORK 9

Frequency of Wireless Communication-Development of Wireless Sensor Network Based Project-Wireless Sensor Based on Microcontroller and Communicating Device-Zigbee Communicating Device - ISA 100 –Wireless HART.

UNIT III POWER SUPPLIES FOR SENSORS 9

Power Sources-Energy Harvesting-Solar and Lead Acid Batteries-RF Energy Harvesting-Energy Harvesting from Vibration-Thermal Energy Harvesting-Energy Management Techniques-Calculation for Battery Selection

UNIT IV SOFTWARE DESIGN FOR DATA RECEPTION AND ANALYSIS 9

Brief Description of API Mode Data Transmission-Testing the Communication between Coordinator and Remote XBee-Design and Development of Graphical User Interface for Receiving Sensor Data Using C++.A Brief Review of Signal Processing Techniques for Structural Health Monitoring

UNIT V WIRELESS SENSOR AND INSTRUMENT APPLICATIONS 9

WSN Based Physiological Parameters Monitoring System-Intelligent Sensing System for Emotion Recognition-WSN Based Smart Power Monitoring System.

BoS Chairman

Text Books:

1. Subhas Chandra Mukhopadhyay "Smart Sensors, Measurement and Instrumentation", Springer Heidelberg New York Dordrecht London,2013
2. HalitEren, "Wireless Sensors and Instruments: Networks, Design, and Applications", CRC Press, Taylor and Francis Group, 2006

Reference Books:

1. UvaisQidwai "Smart Instrumentation: A Data Flow Approach to Interfacing" Chapman & Hall;1st edition December 2013

Web References:

1.**nptel**.ac.in/courses/108105064/34

BoS Chairman

Course Code: 140IC9120	**Course Title:** ADVANCED PROCESS CONTROL (Common to EIE and ICE)
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Process Control / Equivalent subject

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Demonstrate control schemes for satisfying the process requirements
CO2: Determine system behavior by time and frequency analysis
CO3: Design advanced controllers based on process model
CO4: Analyse the multivariable control systems for sensitivity and operability
CO5: Demonstrate digital controllers dynamic response and stability

Course Content:

UNIT I ADVANCED CONTROL STRATEGIES 9

Feed forward, cascade, dead time compensation, split range, selective and override control, adaptive control; automatic tuning and gain scheduling

UNIT II SYSTEM IDENTIFICATION 9

Non Parametric methods: - Transient analysis – Frequency analysis – correlation analysis – Spectral analysis – Parametric methods: - Least square method – Recursive least square Method.

UNIT III INTERNAL MODEL CONTROL 9

Model based control – IMC structure – development and design; IMC based PID control, Model Predictive Control

UNIT IV MULTIVARIABLE CONTROL 9

Control loop interaction – general pairing problem, relative gain array and application, sensitivity. Multivariable control – zeros and performance limitations, directional sensitivity and operability, decoupling control.

UNIT V DISCRETE SYSTEMS 9

Z – Transform and inverse Z – transform properties, Discrete – Time Response of dynamic system, Pulse Transfer Function, Closed Loop System Stability.

BoS Chairman

Text Books:

1. Bequette, B.W., "Process Control Modeling, Design and Simulation", Prentice Hall of India, 2004
2. Stephanopoulos, G., "Chemical Process Control - An Introduction to Theory and Practice", Prentice Hall of India, 2005
3. Bela.GLiptak "Instrument Engineers Handbook:Process Control and Optimization" CRC Press, Fourth Edition,2006.

