Dr. Mahalingam College of Engineering and Technology

(An Autonomous Institution)

Pollachi - 642 003

Curriculum and Syllabus for

B.E. ELECTRONICS AND INSTRUMENTATION ENGINEERING

SEMESTER I to VIII

REGULATIONS 2016

DR MAHALINGAM

MCET

COLLEGE OF ENGINEERING AND TECHNOLOGY

Enlightening Technical Minds

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

REGULATION – 2016

Curriculum for B.E Electronics and Instrumentation Engineering from Semester I to VIII

SEMESTER I

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
16ENT11	Communication Skills I	2	0	2	3	100
16MAT13	Engineering Mathematics I	3	2	0	4	100
16PHT13	Engineering Physics	3	0	0	3	100
16GET14	C – Programming	3	0	2	4	100
16GET15*/ 16GET15R	Fundamentals of Electrical Engineering / Introduction to Engineering	3	0	0	3	100
PRACTICAL						
16EGL13	Engineering Graphics	1	0	4	3	100
16EPL12*/ 16EPL12R	Engineering Practices Laboratory	0	0	4	2	100
PROFESSONAL SKILLS COURSE						
16PSL12	Sports for Wellness	0	0	2	1	100
TOTAL		**15**	**2**	**14**	**23**	**800**

* Applicable for 2016 Batch only

Total Hours in a Week: 31

SEMESTER II

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
16ENT21	Communication Skills II	2	0	2	3	100
16MAT23	Engineering Mathematics II	3	2	0	4	100
16PHT23	Material Science	3	0	0	3	100
16GET25	Electron Devices and Circuits	3	0	0	3	100
16CYT22	Engineering Chemistry	3	0	0	3	100
PRACTICAL						
16PCL21	Engineering Physics and Chemistry Laboratory	0	0	4	2	100
16EDL21	Electron Devices Laboratory	0	0	4	2	100
PROFESSONAL SKILLS COURSE						
16PSL22	Promotion of Students' Wellness	0	0	2	1	100
TOTAL		**14**	**2**	**12**	**21**	**800**

Total Hours in a Week: 28

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SEMESTER III

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
16MAT33	Transforms and Partial Differential Equations	3	2	0	4	100
16EET32	Electric Circuits Analysis	3	2	0	4	100
16EIT31	Electrical Machines and Measurements	3	0	0	3	100
16EIT32	Transducer Engineering	3	0	0	3	100
16EET31	Digital Electronics	3	0	2	4	100
16EIT33	Linear Integrated Circuits and Applications	3	0	0	3	100
PRACTICAL						
16EIL31	Electrical Circuits and Machines Laboratory	0	0	4	2	100
16EIL32	Analog Electronic Circuits Laboratory	0	0	4	2	100
XXXX	One Credit Course (OCC)	0	0	2	1	100
PROFESSONAL SKILLS COURSE						
16PSL31	Personal Effectiveness	0	0	2	1	100
TOTAL		**18**	**4**	**14**	**27**	**1000**

Total Hours in a Week: 36

SEMESTER IV

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
16MAT43	Linear Algebra and Numerical Methods	3	2	0	4	100
16EIT41	Signals and Systems	3	2	0	4	100
16EIT42	Industrial Instrumentation – I	3	0	0	3	100
16EIT43	Microprocessor and Microcontroller	3	0	2	4	100
16CST47	Data Structures and Algorithms	3	0	0	3	100
16MET46	Thermodynamics and Fluid Mechanics	3	0	0	3	100
PRACTICAL						
16EIL41	Transducer and Measurements Laboratory	0	0	4	2	100
16CSL43	Data Structures and Algorithms Laboratory	0	0	4	2	100
XXXX	One Credit Course (OCC)	0	0	2	1	100
PROFESSONAL SKILLS COURSE						
16PSL41	Ethical And Moral Responsibility	0	0	2	1	100
TOTAL		**18**	**4**	**14**	**27**	**1000**

Total Hours in a Week: 36

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SEMESTER V

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
16EIT51	Control Systems	3	2	0	4	100
16EIT52	Industrial Instrumentation - II	3	0	0	3	100
16EIT53	VLSI Design	3	0	0	3	100
16MAT51	Probability and Random Process	3	0	0	3	100
16EIT54	Communication Engineering	3	0	0	3	100
XXX	Professional Elective – I	3	0	0	3	100
PRACTICAL						
16EIL51	System Simulation Laboratory	0	0	4	2	100
16EIL52	Industrial Instrumentation Laboratory	0	0	4	2	100
XXX	One Credit Course (OCC)	0	0	2	1	100
PROFESSONAL SKILLS COURSE						
16PSL51	Teamness and Inter-Personal Skills	0	0	2	1	100
TOTAL		**18**	**2**	**12**	**25**	**1000**

Total Hours in a Week: 32

SEMESTER VI

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
16EIT61	Embedded System Design	3	0	0	3	100
16EIT62	Process Control	3	0	0	3	100
16EIT63	Power Electronics and Drives	3	0	2	4	100
16EIT64	Digital Signal Processing	3	0	2	4	100
16CET65	Environmental Studies	3	0	0	3	100
XXX	Professional Elective – II	3	0	0	3	100
PRACTICAL						
16EIL61	Process Control Laboratory	0	0	4	2	100
16EIL62	Embedded System Design Laboratory	0	0	4	2	100
XXX	One Credit Course (OCC)	0	0	2	1	100
PROFESSONAL SKILLS COURSE						
16PSL61	Campus to Corporate	0	0	2	1	100
TOTAL		**18**	**0**	**16**	**26**	**1000**

Total Hours in a Week: 34

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SEMESTER VII

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
16EIT71	Logic and Distributed Control System	3	0	0	3	100
16EIT72	Principles of Management	3	0	0	3	100
XXX	Professional Elective – III	3	0	0	3	100
XXX	Open Elective	3	0	0	3	100
PRACTICAL						
16EIL71	Industrial Automation Laboratory	0	0	4	2	100
16EIL72	Instrumentation System Design Laboratory	0	0	4	2	100
16EIL73	Innovative and Creative Project	0	0	8	4	100
TOTAL		**12**	**0**	**16**	**20**	**700**

Total Hours in a Week: 28

SEMESTER VIII

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
XXX	Professional Elective – IV	3	0	0	3	100
XXX	Professional Elective – V	3	0	0	3	100
XXX	Professional Elective – VI	3	0	0	3	100
PRACTICAL						
16EIL81	Project	0	0	20	10	200
TOTAL		**9**	**0**	**20**	**19**	**500**

Total Hours in a Week: 29

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PROFESSIONAL ELECTIVES

S.No	Course Code	Course Title	Hours/Week			Credits	Marks
			L	T	P		
DESIGN ENGINEERING							
1.	16ECE18	ASIC Design	3	0	0	3	100
2.	16EIE01	Digital Image Processing	3	0	0	3	100
3.	16EIE02	Automotive Electronics	3	0	0	3	100
4.	16EEE14	Advanced Microprocessors	3	0	0	3	100
5.	16EIE03	Instrumentation System Design	3	0	0	3	100
6.	16EIE04	Machine Learning Techniques	3	0	0	3	100
SENSORS AND INSTRUMENTATION ENGINEERING							
7.	16EIE05	Analytical Instrumentation	3	0	0	3	100
8.	16EIE06	Fiber Optics and Laser Instrumentation	3	0	0	3	100
9.	16EIE07	Instrumentation in Process Industries	3	0	0	3	100
10.	16EIE08	Power Plant Instrumentation	3	0	0	3	100
11.	16EIE09	Smart and Wireless Instrumentation	3	0	0	3	100
12.	16EIE10	Wireless Sensor Networks	3	0	0	3	100
13.	16EIE11	Modern Electronic Instrumentation	3	0	0	3	100
14.	16EIE12	Biomedical Instrumentation	3	0	0	3	100
15.	16EIE13	Industrial Data Communication Networks	3	0	0	3	100
CONTROL AND AUTOMATION							
16.	16EIE14	Advanced Process Control	3	0	0	3	100
17.	16EIE15	Digital Control and State Variable Methods	3	0	0	3	100
18.	16EIE16	Non Linear Control System	3	0	0	3	100
19.	16EIE17	Robotics and Automation	3	0	0	3	100
20.	16EIE18	Hydraulics and Pneumatics	3	0	0	3	100
21.	16EIE19	Virtual Instrumentation	3	0	0	3	100
22.	16EIE20	Industrial safety and standards	3	0	0	3	100

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S.No	Course Code	Course Title	Hours/Week			Credits	Marks
			L	T	P		
SOFTWARE ENGINEERING							
23.	16ITE42	Data Base Management System	3	0	0	3	100
24.	16ITE43	Data Mining and Analytics	3	0	0	3	100
25.	16CSE01	Python Programming	3	0	0	3	100
26.	16CSE25	JAVA programming	3	0	0	3	100
27.	16CSE26	Software Testing	3	0	0	3	100
MANAGEMENT							
28.	16ECE27	Disaster Management	3	0	0	3	100
29.	16MEE49	Engineering Economics and Cost Analysis	3	0	0	3	100
BASIC SCIENCE							
30.	16MAE03	Discrete Mathematics	3	2	0	4	100
31.	16MAE04	Operations Research	3	2	0	4	100
OPEN ELECTIVE							
32.	16OET17	Smart Sensor Technology	3	0	0	3	100
33.	16OET18	Industrial Internet of Things	3	0	0	3	100

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SEMESTER - I

Course Code : 16ENT11	Course Title : COMMUNICATION SKILLS - I (Common to ECE, EEE and EIE)	
General	L : T : P: C	2 : 0 : 2 : 3
Type: Theory	Total Contact hours:	60

Prerequisites: The student should have undergone the course(s):

- The student should have undergone English as his/her first or second language in school

Course Objectives

The course is intended to:

1. Listen to conversations, comprehend and answer questions.
2. Answer questions about oneself and business-related themes.
3. Read passages, infer and respond to the questions.
4. Write appropriate business e mail, note, memo and letter.
5. Write simple and grammatically correct sentences.

UNIT I – LISTENING 12

Short conversations/monologues - numbers and spelling (dates, prices, percentages, figures, etc.) - and locate specific information - longer monologue and guided note taking - gap filling - Understanding the gist and extracting the main idea

UNIT II – SPEAKING 12

Answering questions about oneself, agreeing and disagreeing, expressing preferences - mini-presentation on a business theme (Oral) - Giving information and expressing opinions - discussion on business related topics – initiate a conversation and respond appropriately - business vocabulary - collocation

UNIT III – READING 12

Read short texts and understand the main message (signs, messages, postcards, notes, emails, labels) - Read and find specific information - Interpreting visual information - Comprehend detailed factual information - gather gist – cloze test

UNIT IV – WRITING 12

Internal written communication - short messages to colleagues -note, message, memo, email- External communication -letter, email, notice - set phrases for letters and e-mails- Discourse markers, sign post words

UNIT V – GRAMMAR 12

Types of sentences – Declarative, interrogative, imperative and exclamatory – Usage of tenses (Simple and continuous forms) - Voices – Concord (Subject and verb) - Auxiliary -

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Infinitive and Gerunds –Article - Preposition - Comparative and superlative adjectives.

Course Outcomes

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

CO1. Listen to conversations, comprehend and answer questions equivalent to BEC preliminary listening exercises.

CO2. Answer questions about oneself and business-related themes on par with BEC preliminary speaking tests.

CO3. Read passages, infer and respond to the questions from BEC preliminary reading exercises.

CO4. Write appropriate business e mail, note, memo and letter on par with BEC preliminary writing tests.

CO5. Write simple and grammatically correct sentences.

Text Books

1. M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill Education Pvt. Ltd., New Delhi 2005.
2. BEC-Preliminary-Cambridge Handbook for Language Teachers, 2nd Edition, CUP 2000

Reference Books

1. Business Benchmark Guy Brook-Hart, Norman Whitby, Cambridge ESOL, 2006.
2. Richard Huseman, Business Communication-Strategies and Skills, Alger Press, 1988
3. Sylvie Donna, Teach Business English, CUP
4. Mathew Monipally, Business Communication Strategies, Orient Longman.

Web References

1. www.englishpage.com
2. http://www.usingenglish.com
3. http://www.cambridgeenglish.org/exams/business-certificates/business-preliminary/
4. http://www.cambridgeenglish.org/exams/business-certificates/business-preliminary/

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Course Code : 16MAT13	Course Title : ENGINEERING MATHEMATICS - I (Common to ECE, EEE and EIE)	
General	L : T : P: C	3 : 2 : 0 : 4
Type: Theory	Total Contact hours:	75

Prerequisites: The student should have undergone the course(s):

- NIL

Course Objectives

The course is intended to:

1. Use Eigen values and Eigen vectors of a real matrix.
2. Use different testing methods to check the convergence and divergence.
3. Apply partial derivatives for functions of several variables.
4. Apply multiple integrals to find area of plane curves and volume of solids.
5. Apply first order ordinary differential equations for solving problems.

UNIT I – EIGEN VALUES AND EIGEN VECTORS **9+6**

Eigenvalues and Eigenvectors of a real matrix – Properties of Eigen values and Eigenvectors Diagonalization of symmetric matrices by orthogonal transformation- Reduction of a quadratic form to canonical form by orthogonal transformation –Nature of quadratic forms- Applications to engineering problems

UNIT II – SEQUENCES AND SERIES **9+6**

Sequences: Definition and examples – Series: Types and Convergence – Series of positive terms –Tests of convergence: Comparison test, Integral test, Cauchy's root test and D'Alembert's ratio test – Alternating series –Leibnitz's test – Series of positive and negative terms – Absolute and conditional convergence

UNIT III – FUNCTIONS OF SEVERAL VARIABLES **9+6**

Partial derivatives – Homogeneous functions and Euler's theorem –Total derivative – Change of variables –Jacobian and properties – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers with single constraint.

UNIT IV – MULTIPLE INTEGRALS **9+6**

Double integrals in Cartesian and polar coordinates – Change of order of integration – Area enclosed by plane curves – Change of variables from Cartesian to polar, spherical and

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cylindrical coordinates – Triple integrals- Volume of Solids.

UNIT V – ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER 9+6

Formation of ordinary differential equation-Solution of differential equations of first order and first degree: homogeneous form, linear form and exact differential equations - Applications to circuit problems

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. Use different testing methods to check the convergence and divergence of infinite series

CO3. Apply partial derivatives for functions of several variables.

CO4. Apply multiple integrals to find area of plane curves and volume of solids.

CO5. Apply first order ordinary differential equations for solving electric circuit Problems.

Text Books

1. Srimanta Pal &Subodh C Bhunia. Engineering Mathematics, Oxford University Press,First Edition, 2015.
2. Ervin Kreyszig. Advanced Engineering Mathematics, Wiley India,Tenth Edition, 2015.

Reference Books

1. Peter V. O'Neil. Advanced Engineering Mathematics, Thomson Nelson Toronto,Seventh Edition,2012
2. K. A. Stroud & Dexter J. Booth. Advanced Engineering Mathematics, Palgrave Macmillan,Fifth Edition, 2011

Web References

1. http://nptel.ac.in/video.php?subjectId=122107036

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Course Code : 16PHT13	Course Title : ENGINEERING PHYSICS (Common to ECE, EEE and EIE)	
General	L : T : P: C	3 : 0 : 0 : 3
Type: Theory	Total Contact hours:	45

Prerequisites: The student should have undergone the course(s):

- NIL

Course Objectives

The course is intended to:

1. Calculate the crystal parameters.
2. Interpret the thermal properties and its significance.
3. Explain the principles of LASER.
4. Explain the principles of fiber optics in communication systems.
5. Explain quantum mechanical concepts in electron devices.

UNIT I – CRYSTAL PHYSICS 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- Miller indices – Inter planar distance, Crystal defects: point, line and surface defects and their influence on the electronic and optical properties of materials.

UNIT II – THERMAL PHYSICS 9

Thermal expansion-thermal stress - expansion joints - bimetallic strips - modes of heat transfer -thermal conductivity- Lee's disc method for bad conductors - flow of heat through compound media - radial flow of heat- Cylindrical flow of heat - Thermal management of electronic devices and systems: Heat sink, heat pipes and electrostatic fluid acceleration

UNIT III – LASER TECHNOLOGY 9

Laser principles: Stimulated and spontaneous emissions of radiations - Population inversion and pumping methods – Properties of lasers – Types: Nd: YAG laser, Homo-junction and Hetero-junction semiconductor lasers- Applications: Lasers in electronic industry: scribing, soldering and trimming- Holography: construction, reconstruction and applications

UNIT IV – FIBER OPTICS 9

Principle of light propagation in optical fibres - Numerical aperture and acceptance angle -

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Types of fibres: based on material, refractive index and mode of propagation - Losses in fibers- Dispersion and Attenuation- Light sources: LED - Detectors: PN, PIN and Avalanche photo diodes. Fibre optic communication system and its advantage

UNIT V – QUANTUM PHYSICS 9

Basics of quantum physics – de Broglie wave, postulates of quantum physics – Schrodinger's time independent and time dependent equations (no derivation) – application: particle in a box, tunneling. Applications – Tunnel diode, Gun diode and Electron microscope

Course Outcomes

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

CO1. Calculate the crystal parameters and analyze different crystal structures and defects.

CO2. Interpret the thermal properties and their significance in electronic devices and systems

CO3. Identify the applications of LASER in electronic industry based on its property.

CO4. Explain the principles of fiber optics in communication systems.

CO5. Explain quantum mechanical concepts and its applications in electron devices.

Text Books

1. M.N.Avadhanulu and P.G.Kshirsagar, "Text Book of Engineering Physics", S. Chand & Company Ltd., New Delhi, 2014.
2. R.K.Gaur and S.L.Gupta, "Engineering Physics", DhanpatRai publications, New Delhi, Eighth Edition, 2011.

Reference Books

1. Balasubramaniam "Callister's Material Science and Engineering", John Wilkey and Sons INc.,Second Edition ,2015.
2. Wayne Tomasi,"Electronic Communications system: Fundamentals Through Advanced",Pearson Education India,Fifth Edition,2009
3. Arthur Beiser,'Modern Physics,"Tata McGraw-Hill Co,New Delhi,Seventh Edition,2015

Web References

1. http://www.physicsclassroom.com/class/thermalP
2. http://nptel.ac.in/course.php?disciplineId=115
3. http://ocw.mit.edu/resources/res-6-005-understanding-lasers-and-fiberoptics-spring-2008/laser-fundamentals-i/

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Course Code : 16GET14	Course Title : C PROGRAMMING (Common to ECE, EEE and EIE)	
General	L : T : P: C	3 : 0 :2 :4
Type: Theory	Total Contact hours:	75

Prerequisites: The student should have undergone the course(s):

- NIL

Course Objectives

The course is intended to:

1. Explain about computer systems and problem solving techniques.
2. Write programs using appropriate programming constructs.
3. Write programs using arrays and functions
4. Write programs using pointers and structures
5. Write programs using files and pre-processor directives.

UNIT I – INTRODUCTION 8

Generation and Classification of Computers, Computer Systems, Basic Organization of a Computer, Computer languages, Software development life cycle, Need for logical analysis and thinking, Problem formulation, Problem Solving, Algorithm, Pseudo code, Flow Chart

UNIT II – C PROGRAMMING BASICS 10

Introduction to C programming, Structure of a C program, Compilation and linking processes, Identifier, Keywords, Constants, Variables, Data Types, Operators and Expressions, Managing input and output operations, Decision making, Branching and Looping statements, Type casting

UNIT III – ARRAYS, STRINGS AND FUNCTIONS 9

Arrays: Declaration, Initialization, One dimensional and Two dimensional arrays, Strings: String operations, Arrays of Strings, Functions: Built in function, User defined function, Declaration and Definition of function, Pass by value, Pass by reference, Recursion

UNIT IV – POINTERS AND STRUCTURES 10

Pointers: Definition,Intialization,Relationship between Array and Pointers, Array of Pointers,Structure:Defining a structure, Declaring structure objects, Accessing structure elements, Array of structures, Union: Accessing Union elements

UNIT V – FILES 8

Introduction to Files, File access: Sequential access, Random access, File organization, File operations (open, close, read, write, name) Command line arguments, Pre-processor directives, Features, Macro expansion: File inclusion, Conditional compilation

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Course Outcomes

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

CO1. Explain about computer systems and problem solving techniques.

CO2. Write programs using appropriate programming constructs

CO3. Write programs using arrays and functions

CO4. Write programs using pointers and structures

CO5. Write programs using files and pre-processor directives

Text Books

1. Ajay Mittal, "Programming in C – A Practical Approach", Pearson Education, 2010.
2. Ashok N. Kamthane, "Computer programming", Pearson Education, 2009

Reference Books

1. Yashavant. P. Kanetkar "Let Us C", BPB Publications, 2011.
2. PradipDey, ManasGhosh, "Computer Fundamentals and Programming in C", Oxford University Press,Second Edition, 2013.
3. Byron S Gottfried, "Programming with C", Schaum's Outlines, Tata McGraw-Hill,

Web References

1. http://www.cprogramming.com/tutorial/c-tutorial.html
2. http://www.programiz.com/c-programming
3. http://www.w3schools.in/c/
4. http://www.tutorialspoint.com/sdlc/index.html

LAB COMPONENT **30**

LIST OF EXPERIMENTS:

1. Text formatting, Tables and Mathematical equations in MS Word
2. Calculation and Charting in MS Excel
3. Programs to evaluate an expression using various types of operators (Any 1)
    a. To find the area of a rectangle/circle/square
    b. To find the simple interest and compound interest
    c. To find the roots of a quadratic equation
4. Programs using Decision Making and Branching statements (Any 1)
    a. Calculation of electricity bill
    b. To identify the grade of the student
    c. To find the maximum number among 3 numbers
5. Programs using Loops (Any 2)

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a. To display the total and average of N students
b. To display the floyd's triangle
c. To display the Fibonacci series
d. To display the sum of first N prime numbers
e. To calculate the following series 12 +22+32+……..+N2

6. Program using Arrays (Any 2,1 from 1D array and another from 2D array)
   a. To sort N Numbers in ascending/descending order
   b. To find the greatest number among N numbers
   c. To search for a particular number among N Numbers
   d. To compute the Matrix addition / multiplication / transpose
7. Program using Strings (Any 2)
   a. To manipulate strings using string functions.
   b. To calculate the length of the String without using builtin functions.
   c. To check whether the string is Palindrome or not.
   d. To sort a given set of strings in alphabetical order.
8. Programs using Functions (Any 1)
   a. To find the square and cube of a number.
   b. To find the factorial of a number.
   c. To swap two numbers.
9. Programs using Pointers (Any 1)
   a. To display the address of each element in an array
   b. To perform arithmetic operations using pointers
10. Programs using Structures (Any 1)
   a. To display the employee details using .(dot) operator
   b. To display the book details using ->(reference) operator
   c. To display the information of N Students
11. Programs using Files (Any 1)
   a. To write a string into a text file
   b. To read the contents of a text file
   c. To copy the contents from one file into another

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Course Code : 16GET15	Course Title : FUNDAMENTALS OF ELECTRICAL ENGINEERING (Common to ECE, EEE and EIE)	
Core	L : T : P: C	3 : 0 : 0 : 3
Type: Theory	Total Contact hours:	45

Prerequisites: The student should have undergone the course(s):

- NIL

Course Objectives

The course is intended to:

1. Explain the various terminologies of electrical quantities.
2. Identify the required passive components
3. Analyze the electrical quantities for the simple DC circuits.
4. Determine the electrical quantities for the simple AC circuits.
5. Apply domestic wiring .

UNIT I - ELECTRICAL QUANTITIES 9

Need of S.I.Units, Definitions of electrical quantities: Charge, Resistivity, Conductivity, Voltage, Current, Power, Energy.

Fundamental Laws: Law of conservation of energy, Coulombs law.