Reference Books:

1. Coughanowr, D.R., "Process Systems Analysis and Control", McGraw -Hill international Edition, 2004
2. Seborg, D.E., Edgar, T.F. and Mellichamp, D.A., "Process Dynamics and Control", Wiley John and Sons, 2nd Edition, 2003
3. E. Ikonen and K. Najim, " Advanced Process Identification and Control", Marcel Dekker, Inc. Newyork, 2002
4. P. Albertos and S. Antonio, " Multivariable Control Systems An Engineering Approach", Springer Verlag, 2004

Web References:

1.**nptel**.ac.in/downloads/103101003/

BoS Chairman

Course Code: 140IC9121	**Course Title:** INDUSTRIAL DRIVES AND CONTROL (Common to EIE and ICE)
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Power Electronics / Equivalent subject
- Electrical Machines / Equivalent subject

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Identify the need and choice of various drives.
CO2: Exposed in different speed control methods in D.C and A.C drives using thyristor based control schemes.
CO3:Understand how to use Microprocessors in the control of Electric Drives
CO4:Memorize special machines stepper motor, servo motor and brushless motor drives and their control.
CO5: Analyze and design controllers for closed loop operation.

Course Content:

UNIT I INTRODUCTION **9**

Selection of drives – Factors influencing the choice of drive – Braking methods – Temperature rise and RMS rating – Power converters using IGBT and MOSFET – Open loop and closed loop control of drives – Sensors used in drives

UNIT II CONTROL OF DC DRIVES **9**

Single phase and three phase converter fed drives – Continuous and discontinuous modes – Chopper fed drives – Four quadrant drives – Closed loop drive system

UNIT III CONTROL OF AC DRIVES **9**

Voltage control, v/f control of induction motor – VSI and CSI fed drives – Rotor resistance control and slip power recovery scheme – Closed loop control induction motor drives – Vector control

UNIT IV CONTROL OF SPECIAL DRIVES - I **9**

Stepper motor – Types- Static and Dynamic Characteristics- Driver circuit – Digital Implementation- Open loop and Closed Loop Control - AC and DC servomotor control.

UNIT V CONTROL OF SPECIAL DRIVES - II **9**

Permanent Magnet DC (PMDC) motor-Principle-Performance Characteristics -Types - BLDC motor-Principle, Construction and operation- Types of BLDC motor- Control of BLDC motor-Microprocessor and DSP based control schemes -Sensor less Control- Applications.

BoS Chairman

Text Books:

1. R. Krishnan, 'Electric Motor and Drives: Modelling Analysis and Control', Pearson Education, 2001.
2. G.K. Dubey, 'Fundamentals of Electrical Drives', Narosa Publication, 2002.

Reference Books:

1 .E.G.Janardanan, 'Special Electrical Machines', Prentice Hall of India, 2014.
2. Bimal. K. Bose, 'Modern Power Electronics and AC Drives', Prentice Hall of India, 2003.
3. Chesmond, Wilson and Lepla, 'Advanced Control System Technology', Viva low priced student edition, 1998.

Web References:

1. http://www.accessengineeringlibrary.com/
2. http://www.electrical4u.com/
3. https://en.wikipedia.org/

BoS Chairman

Course Code: 140IC9122	**Course Title:** APPLIED SOFT COMPUTING
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Fundamental knowledge in c language
- Circuit Theory

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Enhance the knowledge on basics of Neural networks
CO2: Observe the Neural based control scheme
CO3: Entice the knowledge on basics of Fuzzy logic
CO4: Excel the Fuzzy logic based control
CO5: Apply genetic algorithm ideas in engineering problems

Course Content:

UNIT I INTRODUCTION TO NEURAL NETWORKS 10

Artificial Neural Networks: Basic properties of Neurons, Neuron Models, Feed forward networks – Multilayer networks – Exact and approximate representation, Back propagation algorithm, variants of Back propagation, Unsupervised and Reinforcement learning; Symmetric Hopfield networks and Associative memory; Competitive learning and self-organizing networks, Hybrid Learning; Computational complexity of ANNs.

UNIT II NEURAL NETWORKS BASED CONTROL 8

Introduction- Representation and identification, modeling the plant, control structures – supervised control, Model reference control, internal model control, Predictive control: Examples – Inferential estimation of viscosity an chemical process, Auto – tuning feedback control

UNIT III INTRODUCTION TO FUZZY LOGIC 9

Fuzzy Controllers: Preliminaries – Fuzzy sets and Basic notions – Fuzzy relation calculations – Fuzzy members – Indices of Fuzziness –comparison of Fuzzy quantities – Methods of determination of membership functions

UNIT IV FUZZY LOGIC BASED CONTROL 9

Fuzzy Controllers: Preliminaries – Fuzzy sets in commercial products – basic construction of fuzzy controller – Analysis of static properties of fuzzy controller – Analysis of dynamic properties of fuzzy controller. Case studies – fuzzy control for smart cars. A hybrid neural network based Fuzzy controller with self learning teacher. Fuzzified CMAC and RBF network based self-learning controllers.

UNIT V GENETIC ALGORITHM 9

Basic Concepts - Working Principle- Encoding - Fitness Function- Reproduction - Inheritance operators - Cross over, Inversion and Deletion, mutation operator, Bitwise operator - Generation Cycle- Convergence of Genetic Algorithm- applications.

BoS Chairman

Text Books:

1. LaureneFausett, 'Fundamentals of Neural Networks' Pearson Education, 2008
2. Timothy Ross, 'Fuzzy Logic with Engineering Applications', John Wiley& Sons, Third Edition, 2010.

Reference Books:

1. Jacek.M.Zurada, 'Introduction to Artificial Neural Systems', Jaico Publishing House, Tenth Edition, 2006.
2. Zimmerman H.J. 'Fuzzy set theory-and its Applications' Kluwer Academic Publishers,Fourth Edition, 2001.
3. Driankov, Hellendroon, 'Introduction to Fuzzy Control', Narosa Publishers,2012,
4. Goldberg D.E. Genetic algorithms in Search, Optimization and Machine learning, Addison Wesley, 2000.

Web References:

1. http://pages.cs.wisc.edu/~bolo/shipyard/neural/local.html
2. http://www.ai-junkie.com/ga/intro/gat1.html

BoS Chairman

Course Code: 140IC9123	**Course Title:** NON LINEAR CONTROL SYSTEM (Common to EIE and ICE)
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0: 1 : 4 : 100
Type: Lecture	**Total Contact Hours:** 60

Pre-requisites: The student should have undergone the course(s):

- Control Engineering / Equivalent subject

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Determine the stability of non-linear system using phase plane method
CO2: Derive the describing function for the non-linear elements, such as relay, hysteresis, dead zone, saturation and backlash
CO3: Comment on the stability of non-linear system using appropriate
CO4: Design the non-linear controller using state feedback and state observer
CO5: Describe the sliding motor control method

Course Content:

UNIT I PHASE PLANE ANALYSIS **12**

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

UNIT II DESCRIBING FUNCTION ANALYSIS **12**

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

UNIT III STABILITY ANALYSIS **12**

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

UNIT IV STATE FEEDBACK AND STATE OBSERVERS **12**

State Feedback - Gain Matrix - Pole Placement design using State feedback system – State observer Full order Observer-Reduced order observer – Design of state observer system.

UNIT V SLIDING MODE CONTROL **12**

Variable structure systems - Basic concepts - Sliding modes in variable structure system conditions for existence of sliding regions – Case Study - Sliding mode approach to speed control of dc motors

BoS Chairman

Text Books:

1. M.Gopal, 'Modern control system theory', New Age International Publishers, Second Edition,2005
2. Ogata, 'Modern control Design with Matlab and Simulink', John Wiley, New Delhi, 2002.

Reference Books:

1. Gene F. Franklin, J. David Powell and Abbasemami-Naeini, "Feedback Control of Dynamic Systems", Fourth edition, Pearson Education, Low price edition.2008.
2. J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2010
3. VadimUtkin, JurgenGuldner, Jingxin Shi, "Sliding Mode Control in Electromechanical System", Taylor and Francis, 1999,
4. George J. Thaler, 'Automatic Control Systems', Jaico Publishers, 1993

Web References:

1.www.**nptel**.ac.in/syllabus/syllabus_**pdf**/108106024.**pdf**

BoS Chairman

Course Code: 140IC9124	**Course Title:** MICRO ELECTRO MECHANICAL SYSTEMS (Common to EEE, EIE and ICE)
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Engineering chemistry
- Transducer Engineering

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Explain the fundamentals of MEMS and Microsystems.
CO2: Describe the basics of Materials and micro fabrication process involved in MEMS.
CO3: Discuss the operation of micro devices, micro systems and their applications.
CO4: Explain the manufacturing of MEMS device or micro system
CO5: Express the principles of designing MEMS device or micro system.