Classification of electrical elements: Active and passive, Unilateral and Bilateral, Linear and Non-linear, Lumped and distributed

UNIT II – PASSIVE COMPONENTS 9

Resistor, Temperature coefficient of Resistance, Types - Fixed resistors: Carbon composition, Thin film, wire wound - variable resistors - colour coding.

Inductors: Types-Fixed Inductors and variable Inductors – chokes.

Capacitors: Types -Fixed Capacitors and variable Capacitors - Dissipation factor

UNIT III – DC CIRCUITS 9

Circuit Laws: Ohms Law, Kirchhoff's Current Law and Voltage Law. Behavior of R, L, C in DC circuits, Series resistive circuit-Voltage division rule, Parallel resistive circuit-Current division rule and series-parallel resistive circuit

UNIT IV – AC CIRCUITS 9

Faradays laws of electromagnetic induction. Alternating Quantities: Time period, Cycle, frequency, Angular frequency, Expression of average value, RMS value, Form factor, peak factor of sinusoidal waveform.

Behavior of R, L, C circuit. Power factor concepts in series RL, RC and RLC circuit.

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Power triangle – Active power, Reactive power and Apparent power

UNIT V – DOMESTIC WIRING 9

Voltage and frequency of single phase & three phase supply standards.

Types of wiring system, materials and accessories. House wiring - Stair case wiring, Fluorescent tube wiring and fan wiring.

Electrical safety-Rules for wiring, Earthing - Pipe earthing and Plate earthing.

Course Outcomes

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

CO1. Explain the various terminologies of electrical quantities.

CO2. Identify the required passive components for the given applications.

CO3. Analyze the electrical quantities for the simple DC circuits.

CO4. Determine the electrical quantities for the simple AC circuits.

CO5. Apply appropriate domestic wiring for the given specification

Text Books

1. V.Jegatheesan, K.Vinoth Kumar &R.Saravanakumar, Basic Electrical and Electronics Engineering, Wiley India, First Edition,2011.
2. John Hiley, Keith Brown,Hughes Electrical and Electronic Technology, Pearson Education Limited, Tenth Edition,2010

Reference Books

1. T.Thyagarajan, K.P.SendurChelvi, T.R.Rangaswamy, "Engineering Basics(Electrical Electronics & Computer Engineering)",New Age Int. Pvt. Ltd, Second Revised Edition,1999.
2. V.K.Mehta, Rohit Mehta, "Principles of Electrical Engineering", Chand &Company Ltd,2007
3. R.Muthusubramanian and S.Salivahanan, "Basic Electrical and Electronics Engineering", McGraw Hill, New Delhi,2010.
4. Giorgio Rizzoni,"Fundamentals of Electrical Engineering", McGraw Hill, New Delhi, First Edition, 2008.

Web References

1. http://www.instructables.com/
2. http://www.allaboutcircuits.com/textbook/reference/chpt-2/resistor-color-codes/
3. http://www.electrical4u.com/fluorescent-lamp-its-working-principle/
4. http://www.edisontechcenter.org/

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Head of the Department,
Department of Electronics and Instrumentation Engineering,
[illegible] College of Engineering and Technology,
Pollachi - 642 003, Coimbatore District, Tamilnadu.

Course Code:16GET15R	Course Title: INTRODUCTION TO ENGINEERING (Common to ECE, EEE and EIE)	
Core	L:T:P:C	3:0:0:3
Type: Theory	Total Contact hours:	45

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

- NIL

Course objectives:

This course is intended to:

1. Select the best material for the required construction
2. Select the suitable foundation for the required construction
3. Explain different manufacturing processes like welding and machining operations.
4. Discuss the construction and working of IC engines and refrigerators.
5. Determine the electrical quantities for simple DC circuits.
6. Determine the electrical quantities for simple AC circuits.

CIVIL **15**

Scope of Civil Engineering - Functions of civil Engineer and Basic areas in Civil Engineering.

Civil Engineering Materials and their properties: - Stones, bricks, sand, aggregate, cement, steel, concrete and Reinforcement cement concrete.

Building Components :Sub structure: - Bearing capacity of soil – Type of foundation - Selection of foundation based on soil conditions – Requirement of good foundation – Introduction for various types of foundations – failure of foundation and remedial measures.

Super structure: Vertical Components such as brick masonry, stone masonry in footing and walls - columns – Horizontal components such as plinth beam, Lintels, beam, sun shades – various types of roofs and floors- staircase.

MECHANICAL **15**

Manufacturing Processes : Metal Joining processes - Welding, Metal machining – Turning, Milling, Drilling, 3D printing

Thermal Engineering: Refrigeration - Principle of vapour compression system – Layout of typical domestic refrigerator, Refrigerants – types and properties. Air conditioning – Definition, working principle of Window and Split type room air conditioners. Internal combustion engines – Working principle of Petrol and Diesel Engines –Two stroke and Four stroke cycles – Comparison of two stroke and four stroke engines.

FUNDAMENTALS OF CIRCUITS **15**

DC Circuits: Passive Components: Resistor, Temperature coefficient of Resistance, - colour coding, Inductors, Capacitors, Dissipation factor. Circuit Laws: Ohms Law, Kirchhoff's Current Law and Voltage Law. Behavior of R, L, C in DC circuits, Series resistive circuit-Voltage division rule, Parallel resistive circuit-Current division rule and series-parallel resistive circuit.

AC circuits: Faradays laws of electromagnetic induction. Alternating Quantities: Time period, Cycle, frequency, Angular frequency, Expression of average value, RMS value,

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Form factor, peak factor of sinusoidal waveform. Behavior of R, L, C circuit.Power factor concepts in series RL, RC and RLC circuit. Power triangle – Active power, Reactive power and Apparent power.

Course outcomes:

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

CO1. Select the best material for the required construction
CO2. Select the suitable foundation for the required construction
CO3. Explain different manufacturing processes like welding and machining operations.
CO4. Discuss the construction and working of IC engines and refrigerators.
CO5. Determine the electrical quantities for simple DC circuits.
CO6. Determine the electrical quantities for simple AC circuits.

Text Books:

1. Jayagopal.L.S & Rudramoorthy.R, "Elements of Civil and Mechanical Engineering", Vikas Publishing House, New Delhi, 2010.
2. John Hiley, Keith Brown, Hughes Electrical and Electronic Technology, Pearson Education Limited, Tenth Edition,2010.

Reference Books:

1. Shanmugam.G and Palanichamy.M.S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi, 1996.
2. Bindra.S.P and Arora.S.P, "The text book of Building construction", Dhanpat Rai Publications (P) Ltd., New Delhi, 2011.
3. Ananthanarayanan.P, "Basic Refrigeration and Air Conditioning", Tata McGraw Hill Publishing Co., New Delhi, 2003.
4. V.Jegatheesan, K.Vinoth Kumar & R.Saravanakumar, Basic Electrical and Electronics Engineering, Wiley India, First Edition,2011.
5. V.K.Mehta, Rohit Mehta, "Principles of Electrical Engineering", Chand & Company Ltd,2007
6. R.Muthusubramanian and S.Salivahanan, "Basic Electrical and Electronics Engineering", McGraw Hill, New Delhi, 2010.
7. Giorgio Rizzoni,"Fundamentals of Electrical Engineering", McGraw Hill, New Delhi, First Edition, 2008.

Web References:

1. www.electrical4u.com/power-plants-types-of-power-plant/
2. www.thelibraryofmanufacturing.com/
3. http://www.instructables.com/
4. http://www.allaboutcircuits.com/textbook/reference/chpt-2/resistor-color-codes/
5. http://www.electrical4u.com/fluorescent-lamp-its-working-principle/
6. http://www.edisontechcenter.org/
7. http://electronicsforu.com/
8. http://www.physicsclassroom.com/

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OPERATIONAL MODALITIES

Hrs/week					Evaluation	Internal
Civil: 15 hours: 3 Hrs/week (for 5 weeks) **(CO1 & CO2)**					CCET-I TQA-I	20
Mechanical: 15 hours: 3 Hrs/week (for 5 weeks) **(CO3 & CO4)**					CCET-II TQA-II	20
Fundamentals of Circuits 15 hours: 3 Hrs/week (for 5 weeks) **(CO5 & CO6)**					CCET-III TQA-III	20
	Part-A	Part-B	Part-C	Part-D	End Semester	40
Civil:30 Marks	5X1=5	1X2=2	1X8=8	1X15=15		
Mechanical: 30 Marks	6X1=6	1X2=2	1X8=7	1X15=15		
Fundamentals of Circuits:40 Marks	4X1=4	3X2=6	-	2X15=30		

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Head of the Department,
Department of Electronics and Instrumentation Engg
Kongu Engineering College
Perundurai - 638 060, Erode District, Tamilnadu

Course Code : 16EGL13	Course Title : ENGINEERING GRAPHICS (Common to ECE, EEE and EIE)	
Core / Elective Core	L : T : P: C	1 :0 :4:3
Type: Lecture & Practical	Total Contact hours:	75

Prerequisites: The student should have undergone the course(s):

- NIL

Course Objectives

The course is intended to:

1. Sketch different curves and explain its application.
2. Prepare orthographic projection.
3. Draw the projection of solids
4. Draw the projection of sectioned solids.
5. Draw the development of surfaces of simple solids.

UNIT I - CURVES USED IN ENGINEERING PRACTICES 13

Application of curves in Engineering. Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloids and involutes of square and circle

UNIT II – ORTHOGRAPHIC PROJECTION 18

First angle projection – layout of views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects. Orthographic projection of solids

UNIT III – PROJECTION OF SOLIDS 18

Projection of solids – Types of solids- Polyhedra and solids of revolution- Orthographic views of solids- Axis inclined to one reference plane.

UNIT IV – SECTION OF SOLIDS 13

Sectional view -Types of section planes-True shape of section-Orthographic views of sectioned solids -Section plane inclined to one reference plane and perpendicular to the other

UNIT V – DEVELOPMENT OF SURFACES 13

Development of lateral surfaces of simple and truncated solids –Parallel line method - Radial Line method

Course Outcomes

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

CO1. Sketch different curves and explain its application.

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CO2. Prepare orthographic projection from pictorial views and models

CO3. Draw the projection of solids

CO4. Draw the projection of sectioned solids.

CO5. Draw the development of surfaces of simple solids with cuts and slots

Text Books

1. K. V. Natrajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2013

Reference Books

1. Dhananjay A. Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGrawHill Publishing Company Limited, 2008.
2. Cencil Jensen, Jay D. Helsel and Dennis R. Short Engineering Drawing and Design. Tata McGraw Hill Publishing Company Limited, 2012

Web References

1. http://www.engineeringdrawing.org
2. http://nptel.ac.in
3. http: //iitd.ac.in

BoS Chairman

Head of the Department,
Department of Electronics and Instrumentation Engineering
Kongu Engineering College
Perundurai - 638 052, Erode District, Tamilnadu.

Course Code : 16EPL12	Course Title : ENGINEERING PRACTICES LABORATORY (Common to CSE, ECE, EEE, EIE and IT)	
Core / Elective Core	L : T : P: C	0 : 0 : 4 : 2
Type: Practical	Total Contact hours:	60

Prerequisites: The student should have undergone the course(s):

- NIL

Course Objectives

The course is intended to:

1. Draw the basic symbols of Electrical and Electronic components and identify the elements.
2. Execute soldering practice.
3. Verify basic laws and demonstrate basic wiring.
4. Demonstrate the basic plumbing, carpentry, fitting, sheet metal and welding operations.
5. Demonstrate the hand forging and sand moulding process.

LIST OF EXPERIMENTS **60**

Electrical &Electronics: **30**

1. Symbols of Electrical and Electronic components.
2. Identification of Resistor and Capacitor Values.
3. Soldering practice of simple circuits and checking the continuity.
4. Verification of Ohms law.
5. Verification of Kirchhoff's current & voltage law.
6. Fluorescent tube, Stair case and House wiring

Civil & Mechanical: **30**

1. Make a wooden Tee joint to the required dimension.
2. Assemble the pipeline connections with different joining components for the given layout.
3. Make a tray in sheet metal to the required dimension.
4. Make a "V" fitting to the required dimension using fitting tools.
5. Weld a butt joint using welding process to the required dimension.
6. Demonstration on hand forging and sand moulding process

Course Outcomes

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

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CO1: Draw the basic symbols of Electrical and Electronic components andidentify the elements

CO2: Execute soldering practice for electrical and Electronics circuits.

CO3: Verify basic laws and demonstrate basic wiring.

CO4: Demonstrate the basic plumbing, carpentry, fitting, sheet metal and welding operations.

CO5: Demonstrate the hand forging and sand moulding process.

Reference Books:

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.
4. MCET - Engineering Practices Laboratory Manual

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Head of the Department,
Department of Electronics and Instrumentation Engineering
Kalaivani College of Engineering and Technology
Pollachi - 642 003, Coimbatore District, Tamilnadu.

Course Code:16EPL12R	Course Title: ENGINEERING PRACTICES LABORATORY (Common to ECE, EEE and EIE)	
Core	L : T : P : C	0:0:4:2
Type: **Practical**	Total Contact hours:	**60**

Course Objectives:

The course is intended to

1. Draw the basic symbols of Electrical and Electronic components and identify the elements.
2. Perform soldering practice for electrical and electronics circuits.
3. Verify basic laws and demonstrate basic wiring.
4. Demonstrate the basic plumbing, carpentry, fitting, sheet metal and welding operations.
5. Demonstrate the hand forging and sand moulding process.

LIST OF EXPERIMENTS

Electrical & Electronics: **30**

1. Symbols of Electrical and Electronic components.
2. Identification of various types of passive components and its values(R,C).
3. Soldering practice of simple circuits and checking the continuity.
4. Verification of Kirchhoff's current & voltage law.
5. Study of electrical safety and rules for wiring.
6. Fluorescent tube, Stair case and House wiring
7. Demonstrate earthing.

Civil & Mechanical: **30**

1. Make a wooden Tee joint to the required dimension.
2. Assemble the pipeline connections with different joining components for the given layout.
3. Make a tray in sheet metal to the required dimension.
4. Make a "V" fitting to the required dimension using fitting tools.
5. Weld a butt joint using welding process to the required dimension.
6. Demonstration on hand forging and sand moulding process.

Course Outcomes:

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

CO1: Draw the basic symbols of Electrical and Electronic components and identify the elements.

CO2: Execute soldering practice for electrical and electronics circuits.

CO3: Verify basic laws and demonstrate basic wiring.

CO4: Demonstrate the basic plumbing, carpentry, fitting, sheet metal and welding operations.

CO5: Demonstrate the hand forging and sand moulding process.

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Pollachi - 642 003, Coimbatore District, Tamilnadu.

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.
4."Engineering Practices Laboratory Manual" prepared by faculty of MCET.

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Course Code : 16PSL12	Course Title : SPORTS FOR WELLNESS (Common to all B.E/B.Tech Programmes)	
Core / Elective General	**L : T : P: C**	0 : 0 : 2: 1
Type: Practical	Total Contact hours:	**30 Hours**

Prerequisites: The student should have undergone the course(s):

- NIL

Course Objectives

The course is intended to:

1. Explain the significance of physical fitness.
2. Maintain physical fitness.
3. Exhibit mental agility.

UNIT I - HEALTH

Meaning of health - Components of health - physical, mental, social, emotional, spiritual -importance of health - Personal hygiene - Heredity and environment – Adopting healthy habits

UNIT II – FITNESS & WELLNESS

Fitness and wellness – what is physical fitness - categories - components of health related physical fitness- components of skill related physical fitness-values of physical fitness – Physical fitness development.

What is wellness - importance of wellness for engineers –factors promoting wellness – Physiology and health: cardio-respiratory, muscular and nervous systems – ageing

UNIT III –FOOD & HEALTH

Energy balance and body composition – nutrients- problems of surplus and deficiency- balanced diet - good food habits for better health – hazards of junk food - food and the gunas

UNIT IV – FITNESS & DEVELOPMENT I

Exercises related ailment and injuries - safety and precautions - first aid.Muscular strength – exercises (calisthenics): pull-up, sit-up, push-up and weight training. Explosive power – exercises: vertical jump, long jump, Cardio respiratory endurance– exercises: walking, jogging, treadmill, stair climbing, bicycling, skipping. Flexibility –exercises: stretching

UNIT V –FITNESS & DEVELOPMENT II

Speed, agility, balance and coordination – exercises: sprint, cone drill, ladder drill, hurdle drill, ball throw - mental agility tests. Dexterity - 12 minutes cooper test – long run – adventure games Team games

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Pollachi - 642 003, Coimbatore District, Tamilnadu.

Course Outcomes

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

CO1. Explain the significance of physical fitness for healthy living

CO2. Maintain physical fitness through exercises

CO3. Exhibit mental agility

Reference Books:

1. Tony Buzan, Harper Collins, The Power of Physical Intelligence (English)
2. PadmakshanPadmanabhan, Handbook of Health & Fitness, Indus Source Books, First Edition,2014

OPERATIONAL MODALITIES:

Orientation programme

Special lectures by invited resource persons at semester beginning

3 lectures x 4 hours = 12 hours

Follow-up practice

12 weeks x 2 hours/week = 24 hours

Evaluation

Continuous evaluation:

Physical Exercises	= 40 marks
Assessment of students workbook	= 20 marks
Total	= 60 marks

Semester end examination:

Written test (MCQ and short answers)	= 30 marks
Physical exercises	= 50 marks
Viva-voce	= 20 marks
Total	= 100 marks

End semester mark out of 100 is reduced to 40 marks

The student should get a total of 50 marks put together for a pass.

MEASUREMENTS:

At the Beginning + At Semester End

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SCHEDULE OF EXERCISES FOR STUDENTS WITH DIFFERENT PHYSICAL CONDITIONS

Underweight	Normal	Obese
Flexibility exercis - stretching	Flexibility exercis - stretching	- Brisk walking
Minor games -forward running relay -backward running relay - over & under relay -circle games, etc.	-Walking - Walking-cum-jogging	- Minor games
Strength Training - Calisthenics	Cardio/Functional Fitness - Skipping - Stair climbing - jogging - bicycling - long distance running	flexibility exercises - stretching - Cycling (static)
Cardio/Functional Fitness - Skipping - Stair climbing - jogging - bicycling	Agility - ladder drills - hurdle drill - cone drill	Cardio/Functional Fitness Skipping Jogging bicycling
Agility exercises - ladder drills - hurdle drill - cone drill	Strength Training -Calisthenics -gym workout for major muscles	Strength Training - Calisthenics - gym workouts
Diet Considerations	Diet considerations	Diet considerations
Measurements		
BMI Hand grip strength test 12 m Cooper run Sit & reach	BMI 12 m Cooper run Sit & reach test Illinois agility test	BMI Body fat percentage Waist-to-hip ratio Sit&reach

END OF SEMESTER I

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SEMESTER II

Course Code : 16ENT21	Course Title : COMMUNICATION SKILLS - II (Common to all B.E/B.Tech Programmes)	
Core / Elective: General	L : T : P: C	2 : 0 : 2 : 3
Type: Lecture& Practical	Total Contact hours:	60

Prerequisites: The student should have undergone the course(s):

- 16ENT11-Communication Skills – I

Course Objectives

The course is intended to:

1. Listen to monologues or dialogues, comprehend and answer questions.
2. Answer questions about oneself and business-related themes.
3. Read business correspondence, infer and respond to the questions.
4. Write appropriate business e mail, memo, proposal, report and letter.
5. Write complex sentences.

UNIT I - LISTENING **6+6**

Listening to monologues or dialogues and noting specific information - Listening to identify topic, context, and function -Listening for details and main ideas - Gap filling and matching job descriptions and titles

UNIT II – SPEAKING **6+6**

Giving personal information -Talking about present circumstances, past experiences and future plans, expressing opinions, speculating - mini-presentation on a business theme - Giving information and expressing and justifying opinions - discussion on a business-related topic - Expressing and justifying opinions, speculating, comparing and contrasting, agreeing and disagreeing, etc. – negotiating and persuading

UNIT III – READING **6+6**

Reading - skimming for gist and scanning for specific information(Newspaper and magazine articles, reports, advertisements, letters, messages, brochures, guides, manuals) - Reading and understanding text structure – Comprehension – Reading for vocabulary and structure - understanding sentence structure and finding errors.

UNIT IV – WRITING **6+6**

Internal written communication - Writing a message, memo or an email: giving instructions, explaining development, asking for comments, requesting information, agreeing to requests - External Communication (e.g. explaining, apologizing, reassuring, complaining), reports (e.g. describing, summarizing) or proposals (e.g.

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describing, summarizing, recommending, persuading and negotiating).

UNIT V – GRAMMAR 6+6

Conditional sentences – Modals and their usage- common errors - Linkers and discourse markers – concord (pronoun and antecedent)

Course Outcomes

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

CO1. Listen to monologues or dialogues, comprehend and answer questions equivalent to BEC vantage listening exam

CO2. Answer questions about oneself and business-related themes on par with BEC vantage speaking exam

CO3. Read business correspondence, infer and respond to the questions similar to BEC vantage reading exam

CO4. Write appropriate business e mail, memo, proposal, report and letter on par with BEC vantage writing exam

CO5.Write complex sentences using appropriate discourse markers

Text Books

1 Whitby Norman, Business Benchmark Upper Intermediate Students' Book CUP Publications, Second Edition, 2014

Reference Books

1. Cambridge BEC Vantage - Practice Tests, Self-study Edition, Cambridge University Press, 2002
2. Hewings Martin, Advanced Grammar in use - Upper-intermediate Proficiency, CUP Publications, Third Edition, 2013
3. Cambridge BEC Vantage - Practice Tests, Self-study Edition, Cambridge University Press, 2002
4. Hewings Martin, Advanced Grammar in use - Upper-intermediate Proficiency, CUP Publications, Third Edition, 2013

Web References

1. www.cambridgeenglish.org/exams/business.../business-preliminary/
2. http://www.examenglish.com/BEC/BEC_Vantage.html
3. www.splendid-speaking.com/exams/bec_speaking.html

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Dr. Mahalingam College of Engineering and Technology,
Pollachi - 642 003, Coimbatore District, Tamilnadu.

Course Code : 16MAT23	Course Title : ENGINEERING MATHEMATICS - II (Common to ECE, EEE and EIE)	
Core / Elective: General	L : T : P: C	3 : 2 : 0 : 4
Type: Lecture & Tutorial	Total Contact hours:	75

Prerequisites: The student should have undergone the course(s):

- 16MAT13-Engineering Mathematics I

Course Objectives

The course is intended to:

1. Solve second and higher order ordinary differential equations.
2. Explain the concepts of vector differentiation and integration.
3. Apply the Laplace transform techniques.
4. Construct analytic functions.
5. Use the concept of complex integration.

UNIT I - DIFFERENTIAL EQUATIONS OF SECOND AND HIGHER ORDER **9+6**

Second and higher order linear differential equations with constant coefficients- Method of variation of parameters- First order simultaneous differential equations- Application to circuit problems

UNIT II – VECTOR CALCULUS **9+6**

Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields –Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem(excluding proofs) – evaluation of integrals using Green's ,Gauss's and Stoke's theorems

UNIT III – LAPLACE TRANSFORM **9+6**

Laplace transforms –Sufficient condition for existence–Transform of elementary functions-Basic properties – Transforms of derivatives and integrals of functions - Transforms of unit step function and impulse function – Transform of periodic functions-Inverse Laplace transforms - Statement of Convolution theorem -Solution of linear ODE of second order-solution to simple circuit problems.

UNIT IV – COMPLEX DIFFERENTIATION **9+6**

Functions of a complex variable – Analytic functions- Necessary conditions – Cauchy-Riemann equations and sufficient conditions (excluding proofs) – Properties of analytic functions – Harmonic conjugate – Construction of analytic functions- Conformal mapping: w = z+ a, az, 1/z – Bilinear Transformation

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UNIT V – COMPLEX INTEGRATION 9+6

Statement and applications of Cauchy's integral theorem and integral formula – Taylor's and Laurent's series expansions – Types of Singularity– Residues – Cauchy's residue theorem – Evaluation of real definite integrals as contour integrals around unit circle and semi-circle (excluding poles on the real axis).

Course Outcomes

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

CO1. Solve second and higher order ordinary differential equations.

CO2. Explain the concepts of vector differentiation and integration.

CO3. Apply the Laplace transform techniques to solve differential equations.

CO4. Use the functions of a complex variable and construct analytic functions.

CO5. Use the concept of complex integration to evaluate contour integrals

Text Books

1. Srimanta Pal &Subodh C Bhunia, Engineering Mathematics, First Edition, Oxford University Press, 2015.
2. Ervin Kreyszig. Advanced Engineering Mathematics, Tenth Edition, Wiley India, 2015

Reference Books

1. Peter V. O'Neil. Advanced Engineering Mathematics, Seventh Edition, Thomson Nelson Toronto, 2012.
2. K. A. Stroud & Dexter J. Booth. Advanced Engineering Mathematics, Fifth Edition, Palgrave Macmillan, 2011

Web References

1. http://nptel.ac.in/video.php?subjectId=122107036

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Head of the Department,
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Kannampalayam (Post), Pollachi - 642 003, Coimbatore District, Tamilnadu.

Course Code : 16PHT23	Course Title : MATERIAL SCIENCE (Common to ECE, EEE and EIE)	
Core / Elective : Core	L : T : P: C	3 : 0 : 0 : 3
Type: Lecture	Total Contact hours:	45

Prerequisites: The student should have undergone the course(s):

- NIL

Course Objectives

The course is intended to:

1. Analyze the types of electron emission and electron ballistics.
2. Calculate the electrical properties of conductors and relate with superconductors.
3. Demonstrate the nature of semiconducting material.
4. Calculate the dielectric properties of materials and discuss their application in electronic components
5. Explain the properties and applications of magnetic materials

UNIT I - ELECTRON EMISSION AND BALLISTICS 9

Electron Emission: Work function – Types of Electron Emission (Qualitative): Thermionic, Photoelectric, Field and Secondary Emissions.

Electron Ballistics: Uniform Electric Field Parallel to Electron Motion - Energy acquired by electron in the electric field – Uniform electric field perpendicular to electron motion – Motion of an electron in a uniform magnetic field – Magneto-static deflection – Electric and Magnetic fields in crossed configuration

UNIT II – CONDUCTING AND SUPERCONDUCTING MATERIALS 9

Conducting Materials: Formation of bands (qualitative) - Classification of solids based on bands - Classical free electron theory, Expression for electrical and thermal conductivity, Wiedemann Franz law - Sources of resistivity - Mattheissen's rule – Properties and applications of low and high resistivity materials.

Superconductors: Properties – Type I & II superconductors - High temperature superconductors - Applications: – Cryotron – Josephson Effect - SQUID - Magnetic levitation

UNIT III – SEMICONDUCTING MATERIALS 9

Elemental and compound semiconductors – Direct and indirect band gap semiconductors - Intrinsic and extrinsic semiconductors - Expression for carrier concentration in n type semiconductor - Variation of carrier concentration and Fermi

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level with temperature for n - type - Hall Effect: Hall coefficient in n-type extrinsic semiconductor, experimental determination of Hall coefficient and applications of Hall Effect - LDR - Solar Cells - Strain gauge

UNIT IV – DIELECTRIC MATERIALS 9

Polarization - Polarizability - Polarization vector, Electrical susceptibility, Dielectric constant – Polarization mechanisms (Qualitative) -Internal Field in solids – ClausiusMossotti relation-Frequency and temperature dependence of polarization – Dielectric loss - Dielectric breakdown mechanisms - Types of Dielectrics: Active and Passive (Qualitative) – Selection of dielectric materials - Applications of Dielectrics: Capacitors and Transformers

UNIT V – MAGNETIC MATERIALS 9

Introduction to magnetic materials – Types and Properties of Magnetic materials: Dia, Para, Ferro, Anti-ferro and Ferri magnetic materials - Domain theory of ferromagnetism - Hysteresis based on domain theory - Hard and soft magnetic materials – Properties and applications of Ferrites- Materials for permanent magnets- Applications: Transductor – Hard disc – Magneto optical recording

Course Outcomes

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

CO1. Analyze the types of electron emission and electron ballistics

CO2. Calculate the electrical properties of conductors and relate with superconductors

CO3. Demonstrate the nature of semiconducting material

CO4. Calculate the dielectric properties of materials and discuss their application in electronic components

CO5. Explain the properties and applications of magnetic materials

Text Books

1. M.N.Avadhanulu and P.G.Kshirsagar, "Text Book of Engineering Physics", S. Chand & Company Ltd., New Delhi, 2014.
2. Balasubramaniam "Callister's Material Science and Engineering", John Wiley and Sons Inc., Second Edition, 2015

Reference Books

1. S.O. Pillai," A Text Book of Solid State Physics", New Age International, SeventhEdition, 2015.
2. S.O. Kasap, "Principlesof Electronics Materials and Devices", McGraw Hill Higher Education, New Delhi, Third Edition, 2007.

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3. V Rajendran, "Engineering Physics", Tata McGraw-Hill Co, New Delhi, 2011.
4. P.K Palanisamy, "Materials Science", ScitechPublications, Chennai, 2007.
5. S. Jayakumar, "Materials Science"', R.K. Publishers, Coimbatore, 2008

Web References

1. http://nptel.ac.in/courses/115102014/1
2. http://nptel.ac.in/course.php?disciplineId=115
3. https://www.khanacademy.org/science/physics/magnetic-forces-and-magnetic-fields
4. http://physics.info/dielectrics/

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Course Code :16GET25	Course Title :ELECTRON DEVICES AND CIRCUITS	
Core	L : T : P: C	3 : 0 : 0 : 3
Type: Lecture	Total Contact hours:	45

Prerequisites: The student should have undergone the course(s):

- 16PHT13-Engineering Physics

Course Objectives

The course is intended to:

Explain the characteristics and applications of PN junction devices

Explain the characteristics and applications of BJT

Explain the characteristics and applications of JFET and MOSFET

Explain the designing concept of the amplifier circuit.

Illustrate the different types of feedback amplifiers and oscillators.

UNIT I -PN JUNCTION DEVICES 9

Semiconductor conductivity - drift current and diffusion current - PN junction - barrier voltage - diode equation - diffusion and transition capacitance - Application of diode as rectifier, clipper and clamper. Special devices and applications, Zener diode as voltage regulator, Schottky diodes for high speed switching, UJT relaxation oscillator, Thyristors - SCR, Diac and Triac

UNIT II – BIPOLAR JUNCTION TRANSISTORS AND APPLICATIONS 9

BJT operation – Characteristics and h-parameters for CE, CB, CC configurations - Design of biasing circuits – Small signal model - High frequency model – Gain-Bandwidth product – CE, CB and CC amplifiers – Transistor Switching circuits.

UNIT III – JFET, MOSFET AND THEIR APPLICATIONS 9

JFET and MOSFET device structure and current equation - Equivalent circuit – Biasing – CS, CG and CD amplifiers. Frequency response of CS amplifier – NMOS and CMOS inverter.

UNIT IV – MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIERS 9

BJT cascaded amplifiers-Single and double tuned amplifiers-gain and frequency response-BJT and FET Differential amplifiers-common mode and difference mode analysis

UNIT V – FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Advantages of negative feedback – Feedback amplifiers with voltage / current sampling and series / shunt mixing – Positive feedback – Condition for oscillations –

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Phase shift, Wien bridge, Hartley, Colpitts and Crystal oscillators.

Course Outcomes

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

CO1. Explain the fundamentals of PN junction devices

CO2. Illuminate the circuit, characteristics and application of BJT

CO3. Elucidate the application of JFET, MOSFET with their application

CO4.Design the amplifier circuit for the requirement

CO5 Explain the different types of feedback amplifiers and oscillators

Text Books

1. David A. Bell ,Electronic Devices and Circuits, Oxford University Press, 2010.

2. Sedra and Smith, Microelectronic Circuits, Oxford University Press, 2004.

Reference Books

1. Jacob Millman, Christos c. Halkias and SatyabrataJit, Millman's Electronic Devices and Circuits, Third edition, Tata McGraw Hill, 2010.

Web References

1. http://nptel.ac.in/video.php?subjectId=117103063
2. http://nptel.ac.in/video.php?subjectId=117106091
3. www.youtube.com/watch?v=Wf19ll0ts84

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Course Code : 16CYT22	Course Title : ENGINEERING CHEMISTRY (Common to ECE, EEE and EIE)	
Core / Elective General	L : T : P: C	3 : 0 : 0 : 3
Type: Lecture	Total Contact hours:	45

Prerequisites: The student should have undergone the course(s):

- NIL

Course Objectives

The course is intended to:

1. Select batteries based on the life cycle, working principle and their applications.
2. Determine the rate of corrosion of a given metal and identify appropriate control techniques.
3. Explain photo physical law and spectroscopic method of chemical analysis.
4. Explain the chemistry of water and specify the water treatment process.
5. Identify the behaviour of nanomaterials.

UNIT I - ELECTROCHEMISTRY AND BATTERIES 9

Cells – Types of cells– Electrochemical and electrolytic cells – emf and its measurement – Nernst equation – Types of electrodes. Batteries – Characteristics, Classifications of batteries, Construction, working and applications - dry cells, Alkaline battery, Lead –Acid battery, Nickel-Cadmium battery, Lithium ion battery, Hydrogen -Oxygen Fuel Cell. Battery hazards and maintenance

UNIT II – CORROSION AND ITS CONTROL 9

Corrosion – dry and wet corrosion – mechanism of electrochemical corrosion – galvanic corrosion and concentration cell corrosion, Factors influencing corrosion. Corrosion Control methods – Cathodic protection methods, Corrosion inhibitors-Inorganic coating- Metallic coating – Galvanizing, Tinning – Organic coating. Electroplating of Silver and Electroless plating of Nickel

UNIT III – PHOTOCHEMISTRY AND SPECTROSCOPY 9

Photo physical laws – Grotthus Draper law, Stark Einstein law and Beer Lamberts law, Photo process – Fluorescence, Phosphorescence, Chemiluminescence and Photosensitization (Phenomenon only). Spectroscopy – Electromagnetic spectrum, Absorption and Emission spectroscopy – UV – Visible Spectroscopy, Atomic Absorption Spectroscopy – Principle, Instrumentation and applications

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UNIT IV – WATER TECHNOLOGY 9

Water quality parameters – Physical, Chemical and Biological characteristics of potable water, Water quality standards –WHO, Central Pollution Control Board, Hardness of water – types, expression of hardness – Determination of hardness by EDTA method –Boiler feed water and Boiler troubles. Water conditioning methods – Internal conditioning- Carbonate, Phosphate and Calgon Conditioning. External conditioning – demineralization, Reverse osmosis. Domestic Water Treatment

UNIT V – SYNTHESIS AND APPLICATIONS OF NANO MATERIALS 9

Introduction – Difference between bulk and Nano materials – size dependent properties. Nano scale materials –particles, clusters, rods and tubes. Synthesis of Nanomaterials: Sol-gel process, Electro deposition, Hydrothermal and Self combustion methods. Applications of Nano materials in Electronics and communication, Energy science and medicines.Risk and future perspectives of nanomaterials

Course Outcomes

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

CO1. Select batteries based on the life cycle, working principle and their applications.

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

CO3. Explain photo physical law and spectroscopic method of chemical analysis.

CO4. Explain the chemistry of water and specify the water treatment process.

CO5. Identify the behaviour of nanomaterials based on size

Text Books

1. P. C. Jain and Monica Jain, "Engineering Chemistry", DhanpatRai Pub, Co., New Delhi, Sixteenth Edition, 2006.
2. Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, Second Edition,2011

Reference Books

1. Larry Brown and Tom Holme, Chemistry for Engineering Students, Cengage Learning, Third Edition, 2015.
2. P.W. Atkins and de Paula Julio, "Physical Chemistry", Oxford University Press, Ninth Edition (Indian Student Edition), 2011.
3. S.S. Dara "A Text book of Engineering Chemistry" S. Chand & Co. Ltd., New

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Delhi 2006.

4. Charles P. Poole, Jr., Frank J. Owens "Introduction to Nanotechnology" Wiley India Pvt. Ltd. New Delhi, 2003

Web References

1. http://nptel.ac.in/courses/122101001/downloads/lec-23.pdf
2. http://nptel.ac.in/courses/118104008/
3. http://nptel.ac.in/courses/104105039/

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Course Code : 16PCL21	Course Title : ENGINEERING PHYSICS AND CHEMISTRY LABORATORY (Common to ECE, EEE and EIE)	
General	L : T : P: C	0 : 0 : 4 : 2
Type: Practical	Total Contact hours:	60

Prerequisites: The student should have undergone the course(s):

- NIL

Course Objectives

The course is intended to:

1. Measure optical parameters of laser and optical fiber.
2. Estimate electrical properties of metal and semiconductor.
3. Estimate the total hardness of water.
4. Measure corrosion rate of a mild metal.
5. Determine the concentration of a solution through electrical method.

List of Experiments: 60

Engineering Physics Lab

1. Diode Laser-Determination of Wavelength and Particle size
2. Optical Fiber- Determination of Numerical aperture and acceptance angle
3. Lee's Disc Method – Determination of Thermal Conductivity of a bad conductor
4. Determination of Band gap of a semiconducting material
5. Characteristic of Light Dependent Resistor-Resistance –Illumination Characteristics
6. Carey Foster's Bridge-Determination of specific resistance of an alloy
7. Solar Cell- V-I Characteristics
8. Hall effect-Determination of Hall coefficient
9. Determination of dielectric constant

Engineering Chemistry Lab

10. Estimation of total hardness of water by EDTA method.
11. Estimation of iron in water by colorimetric method- verification of Beer-Lambert's Law.
12. Estimation of Fe^{2+} by potentiometric titration
13. Determination of strength of acid by pH metry
14. Determination of corrosion rate by weight loss method

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15.Measurement of emf of electrochemical cell – potentiometry

Course Outcomes

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

CO1. Measure optical parameters of laser and optical fiber

CO2. Estimate electrical properties of metal and semiconductor

CO3. Estimate the total hardness of water

CO4. Measure corrosion rate of a mild metal

CO5. Determine concentration of a solution through electrical method.

Reference Books:

1. "Engineering Physics Laboratory Manual" by Dr.R.Jayaraman, V.Umadevi, S. Maruthamuthu and B.Saravanakumar
2. Engineering Chemistry Laboratory Manual by Faculty, Chemistry Department, MCET.

Web References:

1. http://www.iitg.ernet.in/scifac/qip/public_html/cd_cell/chapters/p_k_giri_lab_manual/Physics_Lab_manual.pdf
2. http://www.gitam.edu/eresource/images/Engineering-Chemistrylab-Manual-GU.pdf

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Course Code : 16EDL21	Course Title : ELECTRON DEVICES LABORATORY (Common to ECE, EEE and EIE)	
Core / Elective Core	L : T : P: C	0 : 0 : 4 : 2
Type: Practical	Total Contact hours:	60

Prerequisites: The student should have undergone the course(s):

- NIL

Course Objectives

The course is intended to:

1. Compute the forward and reverse resistances of a diode.
2. Analyze the input and output characteristics of a Bipolar Junction Transistor.
3. Examine the drain and transfer characteristics of JFET and MOSFET.
4. Observe the negative resistance region of a UJT.
5. Analyze the characteristics of Power devices.

List of Experiments:

1. Characteristics of PN junction diode
2. Characteristics of Zener diode
3. Testing of Transistors and Diodes.
4. Characteristics of CE configuration of a Transistor
5. Characteristics of CC configuration of a Transistor
6. Characteristics of JFET
7. Characteristics of MOSFET
8. Characteristics of UJT
9. Characteristics of SCR
10. Characteristics of Diac and Triac

Course Outcomes

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

CO1. Compute the forward and reverse resistances from the acquired diode characteristics.

CO2. Analyze the input and output characteristics of a given Bipolar Junction Transistor.

CO3. Examine the drain and transfer characteristics of a given JFET and MOSFET.

CO4. Observe the negative resistance region of given UJT.

CO5. Analyze the characteristics of Power devices such as SCR, Diac and Triac.

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Reference Books:

1. Electron Devices Laboratory" manual prepared by Department of Electronics and Communication Engineering.
2. David.A.Bell "Fundamentals of Electronic Devices and Circuits Lab manual" Oxford University Press, New Delhi, Fifth Edition, 2009

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Course Code : 16PSL22	Course Title : PROMOTION OF STUDENTS' WELLNESS (Common to all B.E/B.Tech Programmes)	
Core / Elective General	L : T : P: C	0 : 0 : 2: 1
Type: Practical	Total Contact hours:	30

Prerequisites: The student should have undergone the course(s):

- NIL

Course Objectives

The course is intended to:

1. Maintain physical wellbeing.
2. Maintain mental wellbeing.
3. Maintain social wellbeing.

UNIT I - PHYSICAL HEALTH

Physical structure and functions of human body – simplified physical exercises : hand exercises, Leg exercises, breathing exercises, eye exercises – kapalapathi – Maharasanas 1-2 – Massages – Acupuncture – relaxation – importance and benefits. Suryanamaskar

UNIT II – MENTAL HEALTH

Maintenance of youthfulness and life force – kayakalpa yoga – anti ageing process – benefits. Mind and its functions – mind wave frequency – meditation process – Agna, shanthi, thuriam – benefits

UNIT III – PERSONALITY DEVELOPMENT – I

Purpose of life and analysis of thought – philosophy of life – introspection – practice. Moralization of desires and neutralization of anger – practices

UNIT IV – PERSONALITY DEVELOPMENT – II

Eradication of worries and benefits of blessings – wave theory –practices. Genetic centre – purification – cause and effect theory

UNIT V – SOCIAL HEALTH

Greatness of guru – cultural education – love and compassion – fivefold culture. Greatness of friendship and social welfare – individual, family and world peace

Course Outcomes

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

CO1. Maintain physical wellbeing - grooming, BMI, flexibility, muscle strength, body

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CO2. Maintain mental wellbeing - perceptions, attention/concentration, memory, gunas

CO3. Maintain social wellbeing - etiquettes, emotional and psychological aspects, stress

Text Books

1. Vethathiri Maharishi Institute for Spiritual and Intuitional Education, Aliyar , "Value education for harmonious life (Manavalakalai Yoga)", Vethathiri Publications, Erode, First Edition,2010
2. Vethathiri Maharishi Institute for Spiritual and Intuitional Education, Aliyar , "Value education for harmonious life (Manavalakalai Yoga)", Vethathiri Publications, Erode, First Edition,2010

Reference Books

1. Dr.R.Nagarathna, Dr.H.R.Nagendra, "Integrated approach of yoga therapy for positive health", Swami Vivekananda Yoga Prakashana, Bangalore, 2008 Edition.
2. Dr. R. Nagarathna, Dr.H.R.Nagendra, "New perspectives in stress management", Swami Vivekananda Yoga Prakashana, Bangalore, First Edition, June 1986

OPERATIONAL MODALITIES

Orientation programme

Theory and practice demonstration

3 days - 7 hours /day for syllabus coverage

Follow-Up Practice

12 weeks x 2 hours/week: 24 hours

Evaluation:

Continuous evaluation:

Physical Exercises, Kaya kalpa practice, meditation	= 40 marks
Introspection (assessment of students workbook)	= 20 marks
Total	= 60 marks

Semester end examination:

Written test (MCQ and short answers)	= 30 marks
Physical exercises, meditation	= 50 marks
Viva-voce	= 20 marks
Total	= 100 marks

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End semester mark out of 100 is reduced to 40 marks

The student should get a total of 50 marks put together for a pass.

DIMENSIONS AND TOOLS IN MEASUREMENT

Dimension	Sub dimension	Measurement tools
Physical	BMI	Electronic Weighing Machine, Height Measurement
	Flexibility	Sit & Reach
	Muscle Strength	Handgrip Dynamometer
	Prakruti	Dr Ramakrishna's Prakruti Questionnaire
Mental	Perception	Critical Flicker Fusion
	Attention	Digit Letter substitution Test
		Six Letter Cancellation Test
		Stroop Test
	Memory	Digit backward & Forward
Social	Interpersonal Effectiveness & Self Concept	FIRO B
	Psychological Well Being	Short wellbeing scale
		Short Happiness scale
		Barrat Impulsive Scale

END OF SEMESTER II

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SEMESTER III

Course Code:16MAT33	Course Title: TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS (Common to EEE and EIE)	
Core / Elective: General	L: T: P: C	3: 2: 0: 4
Type: Theory and Tutorial	Total Contact Hours:	75

Prerequisites: The student should have undergone the course(s):

- 16MAT13-Engineering Mathematics I
- 16MAT23-Engineering Mathematics II

Course Objectives

The course is intended to:

1. Compute the Fourier series expansion.
2. Calculate the Fourier transform.
3. Determine the solution of first and second order PDE.
4. Solve the one dimensional wave equation.
5. Solve one dimensional and two dimensional heat flow equations.

Unit I - FOURIER SERIES 9+6

Periodic function-Fourier series-Dirichlet's conditions- Half range Fourier cosine and sine series-Parseval'sidentity.Application: Representation of current signals in Fourier series expansion.

Unit II - FOURIER TRANSFORMS 9+6

Fourier transforms-Fourier cosine and sine transforms-Inverse transforms-convolution theorem and Parseval's identity for Fourier transforms. Application to Circuit Analysis-Calculating output voltage of a circuit through Fourier transform.

Unit III - PARTIAL DIFFERENTIAL EQUATIONS 9+6

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

Unit IV - SOLUTION OF ONE DIMENSIONAL WAVE EQUATION 9+6

Method of separation of variables- Classification of second order linear partial differential equations, Solutions of one dimensional wave equation by Fourier series method. Application in Musical Instrument – Calculating Harmonics in a string.

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Unit V - SOLUTION OF ONE AND TWO DIMENSIONAL HEAT FLOW EQUATION 9+6

One dimensional equation of heat conduction - Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded), Solution by Fourier series method- Application to telegraph equations.

Course Outcomes

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

CO1.Compute the Fourier series expansion for given periodic functions

CO2.Calculate the Fourier transform of an aperiodic function.

CO3. Determine the solution of first and second order PDE.

CO4.Solve the one dimensional wave equation.

CO5. Solve one dimensional and two dimensional heat flow equations.

Text Books:

1. Srimanta Pal and Subodh C. Bhunia, Engineering Mathematics, Oxford University Press, New Delhi, First Edition, 2015

2.Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India, New Delhi, Tenth edition, 2007.

Reference Books:

1.Grewal B.S. Higher Engineering Mathematics, Khanna Publishers, New Delhi, Fortieth Edition , 2007.

2. Bali &Iyengar, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., New Delhi, First Edition, 2007

3.Ramanna B.V. Higher Engineering Mathematics, Tata McGraw Hill, New Delhi, Fourth Edition, 2008.

4. Veerarajan T. Engineering Mathematics for Semester III,Tata McGraw-Hill (Education) India Pvt.Ltd , New Delhi, Third Edition, 2005.

Web References:

1. http://nptel.ac.in/courses/111103021/

2. http://nptel.ac.in/video.php?subjectId=122107037

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Course Code:16EET32	Course Title: ELECTRIC CIRCUITS ANALYSIS (Common to EEE and EIE)	
Core	L: T: P: C	3: 2: 0: 4
Type: Theory	Total Contact Hours:	75

Prerequisites: The student should have undergone the course(s):

- 16PHT13 - Engineering Physics
- 16GET15 - Fundamentals of Electrical Engineering

Course Objectives

The course is intended to:

1. Analyze basic electric circuits.
2. Analyze DC and AC circuits.
3. Explain the concept of Resonance and simple coupled circuits.
4. Analyze the transient responses.
5. Differentiate three phase circuit behaviour.