Course Content:

UNIT I MEMS DESIGN **9**

Overview - Microsystems and microelectronics - Working principle of Microsystems - micro actuation techniques – micro sensors – types – micro actuators – types – micro pump – micro motors-micro valves-micro grippers-scaling laws-scaling in geometry-scaling in rigid body dynamics- scaling in electrostatic forces- scaling in electricity- scaling in fluid mechanics- scaling in heat transfer.

UNIT II MATERIALS AND FABRICATION PROCESS **9**

Substrates and wafer-single crystal silicon wafer formation-ideal substrates-mechanical properties-silicon compounds - Sio2, SiC, Si3N4 and polycrystalline silicon - Silicon piezoresistors - Gallium arsenide, Quartz-piezoelectric crystals-polymers for MEMS-conductive polymers-Photolithography - Ion implantation - Diffusion– Oxidation –CVD - Physical vapor deposition Deposition by epitaxy - etching process

UNIT III MICROMECHANIC **9**

Introduction-static bending of thin plates-circular plates with edge fixed - rectangular plate with all edges fixed and square plate with all edges fixed – Mechanical vibration-resonant vibration- micro accelerometers-design theory and damping coefficients- thermo mechanics -thermal stresses-fracture mechanics-stress intensity factors, fracture toughness and interfacial fracture mechanics.

UNIT IV MICRO SYSTEM MANUFACTURING **9**

Clean room technology-Bulk Micro manufacturing - surface micro machining –LIGA-SLIGA-Micro system packaging-materials-die level-device level-system level-packaging techniques-die preparation-surface bonding-wire bonding-sealing

UNIT V MICRO SYSTEM DESIGN **9**

Design considerations-process design-mask layout design- mechanical design-applications of micro system in -automotive industry-bio medical – aerospace - telecommunications

BoS Chairman

Text Books:

1. Gad-el-Hak, Mohamed, 'The MEMS Hand book', CRC press, New York, second edition, 2005.
2. Hsu, Tai-Ran., 'MEMS and Microsystems Design and Manufacture', Tata McGraw-Hill, New Delhi, 2008.

Reference Books:

1. Fatikow, S. and Rembold, U., 'Microsystem Technology and Microrobotics', Springer-Verlag Berlin, 1997.
2. Tay, Francis E.H. and Choong, W.O., 'Microfludics and BioMEMS Applications', Springer, Berlin, 2002.
3. Gardner, Julian W., Varadan, Vijay K. and AwadelKarim, Osama O., 'Micro sensors MEMS and Smart Devices', John Wiley & Sons, New York, 2001.

Web References:

1. www.**nptel**.ac.in

BoS Chairman

Course Code: 140IC9125	**Course Title:** ROBOTICS AND AUTOMATION (Common to EEE, EIE and ICE)
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Mathematics
- Electrical Machines
- Sensors and Transducers

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Analyze the various parts of robotics and its automation.
CO2: Identify the sensors and drive systems for developing a robot.
CO3: Confident on kinematics and dynamics of robots.
CO4: Program a robot using lead through methods.
CO5: Understand the Robots used in various application.