Unit I - BASIC CIRCUIT ANALYSIS **9+6**

Graph representation of circuit: Tree, branch, co-tree, link and loop. Circuit Reduction: Source transformation – star to delta and reverse transformation. Mesh current and Node voltage methods of analysis for D.C and A.C circuits. Parallel RL, RC, RLC circuits excited by AC source. Principle of duality.

Unit II - CIRCUIT THEOREMS FOR DC AND AC CIRCUITS **9+6**

Superposition Theorem – Thevenin's and Norton's Theorem – Maximum power transfer theorem – Reciprocity Theorem – Compensation Theorem - Millman's Theorem – Tellegen's Theorem.

Unit III - RESONANCE AND COUPLED CIRCUITS **9+6**

Resonance: Series and Parallel - Quality factor, Resonant frequency, bandwidth and their relations. Effect of variation of Q on resonance.

Coupled circuits: Mutual inductance – Coefficient of coupling – dot convention – analysis of simple coupled circuits. Series and parallel connections of coupled coils – Tuned coupled circuits.

Unit IV - TRANSIENT RESPONSE **9+6**

Source free response of RL and RC circuits – Forced (step) response of RL and RC circuits – Source free response of RLC series circuit – Forced (step) response of RLC series circuit –

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Forced response of RL RC and RLC series circuit to sinusoidal excitation – Time constant and natural frequency of oscillation of circuits. Laplace transform application to the solution of RL, RC and RLC circuits – Initial and final value theorems and applications.

Unit V - THREE PHASE CIRCUITS **9+6**

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

Course Outcomes

1. Analyze basic electric circuits using circuit reduction, mesh and node analysis.
2. Analyze DC and AC circuits using circuit theorems.
3. Explain the concept of Resonance and simple coupled circuits.
4. Analyze the transient responses of RL, RC, RLC circuits using Laplace transformation technique.
5. Differentiate three phase circuit behavior with balanced and unbalanced three phase loads.

Text Books:

1. William H. Hayt, Jack Kemmerly, Steven M. Durbin. "Engineering Circuit Analysis" Tata McGraw Hill publishers, New Delhi, Eighth Edition, 2013.

2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", McGraw Hill, New Delhi, Fifth Edition, 2013.

Reference Books:

1.Chakrabati A, "Circuits Theory (Analysis and synthesis), DhanpathRai& Sons, New Delhi, Sixth Edition,2014.

2. M Nahvi, Joseph Edminister, K UMA RAO "Electric circuits", Schaum's Series, Tata McGraw-Hill, New Delhi, Fifth Edition, 2010.

3. Robert L. Boylestad, "Introductory Circuit Analysis" Pearson, USA, Sixteenth Edition, 2016

Web References:

1.http://nptel.ac.in/courses/117106101/

2.http://nptel.ac.in/courses/108102042/

3.www.allaboutcircuits.com

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Course Code: 16EIT31	Course Title: ELECTRICAL MACHINES AND MEASURMENTS	
Core	L: T: P: C	3: 0: 0: 3
Type: Theory	Total Contact Hours:	45

Prerequisites

The student should have undergone the course(s):

- 16GET15 - Fundamentals of Electrical Engineering
- 16PHT13 - Engineering Physics

Course Objectives

The course is intended to:

1. Summarize the operation and characteristics of different types DC Machines
2. Analyze Transformer at different load conditions.
3. Demonstrate the working of the induction machines
4. Differentiate the various types of single phase induction motors
5. Describe the concept of different measurement techniques of electrical parameters

Unit I - D.C. MACHINES 9

DC Generators: Construction- EMF equation - Methods of excitation -Characteristics of series, shunt and compound generators - DC Motors: Principle of operation - Back EMF and torque equation -Characteristics of series, shunt and compound motors - Types of starters.

Unit II - TRANSFORMERS 9

Single phase transformer: Principle of operation - EMF equation -equivalent circuit, phasor diagram, open circuit and short circuit tests, regulation and efficiency; three phase transformers: connections, parallel operation; Autotransformer.

Unit III - INDUCTION MACHINES 9

Induction Motors: Construction – Types – Principle of operation- Torque equation-slip-torque characteristics- Starting methods -Speed control-Principle of alternators - Construction details - Types - Equation of induced EMF - Voltage regulation -parallel operation-Brushless alternators- Applications.

Unit IV - SPECIAL MACHINES 9

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

Unit V - MEASUREMENT 9

Introduction to measurement – Operating forces –Measurement of voltage and current: Moving coil instrument - Moving iron instrument, Measurement of power: Dynamometer type wattmeter - Measurement of 3 phase power -3 wire and 4 wire supply, Measurement of Resistance by the Wheatstone bridge method

Course Outcomes

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

CO1.Summarize the characteristics of different types of DC machines.

CO2.Analysis the performance of transformers under various power factors.

CO3.Demonstrate the working of the induction machines under various characteristics.

CO4.Differentiate the various types of single phase induction motors

CO5.Describe the various measurement techniques of electrical parameters

Text Books:

1. Kothari D.P. and Nagrath I.J., "Electrical Machines", Tata McGraw Hill Publishing Company Ltd, Second edition, 2007.
2. Sawhney A.K., "A course in Electrical and Electronic Measurement and Instrumentation", DhanpatRai and Co, New Delhi, Nineteenth Edition, 2011.

Reference Books:

1. Thereja. BL. and Thereja. AK., "A Text Book of Electrical Technology", Vol.I, S.Chand, New Delhi, 2010.
2. Mehta, V.K. and Mehta R. Principles of Electrical Machines: S.Chand& Company LTD, New Delhi, 2008.

Web References:

1. nptel.ac.in/courses/108102042
2. www.nptelvideos.in/2012/11/electrical-machines
3. www.learnerstv.com/Free-engineering-video-lecture-courses
4. bin95.com/Industrial-Training-Videos/industrial_electrical_training.
5. http://nptel.iitg.ernet.in/courses/Elec_Engg/IIT%20Bombay/Electrical%20and%20Electronic% 20Measurements.html

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Kalaignar Karunanidhi Institute of Technology,
Kannampalayam, Coimbatore District, Tamilnadu.

Course Code: 16EIT32	Course Title: TRANSDUCER ENGINEERING	
Core	L: T: P: C	3: 0: 0: 3
Type: Theory	Total Contact Hours:	45

Prerequisites: The student should have undergone the course(s):

- 16GET15 - Fundamentals of Electrical Engineering
- 16PHT13 - Engineering Physics
- 16PHT23- Material Science

Course Objectives

The course is intended to:

1. Explainthe units and standards for physical quantities, error analysis and classification of transducers.
2. Summarizethe static and dynamic characteristics of Transducers.
3. Explain the principle and application of resistance transducers.
4. Describe the principle and application of variable inductance and capacitance transducers
5. Explainprinciple and application of various types of special transducers.

Unit I - SCIENCE OF MEASUREMENTS AND CLASSIFICATION OF TRANSDUCERS 9

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

Unit II - CHARACTERISTICS OF TRANSDUCERS 9

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

Unit III - RESISTIVE TRANSDUCERS 9

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

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Unit IV – INDUCTIVE AND CAPACITIVE TRANSDUCERS 9

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

Unit V - SPECIAL TRANSDUCERS 9

Piezoelectric transducer - Hall Effect transducer – Magneto elastic sensor- Digital transducers – Smart sensors - Fibre optic sensors, Film sensors, MEMS – Nano sensors.

Course Outcomes

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

CO1.Explain the classification of transducers and the performance analysis.

CO2.Analyse the characteristics of transducers.

CO3.Explain the principle and application of resistance transducers.

CO4.Describe the principle and application of variable inductance and capacitance transducers.

CO5.Illustrate the advanced types of transducers.

Text Books:

1. Neubert H.K.P., Instrument Transducers – An Introduction to their Performance and Design, Oxford University Press, Cambridge, 2003
2. Doebelin E.O. and Manik D.N., Measurement Systems – Applications and Design, Special Indian Edition, Tata McGraw Hill Education Pvt. Ltd., 2007.

Reference Books:

1. D. Patranabis, Sensors and Transducers, 2nd edition, Prentice Hall of India, 2010. E.A
2. John P.Bentley, Principles of Measurement Systems, III Edition, Pearson Education, 2000.
3. Murthy, D.V.S., Transducers and Instrumentation, 2nd Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2010.
4. W.Bolton, Engineering Science, Elsevier Newnes, Fifth edition, 2006

Web References:

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

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Pollachi - 642 003, Coimbatore District, Tamilnadu.

Course Code:16EET31	Course Title: DIGITAL ELECTRONICS (Common to ECE, EEE and EIE)	
Core	L: T: P: C	3 : 0 : 2 : 4
Type: Theory	Total Contact Hours:	75

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

- 16GET25 - Electron Devices and Circuits

Course Objectives

The course is intended to:

1. Illustrate the number systems, Boolean laws and logic families.
2. Explain the simplification techniques.
3. Design synchronous sequential circuits.
4. Design asynchronous sequential circuits.
5. Develop Verilog programming.

Unit I - BOOLEAN ALGEBRA AND LOGIC FAMILIES 9

Number System: Review of decimal, Binary, Octal and Hexadecimal numbers – Complements: 1's and 2's – Arithmetic operation of Signed binary Numbers - Digital Logic Gates – Universal gate Implementation.

Boolean algebra: Basic Theorems, Properties and Simplification of Boolean functions– Representation of Boolean functions in Canonical and standard forms.

Digital Logic Families: Characteristics and operation of TTL, ECL and CMOS.

Unit II - COMBINATIONAL LOGIC 9

Minimization Techniques: Simplifications of Boolean expression using K map Method and McCluskey Method. **Combinational Circuits:** Design Procedure of Adder, Subtractor, Comparators, Code converters, Encoders, Decoders, Multiplexers and De-multiplexers – System level design.

Unit III - SYNCHRONOUS SEQUENTIAL LOGIC 9

SR Latch - **Flip flops**: SR, JK, T, D – Level and Edge Triggering – Analysis of sequential circuits - Design of sequential circuits with state diagram, state table, state reduction and state assignment – **Registers:** Shift registers – **Counters:** Ripple counter, Synchronous counter, Design of synchronous counter.

Unit IV-ASYNCHRONOUS SEQUENTIAL LOGIC 9

Analysis of Asynchronous Sequential Circuits - Design of Asynchronous Sequential Circuits

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with primitive flow table, state reduction and state assignment – Races, Cycles and Hazards: Static, Dynamic, Essential, Hazards elimination.

Unit V - INTRODUCTION TO VERILOG HDL 9

Basic concepts: operators, arrays - modules and port definitions –**Modeling:** Gate level, data flow and behavioral- **Design of Combinational & Sequential circuits:** 4 bit Full Adder, 3 x 8 Decoders,8 x 3 Encoders, 4 to 1 Multiplexer, 1 to 4 De-multiplexer and Flip-flops.

LABORATORY EXPERIMENTS 30

1. Simplification of the Boolean expression using K-Map and its implementation.
2. Design of full adder and subtractor using logic gates.
3. Design of Encoder using logic gates.
4. Design of Multiplexer using logic gates .
5. Design of binary counter.
6. Simulation of Shift registers.
7. Design of Simple Programs for Combinational circuits using verilog HDL and verify using simulation.
8. Design of Simple Programs for Synchronous Sequential Circuits using verilog HDL and verify using simulation.

Course Outcomes

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

CO1.Illustrate the number systems, Boolean laws and logic families used in digital design.

CO2.Explain the simplification techniques for design of combinational circuits.

CO3.Design synchronous sequential circuits using flip-flops.

CO4.Design an asynchronous sequential circuit eliminating hazards and races.

CO5.Develop Verilog programming for design of combinational and sequential circuits.

Text Books:

1.Morris Mano. M., "Digital Design", Third Edition, Pearson Edn., 2001

2. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis, Volume 1", Second Edition, Prentice Hall Professional, 2003

Reference Books:

1. Anil.K.Maini, "Digital Electronics", First Edition, Wiley India Pvt, Ltd., 2011

2. Donald D. Givone, "Digital Principles and Design", TMH, 2003 .

3.Salivahanan. S and Arivazhagan. S., "Digital Circuits and Design", Fourth Edition, Vikas Publishing House Pvt. Ltd, New Delhi, 2012.

4. Bhasker. J., "A Verilog HDL Primer", Second Edition, B.S.Publications, 2001.

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Web References:

1. http://web.iitd.ac.in/~shouri/eel201/lectures.php .
2. http://www.learnabout-electronics.org//Digital/dig10.php
3. http://nptel.ac.in/courses/117103064/
4. http://www.ni.com/example/14493/en/
5. http://www.electrical4u.com/digital-electronics/
6. http://www.allaboutcircuits.com/textbook/digital/

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Course Code: 16EIT33	Course Title: LINEAR INTEGRATED CIRCUITS AND APPLICATIONS	
Core	L:T:P:C	3:0:0:3
Type: Theory	Total Contact hours:	45

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

- 16GET25 Electron Devices and Circuits

Course Objectives

The course is intended to:

1. Apply the knowledge on Op-Amp characteristics.
2. Analyze the applications of Operational Amplifier.
3. Summarize the special applications of Operational Amplifier.
4. Explain the functional blocks and applications of special functionl C's.
5. Design an Operational Amplifier based application circuits.

UNIT I OPERATIONAL AMPLIFIER AND CHARACTERITICS 9

Current mirror- Widlar current source- Wilson current source, OPAMP Internal blocks, Ideal OP-AMP characteristics, DC characteristics, AC characteristics, Slew rate-method of improving slew rate, Frequency response of OP-AMP, Open-loop and closed-loop configurations.

UNIT II APPLICATIONS OF OPAMP 9

IC 741 - Inverting amplifier, Non Inverting amplifier, Summer, Differential amplifier, Differentiator, Integrator, Instrumentation amplifier, Log and Antilog amplifier, Precision Rectifiers, Active Filters: First and Second order active Low and high Pass filters.

UNIT III SPECIAL APPLICATIONS OF OPAMP 9

Comparators, Waveform generators, Multivibrators, Clippers, and Clampers, 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 and applications, IC voltage regulators: Fixed and Variable regulators – 78XX, 79XX, 317, 723 regulators, Switching regulator.

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UNIT V CASE STUDIES-OPAMP BASED DESIGNS 9

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

Course Outcomes

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

CO1: Apply the knowledge on Op-Amp characteristics and its frequency response.

CO2: Analyze the applications of Op-amp.

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: Design the Op-Amp based application circuits.

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', IV edition, New Age, 2010.

Reference Books:

1. David A. Bell, 'Op-amp & Linear ICs', Prentice Hall of India, 2008.
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
2. http://nptel.ac.in/courses/117107094/

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Course Code:16EIL31	Course Title: ELECTRICAL CIRCUITS AND MACHINES LABORATORY	
Core / Elective: Core	L: T: P: C	0 : 0 : 4 : 2
Type: Practical	Total Contact Hours:	60

Prerequisites: The student should have undergone the course(s):

- 16GET15 - Fundamentals of Electrical Engineering
- 16PHT13 - Engineering Physics

Course Objectives

The course is intended to:

1. Verify Simple series and parallel circuit.
2. Verify DC circuit theorems.
3. Analyze the performance of DC machines
4. Demonstrate the operation of single and three phase Induction motors
5. Evaluate different characteristics of transformer.

LIST OF EXPERIMENTS:

[A] ELECTRICAL CIRCUITS LABORATORY

1. Simple series and parallel circuit verification using SPICE.
2. Verification of Thevenin's and Norton's theorems.
3. Verification of Superposition and Reciprocity theorems.
4. Verification of Maximum Power transfer theorems

[B] ELECTRICAL MACHINES LABORATORY

1. Open circuit and Load characteristics of separately excited DC generator.
2. Open circuit and Load characteristics of self excited DC generator.
3. Load test on DC shunt motor and Series motor.
4. Speed control of DC motor.
5. Load test on single phase Induction motor.
6. Load test on three phase Induction motor.
7. Load test on single phase transformer.

Course Outcomes

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

CO1. Verify Simple series and parallel circuit using SPICE (Simulation Program with Integrated Circuit Emphasis

CO2. Verify DC circuit theorems

CO3. Analyze the performance of DC machines for various load conditions

CO4. Demonstrate the operation of single and three phase Induction motors.

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CO5. Evaluate the performance of Transformer under various power factors

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Course Code: 16EIL32	Course Title: ANALOG ELECTRONIC CIRCUITS LABORATORY	
Core	L: T: P: C	0 : 0 : 4 : 2
Type: Practical	Total Contact Hours:	60

Prerequisites: The student should have undergone the course(s):

- 16GET25 Electron Devices and Circuits

Course Objectives:

The course is intended to:

1. Analyzethe characteristics of diode application circuits..
2. Analyzedifferent Oscillators using BJT and Power Amplifier circuits.
3. Applypractical knowledge on operational amplifier applications.
4. Determine frequency response characteristics of filters and Timer ICs
5. Verify the analog circuits using spice s/w

LIST OF EXPERIMENTS:

1. Characteristics of Half-wave rectifier and Full wave rectifier with and without filters.
2. Analyze the Clipper and Clamper Circuits.
3. Analyze the RC phase shift Oscillator and Wien Bridge Oscillator.
4. Characteristics of Class A and Class B Power amplifier.
5. Design of Inverter, Non-Inverter, summer, subtractor and average amplifier using IC741.
6. Design a practical Integrator and Differentiator circuit using IC741.
7. Design a Instrumentation Amplifier using IC741.
8. Design an Astable and Monostablemultivibrators using 555 Timer.
9. Design of active low-pass and high-pass filter using IC741.
10. Simulation of analog circuits using spice S/W.

Course Outcomes

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

CO1.Apply Boolean theorems for simplifying logical expressions.

CO2.Analyze different Oscillators using BJT and Power Amplifier circuits.

CO3.Apply knowledge on Op-Amp based applications.

CO4.Determine frequency response characteristics and timer IC's.

CO5.Verify simulation on analog circuit using SPICE software.

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CourseCode: 16PSL31	Course Title: PERSONAL EFFECTIVENESS (Common to all B.E/B.Tech Programmes)
General	L : T : P : C : M – 0 : 0 : 2 : 1 : 100
Type: Practical	Total Contact Hours: 30

Course Objective:

The course is intended to:

1. Identify the strengths, weaknesses and opportunities.
2. Set goals for academics, career, and personal aspirations.
3. Establish the road map for goals.
4. Apply time management techniques.
5. Create time and pursue activities of self-interest.

UNIT I: THE IMPORTANCE OF ENVISIONING

Importance of positive self-perception – Principle of dual creation (Everything gets created twice – Envisioning) - Understanding vision and mission statements - Writing personal mission statements – 'Focus' as a way of life of most successful people – Importance of goal setting – Importance of planning and working to time

UNIT II: FUNDAMENTAL PRINCIPLES OF GOAL SETTING AND WORKINGTO TIME

Clarifying personal values, interests and orientations – Awareness of opportunities ahead – Personal SWOT analysis - Principles driving goal setting: Principle of response and stimuli, Circle of influence and circle of concern, what you see depends on the role you assume

UNIT III GOAL SETTING AND ACTION ORIENTATION

Potential obstacles to setting and reaching your goals - Five steps to goals setting: SMART goals, Inclusive goals, Positive stretch, Pain vs. gain, Gun-point commitment – Importance of action orientation - Converting goals to actionable tasks – Establishing road map – Using Gantt chart for planning and progress

UNIT IV TIME MANAGEMENT - TOOLS AND TECHNIQUES

Pareto 80-20 principle of prioritization – Time quadrants as a way to prioritize weekly tasks – The glass jar principle - Handling time wasters – Assertiveness, the art of saying 'NO' – Managing procrastination

UNIT V PUTTING INTO PRACTICE

Practical's: Using the weekly journal – Executing and achieving short term goals – Periodic reviews.

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Course Outcomes

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

CO1.Identify the strengths, weaknesses and opportunities

CO2.Set well-articulated goals for academics, career, and personal aspirations

CO3.Establish the road map to realize the goals

CO4.Apply time management techniques to complete planned tasks on time

CO5.Create time and pursue activities of self-interest that add value

Course handouts (compiled by PS team, MCET)

1. Learner's workbook
2. Personal efficiency Journal
3. Reading material for Personal Effectiveness

Further Reading:

1. Stephen R Covey, "First things first", Simon & Schuster Uk, Aug 1997.
2. Sean Covey, "Seven habits of highly effective teenagers", Simon & Schuster Uk, 2004.
3. College student's guide to time management (e-book)
4. Michael S Dobson, Susan B Wilson, "Goal setting" (e-book)

Modality on Tests and Examinations

S.No	Test/Examination	Criterion		Reduced to marks	Remarks
1	Knowledge test (KT)	Best out of 'n' tests (each conducted for 20 marks) Minimum two tests to be conducted		20 marks	After initial orientation
2	Scenario based knowledge test (SKT)	Best out of the two tests (Maximum for each test is 80 marks)		20 marks	Immediately before and after Reinforcement Workshop
3	Comprehensive Examination	Work book Journal work Viva voce	= 20 marks = 40 marks = 40 marks	60 marks	Conducted at the End of semester by a panel of Internal faculty members
		Total	= 100 marks		
		Mark will be entered in Examination Portal for			

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		100 marks		
		Total marks for the course	100 marks	
		Condition for passing the course	50 marks as a whole	

No. of hours & credits:

Enablement through learning workshops	Trained Internal faculty	2 days7 hours each	14 hours
Progress monitoring (face to face interaction with student and checking workbook/Journal	Internal faculty	1 hour per week	10 hours
Mid semester reinforcement-workshop	Trained Internal faculty	1 day	6 hours
		Total	30 hours
		No. of credits	1

END OF SEMESTER III

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SEMESTER IV

Course Code:16MAT43	Course Title: LINEAR ALGEBRA AND NUMERICAL METHODS(Common to III SEM:ECE, IV SEM: EEE and EIE)	
Core / Elective: General	L: T: P: C	3: 2: 0: 4
Type: Theory and Tutorial	Total Contact Hours:	75

Prerequisites: The student should have undergone the course(s):

- 16MAT13-Engineering Mathematics I
- 16MAT23-Engineering Mathematics II

Course Objectives

The course is intended to:

1. Explain the basic concepts of vector spaces.
2. Formulate orthonormal basis.
3. Solve the system of equations &Calculate the dominant Eigen value.
4. Predict the unknown values from the given set of data & Compute derivatives and integrals.
5. Solve ordinary and partial differential equations.

Unit I - VECTOR SPACES **9+6**

System of linear equations -Vector spaces- Subspace of a vector space- -basis and dimension of vector space —linear combination and spanning sets of vectors -linear independence and linear dependence of vectors— Row space, Column space and Null space- Rank and nullity of subspaces. Applications to linear equations: Simple electrical network problems to find loop current using Kirchhoff's voltage law.

Unit II - ORTHOGONALITY AND INNER PRODUCT SPACES **9+6**

Inner product of vectors: length of a vector, distance between two vectors, and orthogonality of vectors-Orthogonal projection of a vector-Gram-Schmidt process to produce orthogonal and orthonormal basis -Inner product spaces- Fourier approximation of continuous functions using inner product spaces.

Unit III - SOLUTION OF EQUATIONS AND CURVE FITTING **9+6**

Solution of system of linear equations-Direct method: Gaussian elimination method, Iterative methods: Gauss-Seidel - sufficient conditions for convergence. Power method to find the dominant Eigen value and the corresponding Eigen vector. Non-linear equation: Newton method, order of convergence. Curve fitting: Method of least squares.

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Unit IV - INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION 9+6

Unequal intervals: Lagrange's interpolation, Equal intervals: Newton's forward, backward interpolation – Numerical Differentiation. Numerical Integration – Trapezoidal rule – Simpson's 1/3 rule

Unit V - NUMERICAL SOLUTION OF ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9+6

Solution of first order ordinary differential equations: Taylor's series, Euler's method, Runge - Kutta method of fourth order- Multistep method: Adam's method.

Classification of Partial differential equations- Numerical solution of Laplace equation and Poisson equation by Liebmann's method - solution of one dimensional heat flow equation - Bender - Schmidt recurrence relation.

Course Outcomes

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

CO1. Explain the basic concepts of vector spaces.

CO2. Apply inner product of vectors to produce an orthonormal basis.

CO3. Solve the linear, non-linear equations and calculate the dominant Eigen value.

CO4. Predict the unknown values from the given set of data and apply numerical techniquesto find derivatives and to evaluate integrals.

CO5. Solve ordinary and partial differential equations using numerical techniques.

Text Books:

1. David C Lay, Linear Algebra and its Applications, , Pearson Education, New Delhi, Third Edition, 2009.
2. Simantha Pal and Subodh C. Bhunia, Engineering Mathematics, Oxford University Press, New Delhi, First Edition, 2015.

Reference Books:

1. Gilbert Strang, Linear algebra and its Applications, Cengage Learning India Private Limited, New Delhi,Fourth Edition, 2012.
2. Jain M. K., Iyengar, S. R. and Jain, R. K, Numerical Methods for Scientific and Engineering Computation, New age International Publications,New Delhi, Fifth Edition, 2007.
3. Gerald C.F., and Wheatley P.O., Applied Numerical Analysis, Pearson Education, New Delhi, Sixth Edition, 2006.
4. Grewal, B.S. and Grewal, J. S., Numerical methods in Engineering and Science,Khanna Publishers, New Delhi, Sixth Edition,2004.

Web References:

1. http://nptel.ac.in/courses/122104018/node2.html
2. http://nptel.ac.in/courses/111105038/

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Course Code: 16EIT41	Course Title: SIGNALS AND SYSTEM	
Core / Elective: core	L: T: P: C	3: 2: 0: 4
Type: Theory and Tutorial	Total Contact Hours:	75

Prerequisites: The student should have undergone the course(s):

- 16MAT13-Engineering Mathematics I
- 16MAT23-Engineering Mathematics II

Course Objectives

The course is intended to:

CO1: Classify signals and systems & familiarize their mathematical representation.
CO2: Describe sampling theorem and signal reconstruction.
CO3: Represent continuous time signals using Fourier series and Fourier Transforms.
CO4: Represent discrete time signals using Fourier series and Fourier Transforms.
CO5: Analyze Continuous and discrete Systems using Laplace and Z Transforms.

Unit I - CLASSIFICATION OF SIGNALS AND SYSTEMS **9+6**

Introduction to signals & System ,Mathematical representation of Signals, Continuous time (CT) and Discrete time(DT)signals–Elementary signals, operations on independent and dependent variables, classification of CT and DT signals - Periodic & Aperiodic , Deterministic & Random , Energy & Power - CT &DT systems- Classification of systems – Static & Dynamic, Linear & Nonlinear, Time-variant & Time-invariant, Causal &Noncausal, Stable & Unstable.

Unit II - SIGNAL DISCRETIZATION AND LTI SYSTEMS **9+6**

Discretization of signals: Sample and Hold Circuits ,Sampling: Sampling theorem ,Selection of sampling rate, Types of Sampling, Aliasing: aliasing effects, anti-aliasing filter, Quantization: Quantization errors, Fixed point and floating point representations, Linear Time Invariant /Linear Shift Invariant (LTI/LSI) Systems, Convolution Integral, Convolution Sum, Correlation, Circular convolution, Sectioned convolution, Overlap add and Overlap Save Methods.

Unit III - FOURIER REPRESENTATION OF CONTINUOUS TIME SIGNALS **9+6**

Fourier Representation of Continuous Time Periodic Signals -CTFS, Properties, Fourier Representation of Continuous Time Non-Periodic Signals -CTFT, Properties.

Unit IV - FOURIER REPRESENTATION OF DISCRETE TIME SIGNALS **9+6**

Fourier Representation of Discrete Time Periodic Signals -DTFS, Properties, Fourier Representation of Discrete Time Non-Periodic Signals -DTFT, Properties.

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Unit V - SYSTEM ANALYSIS USING LAPLACE AND Z TRANSFORMS 9+6

Laplace Transforms, Properties, Inverse Laplace Transforms, Analysis of continuous systems using Laplace Transforms, Z Transforms, ROC, Properties, Inverse Z Transforms, Analysis of discrete systems using Z Transforms.

Course Outcomes

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

CO1: Classify signals and systems & familiarize their mathematical representation.

CO2: Describe sampling theorem and signal reconstruction.

CO3: Represent continuous time signals using Fourier series and Fourier Transforms.

CO4: Represent discrete time signals using Fourier series and Fourier Transforms.

CO5: Analyze Continuous and discrete Systems using Laplace and Z Transforms.

Text Books:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab "Signals and Systems", Pearson Education, 2007.
2. Simon Haykins and Barry Van Veen, Signals and Systems John Wiley & sons, Inc, 2004.

Reference Books:

1. H.P Hsu, RakeshRanjan" Signals and Systems", Schaum's Outlines, Tata McGraw Hill, Indian Reprint, 2007
2. Edward W Kamen& Bonnie's Heck, "Fundamentals of Signals and Systems", Pearson Education, 2007.
3. B. P. Lathi, "Principles of Linear Systems and Signals", Second Edition, Oxford, 2009.
4. R.E.Zeimer, W.H.Tranter and R.D.Fannin, "Signals & Systems - Continuous and Discrete", Pearson, 2007.
5. John Alan Stuller, "An Introduction to Signals and Systems", Thomson, 2007.

Web References:

1. http://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011
2. http://nptel.ac.in/courses/117104074
3. http://www.nptel.ac.in/courses/117101055

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Course Code: 16EIT42	Course Title: : INDUSTRIAL INSTRUMENTATION - I	
Core / Elective: General	L: T: P: C	3: 0: 0: 3
Type: Theory and Tutorial	Total Contact Hours:	45

Prerequisites: The student should have undergone the course(s):

- 16EIT32-Transducer Engineering

Course Objectives

The course is intended to:

1. Explain the principle and working of force, torque and velocity measuring instruments.
2. Describe the different measuring methods of acceleration, vibration and density.
3. Explain the various techniques for pressure measurement.
4. Illustrate the temperature standards, calibration and signal conditioning for temperature
5. Provide knowledge on non-contact type temperature measuring instruments.

Unit I - MEASUREMENT OF FORCE, TORQUE AND VELOCITY 9

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

Unit II - MEASUREMENT OF ACCELERATION, VIBRATION AND DENSITY 9

Accelerometers - LVDT, Piezoelectric, Strain gauge and Variable reluctance type accelerometers - Mechanical type vibration instruments - Seismic instruments as accelerometer - Vibration sensor - Calibration of vibration pickups - Units of density and specific gravity - Baume scale and API scale - Float type densitometers - Ultrasonic densitometer - gas densitometer.

Unit III - PRESSURE MEASUREMENT 9

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

Unit IV - TEMPERATURE MEASUREMENT - I 9

Definitions and standards - Primary and secondary fixed points - Calibration of thermometers - Different types of filled in system thermometers - Sources of errors in - filled in systems and their compensation - Bimetallic thermometers - RTD - characteristics and signal conditioning-3 lead and

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4 lead RTDs - Thermistors.

Unit V - TEMPERATURE MEASUREMENT – II 9

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

Course Outcomes

At the end of this 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.

Text Books:

1. Doebellin, E.O.andManikD.N.,Measurement systems Application and Design, Special Indian Edition, Tata McGraw Hill Education Pvt.Ltd,2007
2. Jones.B.E, Instrument Technology, Vol.2, Butterworth-Heinemann, International Edition, 2003.

Reference Books:

1. Liptak, B.G., Instrumentation Engineers Handbook (Measurement), CRC Press, 2005
2. Patranabis,D., Principles of Industrial Instrumentation, 3rd Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2010.
3. Eckman D.P., Industrial Instrumentation, Wiley Eastern Limited, 1990.

Web References:

1. http://www.nptelvideos.in/2012/11/industrial-instrumentation.html
2. http://www.pacontrol.com/industrial-instrumentation.html
3. http://www.endress.com/en/Field-instruments-overview

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Course Code: 16EIT43	Course Title: MICROPROCESSOR AND MICROCONTROLLER	
Core	L: T: P: C	3: 0: 2: 4
Type: Theory and Tutorial	Total Contact Hours:	75

Prerequisites: The student should have undergone the course(s):

- 16EET31-Digital Electronics

Course Objectives

The course is intended to:

1. Explain the architecture of 8085 microprocessor
2. Write assembly language programs for 8085 microprocessor
3. Explain the function of interfacing devices used with 8085 microprocessor
4. Describe the architecture of 8051 Microcontroller
5. Explain Interfacing techniques using 8051 microcontroller

Unit I - 8085 MICROPROCESSOR 9

Introduction to Microprocessors - Evolution of microprocessor - 8085 Microprocessor: Architecture, Signals, Memory interfacing, I/O Devices Interfacing, Timing Diagram, Interrupt structure–Von Neumann architecture vs.Harvard architecture –Pipelining in Microprocessor.

Unit II PROGRAMMING OF 8085 PROCESSOR 9

Assembly language format - Addressing modes - Instruction sets: Data transfer instruction set, Arithmetic & Logic Instruction set – Branching & control Instruction set – Simple Assembly level programs - Code Conversion: Binary to ASCII & ASCII to Binary.

Unit III - PERIPHERALS INTERFACING 9

Interfacing of 8085 with: Keyboard & display unit [8279 IC] – Parallel peripheral interface [8255] – Interrupt controller interface [8259 PIC] – USART interface [8251] - DMA controller

Unit IV - 8051 MICROCONTROLLER 9

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

Unit V - 8051 INTERFACING ANDAPPLICATIONS 9

Interfacing of 8051with: Analog Sensors, Keypad & LCD display, ADC, DAC, DC motor.

LABORATORY EXPERIMENTS **30Hrs**

ALP using 8085 Microprocessor & 8051 Microcontroller

1. Programming for 8 / 16 bit Arithmetic operations Using 8085

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2. Finding Largest / Smallest number in an array

3. Interfacing 8255 and 8279 with 8085

4. Programming for 8 bit Arithmetic operations Using 8051

5. Interfacing of Traffic light controller with 8085/ 8051

6. Speed and direction control of DC motor Module using 8085 /8051

7. Interfacing of temperature sensor with 8085 /8051 using ADC IC and display the results in LCD

Course Outcomes

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

CO1. Summarize the architecture of 8085 microprocessor

CO2. Write assembly language programs for 8085 microprocessor

CO3. Explain the function of interfacing devices used with 8085 microprocessor

CO4. Describe the 8051 Microcontroller architecture

CO5. Practice the Interfacing techniques using 8051 microcontroller

Text Books:

1. R.S.Gaonkar, "Microprocessor Architecture, Programming and Applications with the 8085", 6th Edition, Prentice Hall, 2013.
2. Kenneth J.Ayala., "The 8051 Microcontroller", 3rd Edition, Thompson Delmar Learning, 2011, New Delhi.

Reference Books:

1. Muhammad Ali Mazidi, Janice GillispieMazidi, Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems", 2nd Edition, Pearson Education 2008.
2. Krishna Kant, "Microprocessor and Microcontroller Architecture, Programming and System Design using 8085, 8086, 8051 and 8096", PHI, 2011.
3. Ajay Deshmukh, "Microcontrollers: Theory and Applications", Tata McGraw Hill, 2010.
4. P.K.Ghosh, P.R.Sridhar, "Introduction to Microprocessors for Engineers and scientists", 2nd edition, PHI publications, 2009.

Web References:

1. http://nptel.ac.in/courses/Webcourse-contents/IIT KANPUR/microcontrollers/micro/ui/TOC.htm
2. http://www.nptel.ac.in/downloads/106108100/
3. http://www.ustudy.in/ece/mpmc/u1

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Course Code: 16CST47	Course Title: DATA STRUCTURES AND ALGORITHMS	
Core	L: T: P: C	3: 0: 0: 3
Type: Theory and Tutorial	Total Contact Hours:	45

Prerequisites: The student should have undergone the course(s):

- 16GET14-C Programming

Course Objectives

The course is intended to:

1. Explain the working of various linear data structures
2. Summarize the concept of hashing and priority queue
3. Describe the working of various non linear data structures.
4. Illustrate different searching and sorting techniques with their efficiency.
5. Demonstrate different algorithm design techniques

Unit I - INTRODUCTION TO OBJECT ORIENTED PROGRAMMING AND LINEAR DATASTRUCTURES 9

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 9

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 9

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

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

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

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Bound (Job Scheduling).

Course Outcomes

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

CO1 Explain the concepts of list, stack, queue and their applications

CO2 Summarize the concept of Hashing and Priority queue used in efficient data access.

CO3 Describe Graphs, Graph traversal techniques and Shortest path algorithms.

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

CO5 Demonstrate different techniques used in designing efficient algorithms.

Text Books:

1. Mark A. Weiss., "Data Structures and Algorithm Analysis in C++", Fourth Edition, Pearson Education, 2013.
2. AnanyLevitin, "Introduction to the Design & Analysis of Algorithms", Pearson Education, Third Edition, 2011.
3. Balagurusamy.E, "Object Oriented Programming with C++", 4th edition, Tata McGrawHill, New Delhi 2008.

Reference Books:

1. Alfred V. Aho, John E. Hopcroft and Jeffry D. Ullman, Data Structures and Algorithms,Pearson Education, New Delhi, 2006
2. SartajSahni, "Data Structures, Algorithms and Applications in C++", Second Edition, Universities Press, 2005.
3. Sahni, "Data Structures Using C++", McGraw-Hill, New Delhi, 2006.
4. Seymour, "Data Structures", McGraw-Hill, New Delhi, 2007.

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

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Course Code:16MET46	Course Title: THERMODYNAMICS AND FLUIDMECHANICS	
Core	L: T: P: C	3: 0: 0: 3
Type: Theory	Total Contact Hours:	45

Prerequisites: The student should have undergone the course(s):

- 16PHT13 - Engineering Physics

Course Objectives

The course is intended to:

1. Explain the fundamentals of fluid mechanics and thermodynamics
2. Explain the basic concepts involved in turbines
3. Explain the types of compressors and refrigeration cycle
4. Describe the applications of the flow through pipes and hydraulic machines
5. Explain the working and performance of different types of pumps .

Unit I - BASIC CONCEPTS AND LAWS OF THERMODYNAMICS 9

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 - TURBINES (QUALITATIVE APPROACH) 9

Formation of steam – Properties of steam –Steam turbines: Impulse and reaction type. Hydraulic Turbines -Impulse and reaction types.

Unit III - COMPRESSORS AND REFRIGERATION 9

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 – simple vapour compression cycle- vapour absorption cycle.

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Unit IV - FLUID PROPERTIES & FLOW THROUGH PIPES 9

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 - PUMPS 9

Centrifugal pumps - performance curves for pumps. Reciprocating pumps – Indicator diagrams, Work saved by air vessels – Rotary pumps – Classification. Working and performance curves.

Course Outcomes

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

CO 1. Explain the fundamentals of fluid mechanics and thermodynamics

CO 2. Describe the basic concepts involved in turbines

CO 3. Illustrate the types of compressors and refrigeration cycle

CO 4. Describe the applications of the conservation laws to flow through pipes and hydraulic

CO 5. Explain the types of pumps with performance curves

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, 2005

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. http://nptel.ac.in/courses/112105123/1
2. http://nptel.ac.in/downloads/103101004/
3. http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/Basic_Thermodynamics/ui/TOC.htm
4. http://nptel.ac.in/courses/Webcourse-contents/IISc-BANG/Basic%20Thermodynamics/New_index1.html

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Head of the Department,
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5. http://nptel.ac.in/courses/112105171/1
6. http://nptel.ac.in/courses/105101082/
7. http://nptel.ac.in/courses/112104118/
8. http://nptel.ac.in/courses/103104043/

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Course Code:16EIL41	Course Title: TRANSDUCER AND MEASUREMENTS LABORATORY	
Core / Elective: Core	L: T: P: C	0 : 0 : 4 : 2
Type: Practical	Total Contact Hours:	60

Prerequisites: The student should have undergone the course(s):

- 16EIT32 - Transducer Engineering
- 16EIT31 - Electrical Machines and Measurements

Course Objectives

The course is intended to:

1. Plot the static error analysis of a transducer.
2. Analyze the characteristics of various transducers.
3. Verify the resistive, inductive and capacitive values using bridges.
4. Select the suitable electrical instruments to measure voltage, current, power and energy.
5. Calibrate the basic electrical measuring instruments.

LIST OF EXPERIMENTS:

1. Statistical error analysis of a transducer.
2. Characteristics of resistive, capacitive and inductive transducers.
3. Characteristics of Piezoelectric and Hall Effect transducers.
4. Characteristics of optical transducers.
5. Characteristics of temperature transducers.
6. Step response of RTD and voltmeter.
7. Measurement of high and low resistance values using bridges.
8. Measurement of capacitance and inductance values using bridges.
9. Measurement of power and energy in 3 phase circuits.
10. Measurement of current and voltage using CT and PT.
11. Calibration of voltmeter and ammeter.
12. Calibration of Wattmeter and Energy meter.

Course Outcomes

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

CO1: Plot the static error analysis of a transducer.

CO2: Analyze the characteristics of various transducers.

CO3: Verify the resistive, inductive and capacitive values using bridges.

CO4: Select the suitable electrical instruments to measure voltage, current, power and energy.

CO5: Calibrate the basic electrical measuring instruments.

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Course Code:16CSL43	Course Title: DATA STRUCTURES AND ALGORITHMS LABORATORY	
Core / Elective: Core	L: T: P: C	0 : 0 : 4 : 2
Type: Practical	Total Contact Hours:	60

Prerequisites: The student should have undergone the course(s):

- 16GET14 -C Programming

Course Objectives

The course is intended to:

CO1. Implement linear data structures using array and linked list

CO2. Implement hashing and heap

CO3. Implement non-linear data structures such as Trees and Graphs

CO4: Implement problems solved using divide and conquer and greedy technique

CO5: Implement problems solved using backtracking and dynamic programming

LIST OF EXPERIMENTS:

1. Array implementation of List Abstract Data Type (ADT)
2. Linked list implementation of List ADT
3. Array implementation of Stack ADT
4. Array implementation of Queue ADT
5. Implement a hashing technique
6. Implement Binary heap
7. Implement Binary Search Tree
8. Implement Dijkstra's algorithm
9. Implement searching techniques
10. Implement Quick Sort & Merge sort
11. Implement n-queen problem using backtracking technique
12. Implement traveling salesman problem using dynamic programming approach

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 hashing and heap

CO3. Implement non-linear data structures such as Trees and Graphs

CO4: Implement problems solved using divide and conquer and greedy technique

CO5: Implement problems solved using backtracking and dynamic programming

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Course Code : 16PSL41	Course Title : ETHICAL AND MORAL RESPONSIBILITY (Common to all B.E/B.Tech Programmes)	
General	L : T : P: C	0 : 0 : 2 : 1
Type: PS	Total Contact hours:	30 Hours

Prerequisites: The student should have undergone the course(s):

- Nil

Course Objectives

The course is intended to:

1. Articulate the importance of ethical and moral responsibilities
2. Explain the fundamental aspects of ethics and morality
3. Validate one's appropriate and inappropriate behaviors.
4. Elaborate code of conduct
5. Explain the importance of professional practices.

UNIT I –ETHICAL PRACTICES – IMPORTANCE 8*

Why ethical practices; The current day scenario of ethical practices – parents, society, politics & business; Awareness of skewedness of information – news, advertisements and other media; The need for ethical and moral responsibility on a personal level; Handling oneself amidst peer pressure and societal pressure

UNIT II –ETHICAL PRACTICES – FUNDAMENTALS 6*

Morality & Ethics; Moral issues, inquiry, moral dilemmas; Moral autonomy – Kohlberg's theory and Gilligan's refinement; Theories on "right action" – virtue ethics, utilitarianism, duty ethics, rights ethics – resolving moral dilemmas; justifying moral obligations;

UNIT III –CODES OF CONDUCT 8*

Importance of code of conduct and its role; Evolving draft Code of conduct for different roles – son/daughter, student, future employee & citizen; Reflection on real time incidences at the college.

Engineers as responsible experimenters; Faith of the Engineer (ABET); Pledge and Code of ethics as per National Society of Professional Engineers (NSPE); Code of Ethics of Institution of Engineers (India); Case studies and discussions in professional context

UNIT IV – PROFESSIONAL PRACTICES AT WORK 8*

Transition from a student to a professional; Importance of professional practices at work; Integrity as the topmost virtue of a professional; Self-awareness: Where competence ends and professionalism takes over; Professional qualities;

Need to align oneself to culture & values of organizations; Need to embrace diversity in organizations

Course Outcomes

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

CO1. Articulate the importance of ethical and moral responsibilities

CO2. Explain the fundamental aspects of ethical practices

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CO3. Validate one's appropriate and inappropriate behaviors in various roles
CO4. Elaborate code of conduct of professional bodies
CO5. Explain the importance of professional practices as a future employee/entrepreneur

Assessments

Assessment	Details	Wt:	Administration	When
Class room participation	Group assignments presentation; Case discussions participation	70%	Continuous assessment in class	During class
Knowledge test	Multiple choice questions	10%	Pen and Paper	End of course
Scenario based assessments	Multiple choice questions	20%	Pen and Paper	End of course

No. of hours & credits

Enablement through class room lecture, case discussions and group presentations	Conducted by trained internal faculty	30 hours – 1 credit
At least two guest lectures	Delivered by senior people from Industries/Government organizations	

Course handouts (compiled by Professional Skills team, MCET)

1. Instructor's Manual (for the faculty)
2. Learner's workbook (for the student)

Reference Books

1. Mike W Martin & Roland Schinzenger, "Ethics in Engineering", Latest Edition, Tata McGraw-Hill
2. Code of conduct document, MCET student handbook
3. Gail D Baura, "Engineering Ethics - an industrial perspective", Academic Press, Elsevier,
4. SubratoBagchi, "The professional - Defining the new standard of Excellence at work", Penguin Books India.

END OF SEMESTER IV

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Perundurai - 638 060, Coimbatore District, Tamilnadu.

SEMESTER V

Course Code: 16EIT51	Course Title: CONTROL SYSTEMS (Common to EEE, EIE & MCE)	
Core	L : T : P : C	3 : 2 : 0 : 4
Type: Theory	Total Contact hours	75

Prerequisites: The student should have undergone the course(s):

- 16MAT13 -Engineering Mathematics – I
- 16MAT23 -Engineering Mathematics – II

Course Objectives

The course is intended to:

1. Model electrical and mechanical systems using transfer function.
2. Determine the time response and time domain specifications of first order and second order systems
3. Analyse the given first order and second order system with their frequency domain specifications.
4. Analyse the stability of the given system.
5. Design compensator using bode plot technique

UNIT I – CONTROL SYSTEM MODELING 9+6

Basic Elements of Control System – Open loop and Closed loop systems - Transfer function, Modelling of Electrical systems, mechanical systems: Translational and rotational systems- Transfer function of armature and field controlled DC motor- Block diagram reduction Techniques – Signal flow graph.

UNIT II – TIME RESPONSE ANALYSIS 9+6

Standard test signals - Time response of first order systems - Impulse and Step Response analysis of second order systems – Time Domain specifications - Steady state errors and error constants – Effects of P, PI, PD and PID Controllers on the system's response

UNIT III – FREQUENCY RESPONSE ANALYSIS 9+6

Frequency Response – Bode Plot: Gain margin, Phase margin, gain & phase crossover frequency- Polar Plot: Gain margin, Phase margin, - Frequency Domain specifications from the plots – correlation between time domain and frequency domain specifications

UNIT IV – STABILITY ANALYSIS 9+6

Stability, Routh -Hurwitz Criterion, Concept of Root Locus Technique, Construction of Root Locus, Effects of adding poles and zeros – Nyquist Stability Criterion

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UNIT V – COMPENSATOR DESIGN **9+6**

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

Course Outcomes

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

CO1. Model electrical and mechanical systems using transfer function.