Course Content:

UNIT I BASIC CONCEPTS **9**

Automation and Robotics – Asimov's laws of robotics - Robot Anatomy – basic Components of Robots system - classification of Robots by configuration – Robot Motion – Precision of movements - end effectors

UNIT II POWER SOURCES, SENSORS AND DRIVE SYSTEM **9**

Actuators - Hydraulic, pneumatic and electric drives – Mechanical power transmission System: Bearings, Gears, Belt and chains – Sensors: Position, Velocity, tactile sensors, Proximity and range sensor – Machine vision: Sensing and digitizing, Image processing and applications

UNIT III KINEMATICS AND DYNAMICS **10**

Solution of direct and inverse kinematics problem – Manipulator path control – Robot dynamics - Robot trajectories - Jacobian work envelope - Robot cycle time analysis.

UNIT IV ROBOT PROGRAMMING **8**

Methods of Robot programming – lead through programming methods – robot program as a path in space – motion interpolation – weight, signal and delay commands – Branching capabilities – Robot programming examples for pick and place application using VAL.

UNIT V CASE STUDIES **9**

Robots in manufacturing and non-manufacturing application – Robot cell design – selection of robot - factory automation – FMS and CIM. Applications - material handling, processing operations, assembly and inspection.

BoS Chairman

Text Books:

1. Mikell P. Groover, MilchelWein Roger Nagel and Nicholas G. Ordy, "Industrial Robotics, Technology, Programming and Applications", McGraw Hill, Last Print, 2012.
2. Fu, K.S., Gonzalez RC., and Lee C.S.G., "Robotics control, sensing, vision and intelligence," McGraw Hill, 1987.

Reference Books:

1. Deb.S.R, "Robotics Technology and Flexible Machine Design", Tata McGraw Hill, 2005.
2. Klafter R.D., Chimielewski T.A. and Negin M., 'Robotic Engineering – An integrated Approach', Prentice Hall of India, New Delhi, 2005
3. Syed B. Niku, 'Introduction to Robotics Analysis, Systems, Applications', Prentice Hall of India/Pearson Education, Asia, 2001.

Web References:

1.**nptel**.ac.in/courses/108105063/**pdf**
2.**nptel**.ac.in/downloads/112101098/

BoS Chairman

Course Code: 140IC9126	**Course Title:** WIRELESS SENSOR NETWORKS (Common to EIE and ICE)
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Communication Engineering

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Attain the knowledge on Adhoc Sensor Networks
CO2: Explain the sensor Node architecture
CO3: Illustrate the knowledge on Network protocols
CO4: Describe the operation of Sensor Tasking and Control.
CO5: Elicited the plat form of sensor network and its tools

Course Content:

UNIT I ADHOC AND SENSOR NETWORKS 9

Characteristics of MANETs, Table-driven and Source-initiated On Demand routing protocols, Hybrid protocols, Wireless Sensor networks- Classification, MAC and Routing protocols - Difference between mobile ad-hoc and sensor networks.

UNIT II ARCHITECTURES 9

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT III NETWORKING SENSORS 9

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC, The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses.

UNIT IV INFRASTRUCTURE ESTABLISHMENT 9

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

UNIT V SENSOR NETWORK PLATFORMS AND TOOLS 9

Operating Systems for Wireless Sensor Networks, Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node level Simulators, State-centric programming.

BoS Chairman

Text Books:

1. Holger Karl, Andreas Willig, 'Protocols and Architectures for Wireless Sensor Networks', John Wiley, 2007.
2. Feng Zhao, Leonidas J. Guibas, 'Wireless Sensor Networks- An Information Processing Approach', Elsevier, 2007.

Reference Books:

1. KazemSohraby, Daniel Minoli, and TaiebZnati, "Wireless Sensor Networks- Technology, Protocols, and Applications", John Wiley, 2007.
2. BhaskarKrishnamachari,'Networking Wireless Sensors', Cambridge Press, 2011.
3. Mohammad Ilyas and ImadMahgaob, 'Handbook of Sensor Networks: Compact Wireless and Wired Sensing Systems', Crc Press, 2005.

Web References:

1. www.nptel.ac.in

BoS Chairman

Course Code: 140IC9127	**Course Title:** INDUSTRIAL DATA COMMUNICATION NETWORKS (Common to EIE and ICE)
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Digital Principals and applications
- Communication Engineering

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Understand industrial data communication protocol and standards

CO2: Identify, prevent and troubleshoot industrial data communication problems

CO3: Understand the fieldbus configuration in networking

CO4: Understand the wired and wireless communications used in Process and Industrial Automation

Course Content:

UNIT I INTRODUCTION **9**

Modern Instrumentation and Control Systems – Introduction to Networks – Advantages and Disadvantages. OSI Model – Foundations of OSI Model. Protocol – Standards. Grounding, Shielding and Noise. Basics of Digital Modulation techniques. EIA 232 – Overview. EIA 485 – Overview. Current loop and EIA Converters

UNIT II INDUSTRIAL ETHERNET **9**

Introduction – IEEE Standards – Ethernet MAC layer – IEEE 802.2 and Ethernet SNAP – OSI and IEEE 802.3 standard. Ethernet transceivers, Ethernet types, switches and switching hubs, 10 Mbps Ethernet, 100 Mbps Ethernet, Gigabit Ethernet. TCP / IP Overview – Internet Layer Protocols – Host-to-Host layer

UNIT III INDUSTRIAL PROTOCOL **7**

Overview – Protocol Structure – Example Function codes. ASCII based protocol - Modbus protocol – Overview. HART Protocol – Overview – Layers

UNIT IV FIELD BUS **10**

AS-i Bus - Protocol Stack - CAN bus – Overview – Layers - Profibus – Overview – Protocol Stack. FIP and World FIP - Foundation Field Bus – Layers – Error Detection and Diagnostics - Redundancy

UNIT V WIRELESS COMMUNICATION **10**

Wireless LANs – IEEE 802.11 standard – Bluetooth Technology – Interconnection of LANs - Wireless WANs – Introduction to Cellular Telephony-1G, 2G, GSM and 3G – Satellite networks

BoS Chairman

Text Books:

1. Behrouz A Forouzan, 'Data Communications and Networking', Tata McGraw-Hill, 2013.
2. John Park, Steve Mackay and Edwin Wright, 'Practical Data Communication for Instrumentation and Control', Elsevier, IDC Technologies, 2003.

Reference Books:

1. Steve Mackay, Edwin Wright and Deon Reynders, 'Practical Industrial data Networks: Design, Installation and Trouble Shooting', Elsevier International Projects Ltd., 2004.
2. William Buchanan, 'Computer Buses- Design and Application', CRC Press, 2000.
3. Theodore S Rappaport, 'Wireless Communications: Principles and Practice', Prentice Hall PTR, Second Edition, 2010.

Web References:

1.www.**nptel**.ac.in/courses/108105057/**Pdf**/

2.**nptel**.**iit**g.ernet.in/Courses.php

BoS Chairman

Course Code: 140IC9128	**Course Title:** DISASTER MANAGEMENT (Common to EIE and ICE)
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Environmental Science / Equivalent subject

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Distinguish the natural and manmade disasters
CO2: Identify the environment hazards and level of toxicology
CO3: Summarize the usefulness of integrating management principles in disaster mitigation work
CO4: Explain the causes and effects of Earthquake , Cyclone and Tsunami formation
CO5: Describe about modern technological tools in disaster management

Course Content:

UNIT I INTRODUCTION 9

Disaster- Disaster management- Disaster prevention and preparedness measures-Types of Disaster – Causal factor of Disaster – Natural, Manmade, creeping disaster-Disaster in the Indian context-various measures – Disaster related policy goals – United Nations Development Program (UNDP) – United Nations Disaster Relief Organization (UNDRO) – Govt. of India.

UNIT II ENVIRONMENTAL DISASTER 9

Environmental hazards – Typology – Assessment and response – the strategies – the scale of disaster – Vulnerability – Disaster trends – Paradigms towards a balanced view – Chemical hazards and Toxicology – Biological hazards – Hazard caused by world climate change – Risk analysis – other technological disasters.