CO2. Determine the time response and time domain specifications of first order and second order systems

CO3. Analyse the given first order and second order system with their frequency domain specifications.

CO4. Analyse the stability of the given system.

CO5. Design compensator using bode plot technique

Text Books

1. J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 6th Edition, 2017.
2. Benjamin C. Kuo, 'Automatic Control systems', 10 edition Pearson Education, New Delhi, 10th Edition, 2017.

Reference Books

1. Norman S. Nise, 'Control Systems Engineering', John Wiley, New Delhi, Sixth Edition, 2011.
2. SamarajitGhosh, 'Control systems Theory and Applications ', Pearson Education, New Delhi, Second Edition 2012.
3. M. Gopal, 'Control Systems, Principles and Design', Tata McGraw Hill, New Delhi, Fourth Edition 2012.
4. K. Ogata, 'Modern Control Engineering', Pearson Education India, New Delhi, Fifth Edition 2015.
5. Richard C.Dort and Robert H.Bishop, "Modern Control Systems ", Pearson Prentice Hall , Thirteenth Edition 2016.

Web References

1. http://nptel.ac.in/courses/108101037/1
2. https://www.tutorialspoint.com/control_systems/control_systems
3. http://lpsa.swarthmore.edu/Root_Locus/RLocusExamples.html
4. https://in.mathworks.com/help/control/examples/compensator-design-for-systems-represented-by-frequency-response-data.html

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Course Code: 16EIT52	Course Title: INDUSTRIAL INSTRUMENTATION – II	
Core	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16EIT32- Transducer Engineering
- 16EIT42 - Industrial Instrumentation– 1

Course Objectives

The course is intended to:

1. Explain variable head type flow meters.
2. Describe working of quantity meters, area flow meters and mass flow meters.
3. Describe working of electrical type flow meters.
4. Explain various level measurement techniques.
5. Explain Viscosity, Humidity and Moisture measurements.

UNIT I – VARIABLE HEAD TYPE FLOWMETERS 9

Expression for flow rate through restriction(compressible and incompressible flow) - Orifice plate – different types of orifice plates – Cd variation – pressure tappings – Venturi tube – Flow nozzle – Dall tube – Elbow taps - Pitot tube – combined pitot tube - averaging pitot tube – installation and applications of head flow meters.

UNIT II – QUANTITY METERS, AREA FLOW METERS AND MASS FLOW METERS 9

Positive displacement flow meters – Nutating disc, Reciprocating piston and Oval gear flow meters – Inferential meter – Turbine flow meter – Variable Area flow meter – Rotameter – theory, characteristics, installation and applications – Mass flow meter – Angular momentum – Thermal, Coriolis type mass flow meters – Calibration of flow meters – Dynamic weighing method.

UNIT III – ELECTRICAL TYPE FLOW METERS 9

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

UNIT IV – LEVEL MEASUREMENT 9

Level measurement – Float gauges - Displacer type –D/P methods - Load cell – Electrical types: Conductivity sensors – Capacitive sensors – Nucleonic gauge - Ultrasonic gauge – Boiler drum level measurement: – Differential pressure and

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Hydrastep methods - Solid level measurement.

UNIT V – MEASUREMENT OF VISCOSITY, HUMIDITY AND MOISTURE 9

Viscosity: Saybolt viscometer - Rotameter type and Torque type viscometers – Humidity: Dry and wet bulb psychrometers – Resistive and capacitive type hygrometers – Dew cell – Commercial type dew meter – Moisture: Different methods of moisture measurements – Thermal and Distillation methods - Conductivity and Capacitive sensors-Microwave, IR and NMR sensors - Application of moisture measurement Moisture measurement in solids.

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

Text Books

1. Doebelin, E.O.andManik,D.N., Measurement Systems Application and Design, Special Indian Edition, Tata McGraw Hill Education Pvt.Ltd.,2007.
2. Patranabis,D. Principles of Industrial Instrumentation, 3rd Edition, Tata McGraw Hill, New Delhi, 2010.

Reference Books

1. Liptak, B.G., Instrumentation Engineers Handbook (Measurement), CRC Press,2005.
2. Singh,S.K., Industrial Instrumentation and Control, Tata McGrawHill Education Pvt. Ltd., New Delhi,2009.
3. Jain, R.K., Mechanical and Industrial Measurements, Khanna Publishers, Delhi, 2002

Web References

1. http://www.nptelvideos.in/2012/11/industrial-instrumentation.html
2. http://www.pacontrol.com/industrial-instrumentation.html
3. http://www.endress.com/en/Field-instruments-overview

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Course Code: 16EIT53	Course Title: VLSI DESIGN (Common EEE & EIE)	
Core	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16EIT33 - Linear integrated circuits and Applications
- 16EET31 - Digital Electronics

Course Objectives

The course is intended to:

1. Describe the VLSI design flow and fabrication Techniques
2. Explain the characteristics and operation
3. Design digital circuits
4. Develop VHDL programs
5. Explain the different types of fault and testing principles.

UNIT I – INTRODUCTION 9

VLSI Design process: Design specification- design entry – functional simulation – planning, placement and routing – timing simulation, fabricating into chip- CMOS processing technologies - nWell - pWell - Twin tub - Silicon on insulator.

UNIT II – MOS TRANSISTORS AND INVERTERS 9

Basic MOS Transistors & Operation: NMOS enhancement transistor - PMOS enhancement transistor - Threshold Voltage-Derivation of Drain Current- Channel length modulation- Body Effect –Trans conductance –MOSFETS as Switches - CMOS Inverter – Latch-up in CMOS Circuit - Power Dissipation in CMOS Circuits.

UNIT III – LOGIC DESIGN WITH CMOS 9

Combinational Circuit Design: Logic Gates in Static CMOS - Transistor sizing – Stick diagram, Layout diagrams & Design Rules – Ratioed circuits: Pseudo NMOS – cascode voltage switch logic - Dynamic CMOS logic: domino logic, Dual rail Domino Logic –Transmission gate - pass-transistor circuits - Scaling of MOSFETs & its effects.

UNIT IV – VHDL PROGRAMMING FOR SUBSYSTEM DESIGN 9

Introduction to VHDL: entities, architectures, signals, variables and constants – inertial and transport delay - arrays–operators - functions – procedures – packages and libraries - types of modeling: Structural, dataflow and behavioral modeling –VHDL Programs for simple adders and multipliers –Test Bench - FPGA: Architecture and Programming Technologies.

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UNIT V – TESTING OF DIGITAL CIRCUITS 9

Need for testing-Failures and fault-Modelling of fault: Stuck at faults-Bridging faults-Break and transistor stuck on/open faults-Delay faults-temporary Faults-design of testability: Ad-hoc testing, scan design, BIST, IDDQ testing, Boundary scan.

Course Outcomes

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

CO1. Explain the VLSI design flow and CMOS design processes with appropriate fabrication technologies.

CO2. Describe MOS transistors and CMOS inverter with relevant characteristics

CO3. Design various digital circuits using appropriate CMOS logic styles

CO4. Develop VHDL programs for various digital logic circuits using data path elements

CO5. Categorize the faults in VLSI circuits using suitable testing methods.

Text Books

1. Weste and Harris, "CMOS VLSI Design" (Third edition) Pearson Education, 2005.
2. Charles H.Roth, "Digital System design using VHDL", Thomson business information India Pvt Ltd, 2006.
3. Neil H.E. Weste and Kamran Eshraghian, "Principles of CMOS VLSI Design", Pearson Education ASIS 2 nd Edition, 2000.

Reference Books

1. Uyemura J.P, "Introduction to VLSI circuits and systems" , John Wiley and Sons, Inc., 2002.
2. Eugene D. Fabricius , "Introduction to VLSI design" , McGraw-Hill International Edition,1990
3. Pucknell "Basic VLSI Design", Prentice Hall of India Publication,1995.
4. Wayne Wolf, " Modern VLSI Design System on chip", Pearson Education, 2002
5. P.K.Lala, "Digital Circuit Testing and Testability", Academic Press, 2002

Web References

1. http://nptel.ac.in/courses/117106093/
2. http://www.vlsi-expert.com/p/vlsi-basic.html

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Course Code: 16MAT51	Course Title: PROBABILITY AND RANDOM PROCESS	
Core	– L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16MAT13-Engineering Mathematics I
- 16MAT23-Engineering Mathematics II

Course Objectives

The course is intended to:

1. Characterize probability models
2. Characterize two dimensional probability models
3. Understand the classification of random process
4. Determine correlation and spectral density functions of a random process
5. Apply the random inputs to the linear systems.

UNIT I – RANDOM VARIABLES 9

Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Uniform, Exponential and Normal distributions.

UNIT II – TWO-DIMENSIONAL RANDOM VARIABLES 9

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression.

UNIT III – RANDOM PROCESSES 9

Classification – Stationary process – Markov process - Poisson process.

UNIT IV – CORRELATION AND SPECTRAL DENSITIES 9

Auto-correlation functions – Cross-correlation functions – Properties – Power spectral density – Cross-spectral density – Properties.

UNIT V – LINEAR SYSTEMS WITH RANDOM INPUTS 9

Linear time invariant system – System transfer function – Linear systems with random inputs – Autocorrelation and Cross-correlation functions of input and output.

Course Outcomes

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

CO1. Characterize probability models using random variables

CO2. Characterize two dimensional probability models using random variables

CO3. Understand the classification of random process to interpret the random nature of signals.

CO4. Determine correlation and spectral density functions of a random process using their properties

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CO5. Apply the random inputs to the linear systems

Text Books

1. Peebles, P.Z., "Probability, Random Variables and Random Signal Principles", Tata McGrawHill, New Delhi, 4th Edition, 2002.
2. Veerarajan, T., "Probability, Statistics and Random Processes", Tata McGraw-Hill Education, New Delhi, Third Edition,2008.

Reference Books

1. Miller, S. L. and Childers, D. G., "Probability and Random Processes with Applications to SignalProcessing and Communications", Academic Press, Second Edition,2012.
2. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables andRandom Processes", Tata McGraw Hill, New Delhi, 9th Reprint, 2010.

Web References:

1. http://nptel.ac.in/courses/117105085/

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Course Code : 16EIT54	Course Title : COMMUNICATION ENGINEERING	
Core/Elective: Core	L : T : P: C	3 : 0 : 0 : 3
Type: Theory	Total Contact hours:	45

Prerequisites: The student should have undergone the course(s):

- 16EIT42 - Signals & Systems

Course Objectives

The course is intended to:

1. Describe different amplitude and frequency modulation schemes.
2. Explain different pulse modulation schemes.
3. Identify various baseband coding techniques.
4. Explain various digital modulation techniques.
5. Summarize various communication systems.

UNIT I – AMPLITUDE AND FREQUENCY MODULATION 9

Need for modulation, Amplitude modulation: Principle, Spectrum, Modulation index, DSB-FC, DSB-SC and SSB generation, AM reception- Super heterodyne receiver, Frequency modulation: Principle, Spectrum, Modulation index, FM generation.

UNIT II – PULSE MODULATION TECHNIQUES 9

Sampling theorem & Signal Recovery. Principles of PAM, PPM, PWM, PCM, DPCM, DM and ADM.

UNIT III – BASEBAND CODING TECHNIQUES 9

Baseband coding techniques: Unipolar, Polar, Bipolar, RZ, NRZ-L, NRZ-M ,NRZ-S, Bi-Phase-L, Bi-Phase-M ,Bi-Phase-S, and Manchester Coding techniques.

UNIT IV – DIGITAL MODULATION TECHNIQUES 9

Digital modulation systems: Synchronous & Asynchronous transmission, ASK, BFSK, BPSK and QPSK - Coherent reception - Signal space representations.

UNIT V – COMMUNICATION SYSTEMS 9

Concept of multiplexing: FDM and TDM. Multiple Accesses: FDMA, TDMA and CDMA. Mobile communication - Satellite communication.

Course Outcomes

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

CO1. Describe different amplitude and frequency modulation schemes.

CO2. Explain different pulse modulation schemes.

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CO3. Identify various baseband coding techniques.

CO4. Explain various digital modulation techniques.

CO5. Summarize various communication systems.

Text Books

1.Taub&Schiling "Principles of Communication Systems" ,4'th Edition,Tata McGraw hill 2017.

2.J.Das "Principles of Digital Communication" ,2nd Edition,New Age International, 2016.

Reference Books

1. Kennedy and Davis "Electronic Communication Systems" Tata McGraw hill, 5th Edition, 2013.

2. Sklar "Digital Communication Fundamentals and Applications", Pearson Education, 2nd Edition,2009.

3. Bary le, Memuschmidt, Digital Communication, Kluwer Publication, 2004.

4. B.P.Lathi "Modern Digital and Analog Communication Systems" ,4thEdition,Oxford University Press, 2017.

Web References

1. nptel.ac.in/courses/117102059/
2. nptel.ac.in/downloads/117105077/
3. https://ocw.mit.edu/courses/16-36-communication-systems-engineering

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Course Code: 16EIL51	Course Title: SYSTEM SIMULATION LABORATORY	
Core	L : T : P : C :	0 : 0 : 4 : 2
Type: Practical	Total Contact hours :	60

Prerequisites: The student should have undergone the course(s):

- Nil

Course Objectives

The course is intended to:

1. Create sub VI programs.
2. Interface instrument and circuits with different DAQ card
3. Identify the transfer function of the DC and AC motors
4. Analyze the performance of motor under open and closed loop
5. Analyze the time and frequency domain specifications of linear time invariant system

LIST OF EXPERIMENTS

1. Creating Simple VI's, Editing, Debugging and SubVI
2. Temperature Signal Interface with data logging Using DAQ
3. Illustrating digital logic circuits: MUX, DEMUX
4. Design a LPF and HPF circuits using DAQ cards
5. Generating PWM using LINX Firmware
6. Design of controller for an Inverted Pendulum
7. Identify the transfer function of DC Motor
8. Identify the transfer function of AC Servo Motor
9. Open and Closed loop Speed analysis of DC Motor
10. Linear System analysis (Time domain analysis) using MATLAB
11. Stability analysis (Bode, Root Locus, Nyquist) of linear time invariant system using MATLAB
12. Design of compensators using MATLAB.

Course Outcomes

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

CO1. Create sub VI programs.

CO2. Interface instrument and circuits with different DAQ card

CO3. Identify the transfer function of the DC and AC motors

CO4. Analyze the performance of motor under open and closed loop

CO5. Analyze the time and frequency domain specifications of linear time invariant system

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Course Code: 16EIL52	Course Title: INDUSTRIAL INSTRUMENTATION LABORATORY	
Core	L : T : P : C :	0 : 0 : 4 : 2
Type: Practical	Total Contact hours :	60

Prerequisites: The student should have undergone the course(s):

- 16EIT42 – Industrial Instrumentation – I
- 16EIL41 – Transducer and Measurement Laboratory

Course Objectives

The course is intended to:

1. Demonstrate the working of temperature, flow, level and pressure measuring instruments.
2. Calibrate the pressure gauge and temperature transducer with suitable instruments.
3. Select the suitable instrument to measure parameters like pH, viscosity and torque.
4. Demonstrate the working principle of I/P and P/I converter and UV- Visible spectrophotometer.
5. Demonstrate the various patient monitoring equipment's.

LIST OF EXPERIMENTS

1. Measurement of Temperature and pressure.
2. Measurement of Flow.
3. Discharge coefficient of orifice and venture flow meter.
4. Measurement of Level using DPT and torque tube.
5. Measurement of pH and viscosity.
6. Measurement of torque and load.
7. Calibration of pressure gauge and temperature transducer.
8. I/P and P/I converter.
9. Study of UV - Visible spectrophotometer.
10. Measurement of pulse rate and respiration rate.
11. Measurement of blood pressure and phonocardiogram.
12. Patient monitoring system.

Course Outcomes

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

CO1. Demonstrate the working of temperature, flow, level and pressure measuring instruments.

CO2. Calibrate the pressure gauge and temperature transducer with suitable instruments.

CO3. Select the suitable instrument to measure parameters like pH, viscosity and torque.

CO4. Demonstrate the working principle of I/P and P/I converter and UV- Visible spectrophotometer.

CO5. Demonstrate the various patient monitoring equipment's.

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Course Code: 16PSL51	Course Title: TEAMNESS AND INTER-PERSONAL SKILLS (Common to all B.E/B.Tech Programmes)	
General	L : T : P : C :	0 : 0 : 2 : 1
Type: Practical	Total Contact hours :	30 Hours

Prerequisites: The student should have undergone the course(s):

- NIL

Course Objectives

The course is intended to:

1. Be aware of attitudinal, behavioral and emotional aspects of self
2. Learn continuously and be in harmony with self.
3. Understand others' preferences, values, roles & contexts
4. Identify barriers to harmonious relationships
5. Work collaboratively as a team

UNIT I – HARMONY WITH SELF

Importance of learning about self continuously; Approaches to learn about self: introspection, being open to feedback, critical incidences as opportunities; Understanding life stages and challenges associated with them; Healthy ways of handling self in response to life's challenges;

Instruments/inventories to understand self and others: A) Know your temperament, B) Mayer Briggs Type Indicator, C) Interpersonal Needs Inventory

UNIT II – HARMONY WITH OTHERS

Importance of living in harmony with others; What it takes to live in harmony with others; Understanding preferences, values, roles and contexts of others; Approaches to navigating through differences between self and others;

Barriers to harmonious relationships - Perceptions, Judgments, and Emotional instability; Ways to handle each of the barriers; Importance of reaching-out to others

UNIT III – GROUP DYNAMICS AND CONFLICTS RESOLUTION

Group dynamics: overt and covert processes at micro and macro levels; Understanding the basis of conflicts; Understanding one's own conflict handling style; Methods to handling conflicts effectively.

UNIT IV – WORKING IN TEAMS

Effectiveness in communication; Forming – storming – norming and performing model; Competition vs collaboration – impact of both on team tasks; TEAM Questionnaire –

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components of a healthy team and approaches to improving them.

Course Outcomes

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

CO1. Be aware of attitudinal, behavioral and emotional aspects of self

CO2. Prefer to learn continuously about self and be in harmony with self

CO3. Understand others' preferences, values, roles & contexts and be in harmony with others

CO4. Identify barriers to harmonious relationships and derive ways to handle them

CO5. Work collaboratively as a team to deliver expected outcomes

Mode of delivery:

1. A 2-day learning workshop
    1. Activities (experiential learning)
    2. Audio visuals (affective learning)
    3. Case discussions (cognitive learning)
    4. Instruments/questionnaires (reflective learning)

Guided by Learner's workbook.

2. Continuous learning guided by learning journal, and reviews by faculty
3. Half-day reinforcement session towards the end of the semester

Evaluation:

Sl.No.	Evaluation	Criterion	Total marks		Remarks
1	Continuous Evaluation	KT SKT Evaluation during workshop Weekly review of journal	KT SKT Work book Journal	- 10 marks - 15 marks - 20 marks - 30 marks	KT=Knowledge Test SKT=Scenario based Knowledge Test
			Total	- 75 marks	
2	End semester Evaluation	Comprehensive Examination and Viva voce	KT & SKT, short questions Viva voce	- 10 marks - 15 marks	Conducted for 25 marks
			Total	- 25 marks	
Total marks for the course			100 marks		
Condition for clearing the course			50 marks as a whole; but student should have attended the ESE.		

END OF SEMESTER V

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SEMESTER VI

Course Code: 16EIT61	Course Title: EMBEDDED SYSTEM DESIGN	
Core	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16EET31 – Digital Electronics
- 16EIT43 - Microprocessor and Microcontroller

Course Objectives

The course is intended to:

1. Provide knowledge on the basic concepts of embedded systems
2. Provide knowledge on communication protocols
3. Provide knowledge on developing the real time models for different application
4. Realize the importance and various features in RTOS
5. Provide knowledge onEmbedded IoT concepts.

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 – NETWORKING PROTOCOLS 9

Serial and Parallel Communication Protocols: I2C, SPI, RS232, RS485, USB, CAN, ARM Bus, Ethernet, Blue tooth, IEEE-488

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

Architecture of the Kernel – Tasks - Tasks states - Task priorities - Various task scheduling methods – Semaphores – Mutex - IPC: Mailboxes, Message Queues, Event Registers, Pipes, and Signals.

UNIT V – EMBEDDED IoT 9

Introduction –Physical Design of IoT – Logical Design of IoT – IoT Enabling

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Technologies: Overview: WSN, Cloud Computing, Big Data Analysis, Communication Protocols and Embedded Systems – Case study on IoT based Weather monitoring, Green house Control and Smart Irrigation

Course Outcomes

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

CO1. Explain the basic functions, components and importance of Embedded systems

CO2. Explain the various serial and parallel communication protocols

CO3. Develop the Real Time Models based with application examples

CO4. Elaborate the functions of RTOS

CO5. Explain the Embedded IoT concepts

Text Books

1. Rajkamal, "Embedded Systems: Architecture, Programming and Design", Third Edition, Tata McGraw-Hill, New Delhi, 2015.
2. Frank Vahid, Tony D. Givargis, John Wiley & Sons, "Embedded System Design- A Unified Hardware/Software Introduction" Wiley India, 2009.

Reference Books

1. John.B.Peatman, "Design with Microcontrollers", Pearson Education, 2008
2. Tammy Noergaard, "Embedded Systems Architecture", Second Edition, Elsevier, 2012.
3. Ajay V. Deshmukh, "Microcontrollers Theory and Applications", Tata McGraw Hill Publishing Company Ltd, 2011
4. Internet of Things (A Hands-on-Approach), by Vijay Madisetti and ArshdeepBahga, 1st Edition, VPT, 2014.

Web References

1. http://nptel.ac.in/courses/108102045/
2. http://www.nptelvideos.in/2012/11/embedded-systems.html

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Course Code: 16EIT62	Course Title: PROCESS CONTROL	
Core	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16MAT23 - Engineering Mathematics – II
- 16EIT51 - Control Systems

Course Objectives

The course is intended to:

1. Explain the mathematical model and dynamic behavior of the process.
2. Outline the characteristics of continuous and discontinuous controllers.
3. Provide knowledge to modes of P/PI/PID controller.
4. Describe the construction and operation of final control elements including converters.
5. Illustrate the control strategies of multi loop processes.

UNIT I – PROCESS CONTROL 9

Need for process control – Mathematical model of Flow, Level, Pressure and Thermal processes – Interacting and non-interacting systems – Degrees of freedom – Continuous and batch processes – Self regulation – Servo and regulatory operations-process dynamics– Heat exchanger and CSTR.

UNIT II – CONTROLLER TUNING 9

Evaluation criteria –simple performance- ¼ decay ratio-time integral criteria IAE, ISE, ITAE and ¼ decay ratio - Tuning:- Process reaction curve method, Continuous cycling method and Damped oscillation method –selection of controller

UNIT III – CONTROL ACTIONS 9

Characteristic of on-off, proportional, single speed floating, integral and derivative controllers – P+I, P+D and P+I+D control modes – Electronic PID controller – Auto/manual transfer - Reset windup

UNIT IV – FINAL CONTROL ELEMENTS 9

I/P converter - Pneumatic and electric actuators – Valve Positioner – Control Valves – Characteristic of Control Valves: Inherent and Installed characteristics – Valvebody: Commercial valve bodies – Control valve sizing – Cavitation and flashing – Selection criteria.

UNIT V – MULTILOOP CONTROL 9

Feedback control - feed forward control – Ratio control – Cascade control-selective

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control – Inferential control – Split-range and introduction to multivariable control – case studies from distillation column and boiler systems

Course Outcomes

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

CO1. Explain the mathematical model and dynamic behaviour of the process

CO2. Summarize the characteristics of continuous and discontinuous controllers

CO3. Select suitable P/PI/PID controller by applying tuning methods and performance criteria

CO4. Describe the construction and operation of final control elements including converters

CO5. Illustrate the control strategies of multi loop processes

Text Books

1. Coughanowr, D.R., "Process SystemsAnalysis and Control", McGraw - Hill International Edition, 2004.
2. Bequette, B.W., "Process Control Modeling, Design and Simulation", Prentice Hall of India, 2003.