UNIT III EARTHQUAKE AND TSUNAMI 9

Earthquake – Causes of earthquake – Earthquake scales – Measures of earth – quake – Magnitude and Intensity – Earthquake Recurrence hazard assessment – Seismic zoning – Earthquake disaster mitigation – Component research focus – Forecasting techniques and Risk analysis – Tsunami – Causes of Tsunami – Effects of Tsunami – Tsunami warning system – Tsunami warning system in India – International status of Tsunami warning and communication system – Tsunami warning centers – Pacific Tsunami Warning Center (PTWC) – Pacific Tsunami Warning System (PTWS) components – Institutional arrangements and design criteria for Tsunami mitigation.

UNIT IV CYCLONE 9

Tropical cyclone- Warning system – Protection of buildings from cyclones- Precaution before and during cyclones – Tropical cyclone warning strategy in India – Cyclone related problems – aerial survey – Management strategy – risk reduction by public awareness and education.

UNIT V APPLICATION OF TECHNOLOGY IN DIASTER MANAGEMENT 9

Hazard map – Multi hazard mapping – Application of satellites in Disaster Management – Application of remote sensing in forecasting and disaster relief – Use of digital image processing in disaster management – GIS in disaster management – Spatial data – GIS data base design – Convention mapping concepts and Coordinate system – Methods of spatial Interpolation in GIS.

BoS Chairman

Text Books:

1. PardeepSahni, Madhavimalalgoda and ariyabandu, "Disaster risk reduction in south asia", PHI, 2003.
2. AmitaSinhal, "Understanding earthquake disasters" TMH, 2010.

Reference Books:

1. PardeepSahni, AlkaDhameja and Uma medury, "Disaster mitigation: Experiences and reflections", PHI, 2001
2. Jeff Groman "The atlas of Natural Disasters" by (author) Publisher: Friedman/Fairfax publishing;(March 2002)
3. Jaikrishna&Chandrasekar, Elements of Earthquake Engineering.

Web References:

1.iare.ac.in/sites/default/files/lecture_notes

2. www.iitk.ac.in/olddord/institutelecture_2009.**pdf**

BoS Chairman

Course Code: 140IC9129	**Course Title:** PROFESSIONAL ETHICS AND HUMAN VALUES (Common to EEE, EIE and ICE)
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0: 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

- Communication Skills
- Technical English

Course Outcomes:

At the end of the course the learners will be able to:

CO1: Describe the legal requirements, ethical issues, and professional issues in the work place.
CO2: Elucidate the broad education and to value the impact of engineering solutions in a global and societal context
CO3: Summarize contemporary issues related to human and professional interactions at workplace
CO4: Illustrate the engineer's life-long commitment to serve the destitute
CO5: Explain the working environment for its safety measures

Course Content:

UNIT I ENGINEERING ETHICS 9

Senses of Engineering Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas. Moral Autonomy – Kohlberg's theory – Gilligan's theory – Controversy and Consensus – Professions and Professionalism – Professional ideals and virtues – Theories about right action – Self-interest – Customs and religion – Use of Ethical Theories.

UNIT II 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 III ENGINEER'S RESPONSIBILITY FOR SAFETY 9

Safety and risk – Assessment of safety and risk – Risk Benefit Analysis – Reducing risk – The Three Mile Island and Chernobyl Case Studies

UNIT IV RESPONSIBILITIES AND RIGHTS 9

Collegiality and loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – 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 conduct – Climate change

BoS Chairman

Text Books:

1. Mike Martin and Roland Schinzinger, Ethics in Engineering, McGraw-Hill, New York, 1996
2. Charles D Fledderman, Engineering Ethics, Prentice Hall, New Mexico, 1999

Reference Books:

1. Krishnaswamy K, Thangaraj K and Karmegam G, "A Guide to Professional Ethics and Human Values", R.K. Publishers, First edition 2005
2. Laura Schlesinger, "How Could You Do That: The Abdication of Character, Courage, and Conscience", Harper Collins, New York, 1996.

Web References:

1.**nptel**.ac.in/courses/109104068/30

BoS Chairman