Reference Books

1. Krishnasamy, K., "Process Control",New age international,2009
2. Stephanopoulos, G., "Chemical Process Control - An Introduction to Theory and Practice",Prentice Hall of India, 2005.
3. Curtis D. Johnson Process Control Instrumentation Technology, 8th Edition, Pearson, 2006.
4. Bela.G.Liptak., "Process Control and Optimization"., Instrument Engineers' Handbook., volume 2, CRC press and ISA, 2005.
5. Considine, D.M., Process Instruments and Controls Handbook, Second Edition, McGraw, 2008

Web References

1. http://nptel.ac.in/courses/103105064/

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Course Code: 16EIT63	Course Title: POWER ELECTRONICS AND DRIVES	
Core	L : T : P : C :	3 : 0 : 2 : 4
Type: Theory & Practical (Integrated)	Total Contact hours :	75

Prerequisites: The student should have undergone the course(s):

- 16GET25 - Electron Devices and Circuits
- 16EIT31 - Electrical Machines and Measurements

Course Objectives

The course is intended to:

1. Summarize the characteristics of various power semiconductor devices.
2. Analyse the performance of AC/DC rectifier and DC/DC converter circuits.
3. Describe the various PWM techniques of Inverter and AC/AC converter circuits.
4. Demonstrate the speed control methods of D.C and A.C drives
5. Explain the concept of special Electric Drives

UNIT I – POWER SEMI-CONDUCTOR DEVICES 9

Study of switching devices: Diode, SCR, TRIAC, MOSFET, IGBT-Static and Dynamic characteristics –Turn ON and OFF characteristics - protection circuit.

UNIT II – DC POWER CONVERTER 9

Single phase and three phase controlled rectifiers (half and full converters) with R and RL load -estimation of rms load voltage, current and input power factor - Effect of source inductance -Dual Converter.

UNIT III – AC POWER CONVERTER 9

Inverters: voltage source inverters (120 and 180 degree mode) - current source inverters -Harmonic reduction.AC voltage controller: Single phase R and RL load. Cycloconverter: Three phase to single phase and three phase to three phase cycloconverter.

UNIT IV – CONTROL OF DC &AC DRIVES 9

Selection of drives – Factors influencing the choice of drive – Braking methods – Chopper fed drives – Four quadrant drives –. Voltage control, V/F control of induction motor – VSI and CSI fed drives – Open loop and closed loop control of drives.

UNIT V – CONTROL OF SPECIAL DRIVES 9

Stepper motor: Driver circuit – Digital Implementation- BLDC motor: Principle of

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operation- Types - Control of BLDC motor -Microprocessor and DSP based control schemes -Sensor less Control- servomotor: AC and DC control.

List of Experiments **30 Hrs**

1. Gate pulse generation using R, RC and UJT.
2. Determine the turn on and turn off characteristics of MOSFET & SCR
3. Model the Single phase half and full converter using simulation and validate the result using hardware.
4. Model the Single phase inverter using simulation and validate the result using hardware.
5. Model the Step up chopper using simulation and validate the result using hardware.
6. Speed control of 3 phase induction motor using V/F drives.

Course Outcomes

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

CO1. Classify the characteristics of various power semiconductor devices.

CO2. Analyse and design the AC/DC rectifier and DC/DC converter circuits.

CO3. Compare and contrast the different PWM techniques of Inverter and AC/AC converter circuits.

CO4. Exposed in different speed control methods in D.C and A.C drives using thyristor based control schemes.

CO5. Explain the use of Microprocessors in the control of Electric Drives

Text Books

1. Muhammad H. Rashid, "Power Electronics: Circuits, Devices and Applications", Pearson Education, 3rd Edition, 2013.
2. M.D.Singh and K.B.Khanchandani, "Power Electronics", Tata McGraw-Hill, New Delhi, 2006.
3. E.G.Janardanan, 'Special Electrical Machines', Prentice Hall of India, 2014.

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. Bimal K Bose, "Modern Power Electronics& AC Drives", PHI Learning PVT. LTD New Delhi,2002.
3. R. Krishnan, 'Electric Motor and Drives: Modelling Analysis and Control', Pearson Education, 2001.

Web References

1. http://www.nptel.ac.in/courses
2. https://onlinelibrary.wiley.com/doi/book/10.1002/9780470547113

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Course Code :16EIT64	Course Title : DIGITAL SIGNAL PROCESSING	
Core/Elective: Core	L : T : P: C	3 : 0 : 2 : 4
Type: Theory & Practical (Integrated)	Total Contact hours:	75

Prerequisites: The student should have undergone the course(s):

- 16EIT42 Signals & Systems

Course Objectives

The course is intended to:

1. Apply DFT for the analysis of digital signals & systems
2. Apply FFT algorithms for computing DFT.
3. Design IIR filters.
4. Design FIR filters.
5. Explain basics of digital signal processors.

UNIT I – DISCRETE FOURIER TRANSFORM 9

Review of Discrete Signals and Systems–DTFT and its demerits, Introduction to DFT – computational complexity, magnitude and phase representations, Properties of DFT.

UNIT II – FAST FOURIER TRANSFORMS 9

FFT Algorithms –Decimation in time FFT Algorithms (DITFFT), Decimation in frequency FFT Algorithms (DIFFFT), IDFT Using FFT Algorithms.

UNIT III – IIR FILTER DESIGN 9

Analog filter design basics– Butterworth and Chebyshev approximations .IIR Filters-Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation– (LPF, HPF, BPF, BRF),IIR Filter realizations

UNIT IV – FIR FILTER DESIGN 9

Linear phase FIR filter – Fourier series - Filter design using windowing techniques (Rectangular, Triangular, Hamming and Hanningand Kaiser Windows), FIR Filter realizations.

UNIT V – DIGITAL SIGNAL PROCESSORS 9

Introduction – Architecture (TMS320 family) – Features – Addressing Formats – Functional modes - Introduction to Commercial Digital Signal Processors.

LAB EXPERIMENTS (USING MATLAB) **30 Hours**

1. Generation of basic signals.
2. Linear Convolution.
3. Circular Convolution.

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4. Spectrum Analysis using DFT.
5. FIR filters design.
6. IIR filter design

Course Outcomes

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

CO1. Apply DFT for the analysis of digital signals & systems

CO2. Apply FFT algorithms for computing DFT.

CO3. Design IIR filters.

CO4. Design FIR filters.

CO5. Explain basics of digital signal processors.

Text Books

1. John G. Proakis&Dimitris .G. Manolakis, "Digital Signal Processing – Principles, Algorithms & Applications", Fourth Edition, Pearson Education / Prentice Hall, 2014.
2. A.V.Oppenheim, R.W. Schafer and J.R. Buck, "Discrete-Time Signal Processing", Third Edition, Pearson, 2014

Reference Books

1. Emmanuel C..Ifeachor, &Barrie.W.Jervis, "Digital Signal Processing", Second Edition, Pearson , 2012
2. Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", Tata McGraw Hill, 2007
3. B.Venkataramani,M.Bhaskar,"Digital Signal Processors",2'nd Edition,McGraw Hill,2010
4. A.AnandKumar ,"Digital Signal Processing", Second Edition, PHI, 2012.

Web References

1. http://nptel.ac.in/courses/117102060/
2. http://www.analog.com/en/design-center/landing-pages/001/beginners-guide-to-dsp.html
3. http://whatis.techtarget.com/definition/digital-signal-processing-DSP

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Course Code: 16CET65	Course Title: ENVIRONMENTALSTUDIES	
General	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- Nil

Course Objectives

The course is intended to:

1. Describe the multidisciplinary nature of environmental studies
2. Explain the importance of ecosystem and biodiversity
3. Identify the causes and propose suitable methods of control for various types of environmetnal pollution
4. Describe the importance of environmental protection in social and global context
5. Explain the relationship between environment and human beings

UNIT I – MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES 9

Definition, scope and importance; Need for public awareness; Natural resources and associated problems - Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources; Role of individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT II – ECOSYSTEMS AND BIODIVERSITY 9

Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem - Forest, Grassland, Desert, Aquatic; Biodiversity and its conservation: Introduction; Biogeographically classification of India; Value of biodiversity; Biodiversity at global, national and local levels; India as a mega diversity nation; Threats to biodiversity; Endangered and endemic species of India; Conservation of biodiversity : In-situ and Ex-situ conservation.

UNIT III – ENVIRONMENTAL POLLUTION 9

Definition; Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear pollution; Solid waste Management: Causes, effects and control measures of urban and industrial wastes; Role of an individual in prevention of pollution; Pollution case studies; Disaster management : floods, earthquake, cyclone and landslides.

UNIT IV –SOCIAL ISSUES AND THE ENVIRONMENT 9

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From Unsustainable to Sustainable development; Urban problems related to energy; Water conservation, rain water harvesting, watershed management; Environmental ethics: issues and possible solutions; Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation ; Consumerism and waste products; Environment Protection Act; Air Act; Water Act ; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation; Public awareness.

UNIT V – HUMAN POPULATION AND THE ENVIRONMENT 9

Population growth, variation among nations; Population explosion - Family Welfare Programme; Environment and human health; Human Rights; Value Education; HIV/AIDS; Women and Child Welfare; Role of information Technology in Environment and human health; Case studies; Field work – Visit to a local area to document environmental assets – river/forest/grassland/hill/mountain; Visit to a local polluted site – Urban/Rural/Industrial/Agriculture; Study of simple ecosystems – pond, river, hill, slopes, etc.

Course Outcomes

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

CO1. Describe the multidisciplinary nature of environmental studies

CO2. Explain the importance of ecosystem and biodiversity

CO3. Identify the causes and propose suitable methods of control for various types of environmetnal pollution

CO4. Describe the importance of environmental protection in social and global context

CO5. Explain the relationship between environment and human beings

Text Books

1. Benny Joseph, "Environmental Studies", Tata McGraw Hill, New Delhi, 2006.
2. Mackenzie Davis and Susan Masten, "Principles of environmental engineering and science", Mc-Graw Hill, 3rd edition, 2014.

Reference Books

1. Trivedi R.K. "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.
2. Cunningham, W.P.Cooper., T.H. Gorhani, "Environmental Encyclopedia", Jaico Publishing House, Mumbai, 2001.
3. Rajagopalan. R, "Environmental Studies - From Crisis to Cure", Oxford University Press, 2005.

Web References

1. http://nptel.ac.in/courses/122102006

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Course Code: 16EIL61	Course Title: PROCESS CONTROL LABORATORY	
Core	L : T : P : C :	0 : 0 : 4 : 2
Type: Practical	Total Contact hours :	60

Prerequisites: The student should have undergone the course(s):

- 16EIL41 - Transducer and measurements Laboratory
- 16EIL51 - System Simulation Instrumentation Laboratory
- 16EIL52 - Industrial Instrumentation Laboratory

Course Objectives

The course is intended to:

1. Conduct experiment to obtain the mathematical model of the first order and second order system
2. Obtain the response of PID controller for first order and second order processes
3. Design the PID controller for first order and second order processes.
4. Determine the characteristics of control valve and obtain the response of complex control systems.
5. Analyze the closed loop response of various process

LIST OF EXPERIMENTS

1. Mathematical modelling of non-interacting systems
2. Mathematical modelling of Interacting systems
3. Response of P+I+D controller using MATLAB
4. Response of Electronic PID Controller
5. PID Controller tuning with performance criteria using MATLAB
6. Characteristics of control valve with and without positioner
7. Modelling and response of flow/ level control loop
8. Modelling and response of temperature control loop
9. Modelling and response of pressure control loop
10. Response of cascaded level-flow system using PID controller
11. Design of PID controller for higher order systems
12. Response of complex control systems (Ratio control/conical/spherical)

Course Outcomes

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

CO1. Conduct experiment to obtain the mathematical model of the first order and second order system

CO2. Obtain the response of PID controller for first order and second order processes

CO3. Design the PID controller for first order and second order processes.

CO4. Determine the characteristics of control valve and obtain the response of complex control systems.

CO5. Analyze the closed loop response of various process

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Course Code: 16EIL62	Course Title: EMBEDDED SYSTEM DESIGN LABORATORY	
Core	L : T : P : C :	0 : 0 : 4 : 2
Type: Practical	Total Contact hours :	60

Prerequisites: The student should have undergone the course(s):

- 16EIT43 - Microprocessor and Microcontroller

Course Objectives

The course is intended to:

1. Demonstrate the configuration of I/O ports, ADC, Timer, PWM and Serial Communication based Operations
2. Demonstrate the utilization of I/O parts for interfacing LCD and Keypad
3. Design the adders, encoders, decoders and counters
4. Design the flip flop circuits
5. Implement the combinational circuit and sequential circuit using FPGA

LIST OF EXPERIMENTS

1. Activation of LED and Generating delay for buzzer using timer.
2. Interfacing LCD with microcontroller
3. Interfacing of Matrix keypad and display the data on LCD using microcontroller.
4. Interfacing of temperature sensor and programming of ADC using microcontroller.
5. Transmit and receive sensor data using RF communication.
6. PWM Generation using microcontroller.
7. Design and Simulation of Adders (Half adder and full adder)
8. Design and Simulation of Encoder and Decoder.
9. Design and Simulation of flip-flops.
10. Design and Simulation of synchronous sequential counters.
11. Design and implementation of a Combinational Circuit using FPGA
12. Design and implementation of a Sequential Circuit using FPGA

Course Outcomes

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

CO1. Demonstrate the configuration of I/O ports, ADC, Timer, PWM and Serial Communication based Operations

CO2. Interface LEDS and keypad with microcontroller

CO3. Design the adders, encoders, decoders and counters

CO4. Design the flip flop circuits

CO5. Implement the combinational circuit and sequential circuit using FPGA

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Course Code: 16PSL61	Course Title: CAMPUS TO CORPORATE (Common to all B.E/B.Tech Programmes)	
General	L : T : P : C :	0 : 0 : 2 : 1
Type: Practical	Total Contact hours :	30 Hours

Prerequisites: The student should have undergone the course(s):

- NIL

Course Objectives

The course is intended to:

1. Display gratitude and social responsibility.
2. Understand various business environments.
3. Explain the transition from a campus mindset to corporate mindset.
4. Be prepared to the work culture.
5. Choose to be presentable and agile.

UNIT I – GRATITUDE AND SOCIAL RESPONSIBILITY

Importance of gratitude; Finding opportunities to give back to society; Responsible behavior in public places; Volunteerism during calamities;Social relevancy during engineering design and manufacturing – how social issues could be tackled by engineering solutions;

UNIT II – THE WORLD OF BUSINESS (GET TO THE SPECIFICS OF BEHAVIORAL RESPONSES TO CERTAIN SPECIFIC CONTEXTS)

World of business - Perceptions vs reality; Various business types - B2B, B2C, & other business models; Various industry verticals – fundamentals, dynamics & nuances; Nature of work as per various functions – Sales & Marketing, Service, Research & Development, Production etc; Self-reflective questionnaire to identify the fitment to a particular field/function;

UNIT III – TRANSITION FROM A CAMPUS MINDSET TO CORPORATE MINDSET

ROCK as an acronym (Responsibility, Ownership, Contribution, Knowledgeable (continuous learning)); Responsibility – ways in which responsibility should be demonstrated; Ownership – owning one's career, owning mistakes, desisting from complaining; Contribution – focus on creating value, giving more than receiving (salary & perks); Knowledgeable(continuous learning) – learning just begins after campus, aspects of learning mindset, various opportunities to learn and how they can be utilised at work;

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UNIT IV – PREPAREDNESS TO ADAPT TO WORK CULTURE

Skills to get through selection process – Interview conversations, resume writing, group discussion & presentation; Handling Cultural differences; Handling Gender dynamics; Alignment to Ethics and values; Alignment to work processes & code of conduct; Handling multiple (often conflicting) demands; Handling peer influence; Conducting sensitively with subordinates, peers &boss;Managing personal finance; Maintaining work-life balance – work & social life, hobbies etc;

UNIT V – PRESENTABLE AND AGILE

Dressing & grooming – Reasons for good dressing & grooming; Professional etiquette – what is etiquette, professional etiquette vs social etiquette, Aspects of professional etiquette; Wellness – Healthy eating habits, Importance of sleep, Importance of fitness; Importance of cleanliness of surroundings – desk, work area, place of stay (5S);

Course Outcomes

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

CO1. Display gratitude and social responsibility

CO2. Understand various business environments – industry & function wise

CO3. Explain the transition from a campus mindset to corporate mindset

CO4. Be prepared to adapt to the future work culture

CO5. Choose to be presentable and agile

Mode of delivery:

1. A 2-day learning workshop guided by Learner's workbook.
2. Continuous learning guided by learning journal, and reviews by faculty

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Assessments and Evaluation:

Assessment	Details	Weightage	Administration	By Whom	When
Workbook record assessment	Assess the necessary elements to be entered in the workbook	20%	Individual workbooks reviewed by the faculty		Immediately after the learning workshop
Initial Knowledge Test and Scenario based knowledge test	Multiple choice questions (20)	25%	Pen and paper,	Internal team	Immediately after the learning workshop
Review of student journal	Student held journal for the whole semester	30%	Individual journals reviewed by the faculty	Trained faculty members	Once in a week.
Final Knowledge test and Scenario based knowledge test	Multiple choice questions (40)	10%		Internal team	End of semester
Review of student journal by external expert		15%	Student journal comprehensive review	Trained faculty members	End of semester

END OF SEMESTER VI

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SEMESTER VII

Course Code: 16EIT71	Course Title: LOGIC AND DISTRIBUTED CONTROL SYSTEM	
Core	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16GET15 - Fundamentals of Electrical Engineering
- 16EET31 - Digital Electronics

Course Objectives

The course is intended to:

1. Summarize the architecture of PLC and I/O devices
2. Solve simple tasks using ladder programming
3. Develop operator panel for PLC
4. Summarize the concepts of SCADA
5. Infer the operation of DCS

UNIT I – BASICS OF PROGRAMMABLE LOGIC CONTROLLER 9

Overview of PLC systems – parts of PLC –Input/Output modules – power supplies and isolators – Fundamental PLC wiring diagram – relays – switches –transducers – sensors –seal-in circuits

UNIT II – PROGRAMMING OF PLC 9

Fundamentals of logic – Types of PLC – Program scan – Relay logic – PLC programming languages – register basics - timers – counters – Arithmetic functions - comparison functions - Skip and MCR functions - data move systems - PLC Advanced intermediate functions - sequencer functions - matrix functions – Design of interlocks and alarms using PLC –connecting PLC to computer

UNIT III – PLC ADVANCED FUNCTIONS AND HMI 9

Other programming languages – FBD-Structured Text- Analog PLC operation - PLC-PID functions - Networking of PLC - PLC installation - troubleshooting and maintenance -Necessity and Role of HMI in Industrial Automation, Text display - operator panels - Touch panels - Integrated displays (PLC & HMI)

UNIT IV – SCADA 9

Elements of SCADA system – history of SCADA – remote terminal unit (RTU) – discrete control – analog control – master terminal unit – (MTU) –operator interface. Open SCADA protocol –DNP3 – Case Study: Water Industry Application of DNP3.

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UNIT V – DISTRIBUTED CONTROL SYSTEM 9

Evolution – Different architectures – local control unit – Operator Interface –Displays – Engineering Interface – DCS integration with PLC and computers. Case study: DCS Applications in power plant and Cement plant.

Course Outcomes

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

CO1. Summarize the architecture of PLC and I/O devices

CO2. Solve simple tasks using ladder programming

CO3. Develop operator panel for PLC

CO4. Summarize the concepts of SCADA

CO5. Infer the operation of DCS

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. Stuart Boyer A, "Supervisory contril and data Acquisition", Second edition,ISA.
3. Romily Bowden, "HART application guide and the OSI communicationfoundation", 2002.
4. McMillan. G.K, "Process/ Industrial instrument and handbook", McGraw-Hill,New York, 2004.

Web References

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

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Course Code: 16EIT72	Course Title: PRINCIPLES OF MANAGEMENT (Common to AUTO, ECE,EEE,EIE & MECH)	
Core	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16ENT11 - Communication Skills – I
- 16ENT21 - Communication Skills - II

Course Objectives

The course is intended to:

1. Describe the overview of management
2. Explain the planning process, policy and decision making
3. Explain the human resource structure and policy
4. Explain the motivational theories for management
5. Explain the control techniques for operations

UNIT I - OVERVIEW OF MANAGEMENT 9

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

UNIT II - PLANNING 9

Nature and Purpose planning – Planning process – Types of plans – Objectives – Managing by objective (MBO) Strategies – Types of strategies – Policies – Decision Making – Types of decision –Decision Making Process - Rational Decision Making Process – Decision Making under different conditions.

UNIT III - ORGANISING 9

Nature and purpose of organizing – Organization structure – Formal and informal groups / organization – Line and Staff authority – Departmentation – Span of Control – Centralization and Decentralization – Delegation of authority – Staffing – Selection and Recruitment – Orientation Career Development – Career stages – Training – Performance Appraisal.

UNIT IV - DIRECTING 9

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

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UNIT V - CONTROLLING 9

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

Course Outcomes

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

CO1. Describe the overview of management

CO2. Explain the planning process, policy and decision making

CO3. Explain the human resource structure and policy

CO4. Explain the motivational theories for management

CO5. Explain the control techniques for operations

Text Books

1. Stephen P. Robbins and Mary Coulter, "Management", Prentice Hall of India, 8th edition, 2009.
2. Charles W.L Hill, Steven L McShane, "Principles of Management", Mcgraw Hill Education, 2007.

Reference Books

1. Hellriegel, Slocum & Jackson, "Management – A Competency Based Approach", Thomson South Western, 10th edition, 2007.
2. Harold Koontz, Heinz Weihrich and mark V Cannice, "Management – A global & Entrepreneurial Perspective", Tata Mcgraw Hill, 12th edition, 2007.
3. Andrew J. Dubrin, "Essentials of Management", Thomson Southwestern, 7th edition, 2007

Web References

1. http://www.managementstudyguide.com/all-subjects.htm

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Course Code: 16EIL71	Course Title: INDUSTRIAL AUTOMATION LABORATORY	
Core	L : T : P : C :	0 : 0 : 4 : 2
Type: Practical	Total Contact hours :	60

Prerequisites: The student should have undergone the course(s):

- 16EET31 - Digital Electronics

Course Objectives

The course is intended to:

1. Interface pneumatic devices with PLC
2. Develop PLC programs for automation application
3. Develop PLC and HMI programs for process control applications
4. Develop SCADA based automation for real time process
5. Design LabVIEW based Control system for real time process

LIST OF EXPERIMENTS

1. Programming of PLC for logic gates
2. Programming of PLC for latching, interlock, motor forward, reverse and motor starter
3. Interfacing of pneumatic type direction control valves with PLC
4. Programming of PLC for Automatic stamp machine.
5. Control of Bottle filling system using PLC
6. Programming of PLC for Parking system
7. Temperature process control using PLC and HMI
8. Flow process control using PLC and HMI
9. Remote monitoring of Temperature Process using SCADA.
10. SCADA programming to simultaneously monitor and control multiple processes.
11. Control of Level process using LabVIEW
12. Ratio and Cascade process Control using LabVIEW

Course Outcomes

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

CO1. Interface pneumatic devices with PLC
CO2. Develop PLC programs for automation application
CO3. Develop PLC and HMI programs for process control applications
CO4. Develop SCADA based automation for real time process
CO5. Design LabVIEW based Control system for real time process

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Course Code : 16EIL72	Course Title : INSTRUMENTATION SYSTEM DESIGN LABORATORY	
Core	L : T : P: C	0 : 0 : 4 : 2
Type: Practical	Total Contact hours:	60

Prerequisites: The student should have undergone the course(s):

- 16EIL32 - Analog Electronic Circuits Laboratory
- 16EIL51 - System Simulation Laboratory
- 16EIL62 - Embedded System Design Laboratory

Course Objectives

The course is intended to:

1. Fabricate power supply circuit
2. Design the amplification, converter and controller circuit using Op-amp
3. Analyze the characteristics of process parameters using Wireless HART.
4. Develop a signal conditioning unit using microprocessor/microcontroller and VI
5. Draw the P&I Diagram for various process

List of Experiments

1. Design of fixed and adjustable regulated power supply.
2. Development of power supply using general purpose PCB.
3. Design of RTD signal conditioning circuit using Instrumentation amplifier.
4. Design of 4-20 mA convertor for sensor signal conditioning.
5. Design of analog ON/OFF controller using operational amplifier for the given system.
6. Design of analog controller (PI or PID) using operational amplifier.
7. Measurement of process parameters using wireless HART.
8. Design and implementation of DAQ system using VI (RTD or LDR).
9. Design and implementation of microprocessor based humidity and moisture measurement.
10. Study and development of P& I diagram for simple process control application.

Course Outcomes

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

CO1: Design the power supply circuit as per the requirement in PCB.

CO2: Design a I/V, signal conditioning circuit for RTD, ON/OFF and PI/PID Controller using op-amp

CO3: Analyze the characteristics of process parameter like temperature, flow, level and pressure using Wireless HART.

CO4: Develop a signal conditioning unit using microprocessor/microcontroller and VI

CO5: Draw the P&I diagram for Temperature/flow/level/pressure process stations

End of Semester VII

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PROFESSIONAL ELECTIVE

Course Code: 16ECE18	Course Title: ASIC DESIGN (Common to ECE,EEE & EIE)	
Elective	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16EET31 - Digital Electronics
- 16EIT53 - VLSI Design

Course Objectives

The course is intended to:

1. Explain the different types of ASICs and logic cells used in ASIC design
2. Explain the architecture of various programmable logic cells
3. Explain the various interconnects in programmable logic cells and design software.
4. Develop a digital circuit using HDL.
5. Explain the various functional blocks in an ASIC.

UNIT I – INTRODUCTION TO ASICS 9

Types of ASICs - Design flow – CMOS transistors- CMOS Design rules – Combinational logic Cell - Sequential logic cell - Transistor as Resistor - Transistor parasitic capacitance – Library cell design.

UNIT II – PROGRAMMABLE ASICS, LOGIC CELLS AND I/O CELLS 9

Anti-fuse - Static RAM - EPROM and EEPROM technology - Actel ACT - Xilinx LCA, Xilinx I/O blocks –Altera MAX 5000 - Altera FLEX.

UNIT III – ASIC INTERCONNECT AND DESIGN SOFTWARE 9

Actel ACT -Xilinx LCA - Xilinx EPLD - Altera MAX 5000 - Altera FLEX –Design systems - Logic Synthesis - Half gate ASIC -Low level design language - PLA tools

UNIT IV – LOGIC SYNTHESIS 9

A logic synthesis example: Adder and MUX units, FSM synthesis in VHDL, Memory synthesis in VHDL.

UNIT V – CONTROL OF SPECIAL DRIVES 9

Floor planning, Placement, Routing- Global routing-detailed routing- special routing-Parasitic extraction, LVS and DRC.

Course Outcomes

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

CO1. Explain the different types of ASICs and logic cells used in ASIC design.

CO2. Explain the architecture of various programmable logic cells.

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CO3. Explain the various interconnects in programmable logic cells and design software.

CO4. Develop a digital circuit using HDL.

CO5. Explain the various functional blocks in an ASIC.

Text Books

1. Michael John Sebastian Smith"Application Specific Integrated Circuits" Pearson Education 2008.
2. Norman G. Einspruch, "Application Specific Integrated Circuit (ASIC) Technology", Academic Press, 2012.

Reference Books

1. Morris Mano.M, "Digital Design", Prentice hall of India Pvt.Ltd, Pearson Education Pvt.Ltd, Third Edition , 2013.
2. Douglas L. Perry, "VHDL: Programming by Example", McGraw-Hill, Fourth Edition,2002.

Web References

1. www.vlsi.wpi.edu/cds/explanations/lvs.html
2. http://www.eng.auburn.edu/
3. http://www.geoffknagge.com/fyp/index.shtml#asic

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Course Code : 16EIE01	Course Title : DIGITAL IMAGE PROCESSING	
Core/Elective: Elective	L : T : P: C	3 : 0 : 0 : 3
Type: Theory	Total Contact hours:	45

Prerequisites: The student should have undergone the course(s):

- 16EIT42 Signals & Systems.
- 16EIT64 Digital Signal Processing.

Course Objectives

The course is intended to:

1. Explain digital image fundamentals.
2. Summarise simple image enhancement techniques.
3. Illustrate different image restoration and segmentation techniques.
4. Compare different image compression standards.
5. Describe various image representation techniques.

UNIT I – DIGITAL IMAGE FUNDAMENTALS 9

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - color models.

UNIT II – IMAGE ENHANCEMENT 9

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering –Basic image processing operations using MATLAB. Histogram equalization using MATLAB Frequency Domain:Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters. Basic filtering operations using MATLAB

UNIT III – IMAGE RESTORATION AND SEGMENTATION 9

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering **Segmentation:** Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation-Morphological processing- erosion and dilation.

UNIT IV – WAVELETS AND IMAGE COMPRESSION 9

Wavelets – Sub band coding – Multi resolution expansions - **Compression:** Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding –Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.

UNIT V – IMAGE REPRESENTATION AND RECOGNITION 9

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Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments –Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors –Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

Course Outcomes

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

CO1. Explain digital image fundamentals.

CO2. Summarise simple image enhancement techniques.

CO3. Illustrate different image restoration and segmentation techniques.

CO4. Compare different image compression standards.

CO5. Describe various image representation techniques.

Text Books

1. Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2016
2. S .Jayaraman, T.Veerakumar, &S.Ezakkirajan, "Digital Image Processing", Fourth Edition, Pearson Education, 2017

Reference Books

1. Maria Petrou& Costas Petrou, " Image Processing –The Fundamentals ", Second Edition ,Wiley Publications., 2010

2. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011.

3. Willliam K Pratt, "Digital Image Processing", CRC Press, 2013.

4. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", First Edition, PHI Learning Pvt. Ltd., 2011

Web References

1. http://eeweb.poly.edu/~onur/lectures/lectures.html
2. http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html
3. https://web.stanford.edu/class/ee368/

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Course Code : 16EIE02	Course Title : AUTOMOTIVE ELECTRONICS	
core	L : T : P: C	3:0:0:3
Type: Theory	Total Contact hours:	45

Prerequisites: The student should have undergone the course(s):

- Electronic devices and circuits
- Embedded system design

Course Objectives

The course is intended to:

1. Explain the mechanical systems of automobiles
2. Describe the electronic system in automobiles
3. Summarize the X-by-wire concepts in automobile
4. Outline the embedded system applications in automobiles
5. Explain the different communication protocols in embedded system for automobile

UNIT I – AUTOMOTIVE MECHANICAL SYSTEMS 9

Vehicle Systems: Power Train System (Air System, Fuel System (Carburettor& Diesel Fuel Injection, Ignition System, Exhaust System and other Auxiliary Systems (Cooling, Lubrications & Electrical Systems)), Transmission System (Front, Rear & 4 wheel Drive, Manual, Automatic Transmission, Differential). Braking System (Drum, Disc, Hydraulic, Pneumatic), Steering System (Rack and Pinion, Power Steering).

UNIT II – ELECTRONICS IN AUTOMOTIVE SYSTEMS 9

Performance (Speed, Power, and Torque), Control (Emission, Fuel Economy, Drivability, and Safety) & Legislation (Environmental legislation for pollution & Safety Norms). Overview of Vehicle Electronic Systems: Basic electrical components and their operation in an automobile: Power train subsystem (Starting systems, Charging systems - Ignition systems – Electronic fuel control), Chassis subsystem (ABS, TCS, & ESP) – Comfort and safety subsystems (Night Vision, Airbags, Seatbelt Tensioners, Cruise Control-Lane-departure-warning, Parking).

UNIT III – DRIVE BY WIRE 9

Challenges and opportunities of X-by-wire: system & design requirements, steer-by-wire, brake-by-wire, suspension-by wire, gas-by-wire , power-by-wire, shift by wire-Future of Automotive Electronics

UNIT IV – EMBEDDED SYSTEM IN AUTOMOTIVE APPLICATIONS 9

Gasoline / Diesel systems, various sensors used in system – Electronic transmission control - Vehicle safety system – Electronic control of braking and traction – Body electronics – Infotainment systems – Navigation systems – System level tests –

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Software calibration using engine and vehicle dynamometers – Environmental tests for Electronic Control Unit - Application of Control elements and control methodology in Automotive System.

UNIT V – VEHICLE COMMUNICATION PROTOCOLS 9

SPI, I2C, USB communication protocols - Introduction to CAN, LIN, FLEXRAY, MOST, KWP2000. Introduction to AUTOSAR

Course Outcomes

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

CO1. Explain the mechanical systems of automobiles

CO2. Describe the electronic system in automobiles

CO3. Summarize the X-by-wire concepts in automobile

CO4. Outline the embedded system applications in automobiles

CO5. Explain the different communication protocols in embedded system for automobile

Text Books

1. Robert Bosch GmbH, "Bosch Automotive Handbook", Updated 6th Edition, Bentley Publishers, 2005
2. William B. Ribbens, "Understanding Automotive Electronics", 6th Edition, SAMS/Elsevier Publishing, 2003

Reference Books

1. Robert Bosch Gmbh, Automotive Electrics and Automotive Electronics, Systems and Components, Networking and Hybrid drive, 5th edition, John Wiley& Sons Ltd., 2007
2. Knowles.D, Automotive Electronic and Computer Controlled Ignition Systems, Reston Pub Co,1990
3. Denton.T , Automobile Electrical and Electronic Systems: Automotive Technology: Vehicle Maintenance and Repair, 2012
4. JoergSchaeuffele, Thomas Zurawka – Automotive Software Engineering – Principles, Processes, Methods and Tools, SAE,2016

Web References

1. www.austincc.edu/autotech
2. www.austincc.edu
3. https://acconline.austincc.edu/webapps/portal/frameset.jsp

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Course Code: 16EEE14	Course Title: ADVANCED MICROPROCESSORS (Common to EEE & EIE)	
Core/Elective: Elective	L : T : P : C	3 : 0 : 0 : 3
Type: Lecture	Total Contact Hours:	45

Prerequisites: The student should have undergone the course(s):

- Microprocessor & Microcontroller

Course Objectives

The course is intended to:

1. Explain the basic concepts of advanced microprocessors
2. Describe the architecture of Pentium processors.
3. Discuss the concepts and architecture of RISC processor.
4. Describe the concepts of the Superscalar Processors
5. Explain the architecture programming and interfacing of advanced microprocessors.

UNIT I MICROPROCESSOR ARCHITECTURE 9

Instruction Set – data formats -addressing modes-memory hierarchy-register file-cache—virtual memory and paging-segmentation- pipelining- instruction pipeline— pipeline hazard-instruction level parallelism-reduced instruction set- RISC VS CISC

UNIT II PENTIUM MICROPROCESSORS 9

Introduction to Pentium Microprocessor- real and production mode operation- software model of Pentium – function description –registers-data organization- summary of the 80286,80386, and 80486- cpu architecture –bus operation-pipelining-branch

UNIT III RISC PROCESSORS I 9

PowerPC620 – Instruction fetching – Branch Prediction – Fetching – Speculation, Instruction Dispatching –dispatch stalls – Instruction Execution – Issue stalls- Execution Parallelism– Instruction completion – Basics of P6 micro architecture – Pipelining – Memory subsystem.

UNIT IV RISC PROCESSORS II (SUPERSCALAR PROCESSORS) 9

Intel i960 – Intel IA32- MIPS R8000 – MIPS R10000 – Motorola 88110 – Ultra SPARC processor-SPARC version 8 – SPARC version 9.

UNIT V PC HARDWARE OVERVIEW 9

Functional Units & Interconnection, New Generation Mother Boards 286 to Pentium 4 Bus Interface-ISA- EISA- VESA- PCI- PCIX. Peripheral Interfaces and Controller, Memory and I/O Port Addresses.

Course Outcomes

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

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CO1. Explain the basic concepts of advanced microprocessors

CO2. Describe the architecture of Pentium processors.

CO3. Discuss the concepts and architecture of RISC processor.

CO4. Describe the concepts of the Superscalar Processors

CO5.Explainthearchitecture programming and interfacing of advanced microprocessors

Text Books:

1. B.B.Brey The Intel Microprocessor 8086/8088 /80186/80188, 80286, 80386, 80486PENTIUM, PENTIUM Pro, PII, PIII & IV Archietecture, Programming & Interfacing, Pearson Education, 2004.
2. John Paul Shen, Mikko H.Lipasti, "Modern Processor Design", Tata Mcgraw Hill,2006.

References:

1. Daniel Tabak , "Advanced Microprocessors", McGrawHill.Inc., Edition 2 1995
2. James L. Antonakos , " The Pentium Microprocessor", Pearson Education, 1997.
3. Gene .H.Miller, "Micro Computer Engineering", Pearson Education, 2003.
4. Douglas V.Hall, "Microprocessors and Interfacing", Tata McGraw Hill, Second Edition, 2006
5. Mohamed Rafiquzzaman,"Microprocessors and Microcomputer Based SystemDesign", Second Edition, CRC Press, 2007

Web References:

1. http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/microcontrollers/micro/ui/TOC.htm
2. https://ee641dm.wordpress.com/study-materials/
3. https://www.tutorialspoint.com/microprocessor/index.html

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Perundurai - 638 052, Erode District, Tamilnadu, India.

Course Code: 16EIE03	Course Title: INSTRUMENTATION SYSTEM DESIGN	
Elective	L : T : P : C	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16EIT32 - Transducer Engineering
- 16EIT42 - Industrial Instrumentation –I
- 16EIT52 - Industrial Instrumentation - II
- 16EIT62 - Process Control

Course Objectives

The course is intended to:

1. Elucidate the standards and P&I symbols used for Instrumentation systems
2. Design the signal conditioning circuits for sensors
3. Describe control system concept and process safety
4. Design the electronic controller for P+I+D
5. Develop a measuring instrument using microprocessor

UNIT I – INSTRUMENTATION BASIC CONCEPTS 9

Calibrating and testing standards for instruments and transducer-NEMA, DIN, BIS and ANSI standards - P&I symbols: SAMA & ISA, P&I diagram for flow, pressure, level and temperature process

UNIT II – SIGNAL CONDITIONING FOR TRANSDUCERS 9

Analog Signal Conditioning: Overview of bridge circuits and OP-AMP based amplifiers - Design considerations for transducers such as thermocouple, RTD - Calibration and installation procedure for thermocouple and RTD – Digital Signal Conditioning: Over view of ADCs and DACs – Analog and Digital Conversions – Hardware structure of DAS

UNIT III – CONTROL SYSTEM INSTRUMENTATION 9

Standard Instrumentation Signal levels – Sensor Transmitters – Transmission lines - Steps in Control System Design – Selection of Controlled, Manipulated and Measured variable – Process safety – Process alarms – Safety Interlock System (SIS) – Interlocks and Automatic shutdown systems

UNIT IV – ANALOG CONTOLLERS 9

Electronic controllers – Error detector – Single mode: Design of Two position and Three Position control, Proportional, Integral and Derivative modes – Composite Controller modes: Design of PI, PD and PID.

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UNIT V – MICROCONTROLLER BASED INSTRUMENTATION 9

CASE STUDY - Temperature monitoring and control: Temperature IC Sensor, Signal Conditioning – ADC – Interface of Microcontroller – DAC - Driver circuit for heater – PID algorithm and programming for temperature control.

Course Outcomes

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

CO1. Explain the basic concepts of instrumentation system

CO2. Develop signal conditioning circuits (Analog and digital) for temperature sensor

CO3. Summarize the concepts of control system design

CO4. Develop analog PID controllers for process control applications

CO5. Design a microcontroller based instrumentation system for measuring and controlling

Text Books

1. Dale E. Seborg, Thomas F. Edgar, Duncan A. Mellichamp, "Process Dynamics and Control" 2nd Edition, Wiley, 2004
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. Benley, Principles of Measurement Systems, Longman Inc., 2000.
3. Bela. G. Liptak, Instrument Engineers Handbook, Vol. I and II, Third Edition, Chilton and BookCompany, 2006.
4. T. R. Padmanabhan, Industrial Instrumentation: Principles and Design, Springer Verlag Publications, 2000.
5. Balaguruswamy E, Reliability Engineering, Tata McGraw-Hill Pub.co. New Delhi, 1999.

Web References

1. nptel.ac.in/courses/117108107/17
2. nptel.iitg.ernet.in/Courses(Video).php

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Pollachi - 642 003, Coimbatore District, Tamilnadu.

Course Code : 16EIE04	Course Title : MACHINE LEARNING TECHNIQUES	
Electives	L : T : P: C	3 : 0 : 0 : 3
Type: Theory	Total Contact hours:	45

Prerequisites: -

Course Objectives

The course is intended to:

1. Introduce the basic concepts and techniques of Machine Learning.
2. Understand the Supervised and Unsupervised learning techniques.
3. Introduce the various probability based learning techniques
4. Introduce Dimensionality Reduction and evolutionary models
5. Understand graphical models of machine learning algorithms

UNIT I – INTRODUCTION 9

Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants – Perceptron – Linear Separability – Linear Regression.

UNIT II – LINEAR MODELS 9

Multi-layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines.

UNIT III – TREE AND PROBABILISTIC MODELS 9

Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Probability and Learning – Data into Probabilities – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms – Vector Quantization – Self Organizing Feature Map

UNIT IV – DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS 9

Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization – Evolutionary Learning – Genetic

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algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example – Markov Decision Process

UNIT V – GRAPHICAL MODELS 9

Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods

Course Outcomes

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

CO1. Distinguish between, supervised, unsupervised and semi-supervised learning.

CO2. Apply the apt machine learning strategy for any given problem.

CO3. Suggest supervised, unsupervised or semi-supervised learning algorithms for any given problem.

CO4. Design system that uses the appropriate graph models of machine learning.

CO5. Modify existing machine learning algorithms to improve classification efficiency.

Text Books

1. Stephen Marsland, —Machine Learning – An Algorithmic Perspectivell, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
2. Tom M Mitchell, —Machine Learningll, First Edition, McGraw Hill Education, 2013.

Reference Books

1. Peter Flach, —Machine Learning: The Art and Science of Algorithms that Make Sense of Datall, First Edition, Cambridge University Press, 2012.
2. Jason Bell, —Machine learning – Hands on for Developers and Technical Professionalsll, First Edition, Wiley, 2014.
3. EthemAlpaydin, —Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)ll, Third Edition, MIT Press, 2014.

Web References

1. http://nptel.ac.in

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Pollachi - 642 003, Coimbatore District, Tamilnadu.

Course Code: 16EIE05	Course Title: ANALYTICAL INSTRUMENTATION	
Elective	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16CYT22 – Engineering Chemistry

Course Objectives

The course is intended to:

1. Explain the concepts and application of various spectrophotometers.
2. Describe Nuclear magnetic resonance, types of mass spectrometers and electron microscope.
3. Compare different types of chromatography.
4. Summarize the working and characteristics of different analyzers.
5. Illustrate the measuring techniques for Pollutant gases from industries.

UNIT I – COLORIMETRY AND SPECTROPHOTOMETRY 9

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

UNIT II – NUCLEAR MAGNETIC RESONANCE AND MICROSCOPIC TECHNIQUES 9

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

UNIT III – CHROMATOGRAPHY 9

Different techniques – Techniques by chromatographic bed shape- Column chromatography Planer Chromatography - Paper Chromatography - Thin layer Chromatography-Applications - Techniques by physical state of mobile phase - Gas chromatography – Detectors – High-pressure liquid chromatographs – detectors - Applications - Techniques by separation mechanism Ion exchange chromatography-size-exclusion chromatography – Applications.

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UNIT IV – pH METERS AND DISSOLVED COMPONENT ANALYZERS 9

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

UNIT V – INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING INSTRUMENTS 9

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

Course Outcomes

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

CO1. Explain the concepts and application of various spectrophotometers

CO2. Describe Nuclear magnetic resonance, types of mass spectrometers and electron microscope.

CO3. Contrast the different types of chromatography based on construction and working principle

CO4. Summarise the working and characteristics of different analyzers

CO5. Illustrate the measuring techniques for Pollutant gases from industries

Text Books

1. R.S. Khandpur, Handbook of Analytical Instruments, Tata McGraw Hill publishing Co. Ltd., 2nd edition, 2006.
2. G.W. Ewing, Instrumental Methods of Analysis, McGraw Hill, 2004.
3. H.H.Willard, L.L.Merritt, J.A.Dean, F.A.Settle, Instrumental methods of analysis, CBS publishing & distribution, 1995.

Reference Books

1. Braun, R.D., Introduction to Instrumental Analysis, McGraw – Hill, Singapore, 2006.
2. Liptak, B.G., Process Measurement and Analysis, CRC Press, 2005.

Web References

1. www.nptel.ac.in

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Pollachi - 642 003, Coimbatore District, Tamilnadu.

Course Code: 16EIE06	Course Title:FIBER OPTICS AND LASERINSTRUMENTATION	
Elective	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16PHT23 - Material Science

Course Objectives

The course is intended to:

1. Explain the basic concepts of optical fibres and their properties.
2. Describe the Industrial applications of optical fibres.
3. Illustrate the Laser fundamentals.
4. Discuss the adequate knowledge about Industrial application of lasers
5. Explain about the Medical applications of Lasers.

UNIT I – OPTICAL FIBRES AND THEIR PROPERTIES 9

Principles of light propagation through a fibre - Different types of fibres and their properties, fibre characteristics – Absorption losses – Scattering losses – Dispersion – Connectors & 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 9

9Laser 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 – APPLICATIONS AND SAFETY MEASURES OF LASER 9

Laser Applications in Defense : Laser Range Finder - Underwater Laser - Laser-Guided Anti-Tank Missile (ATM) - Ring Laser Gyroscope - Air Reconnaissance – Communications - Anti-Missile Defense System (Star Wars), Laser safety : Classification of laser classes – safety measures – Causes of laser accidents - Biological effects of Laser Beam - Control measures for Class 3B and Class 4 Lasers - Factors in determining appropriate eyewear - Non-beam laser hazards.

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Course Outcomes

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

CO1. Explain the basic concepts of optical fibres and their properties.

CO2. Describe the Industrial applications of optical fibres.

CO3. Illustrate the Laser fundamentals.

CO4. Discuss the adequate knowledge about Industrial application of lasers

CO5. Explain about Medical applications of Lasers.

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. http://nptel.ac.in/courses/104104085/38

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Course Code: 16EIE07	Course Title: INSTRUMENTATION IN PROCESS INDUSTRIES	
Elective	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- Engineering Chemistry
- Process Control
- Logic and Distributed Control System

Course Objectives

The course is intended to:

1. Explain about Petroleum production and the various equipments involved in the petrochemical industries.
2. Describe the chemical reactors and heat exchangers.
3. Illustrate the performance of the pumps and various control loops in Petrochemical Industry.
4. Explain about the Cement manufacturing process.
5. Elaborate the various instrumentation and control loops in Cement industry.

UNIT I – INTRODUCTION TO PETROLEUM 9

Petroleum exploration – production and refining – constituents of crude oil – P &I diagram of petroleum refinery – atmospheric distillation of crude oil – vacuum distillation process – thermal conversion process – control of distillation column – temperature control.

UNIT II – CHEMICAL REACTORS AND HEAT EXCHANGERS 9

Temperature control– pressure control – control of dryers – batch dryers – atmospheric and vacuum – continuous dryers – liquid to liquid heat exchangers – steam heaters – condensers – reboilers and vaporizers – evaporators– types of evaporators.

UNIT III – EFFLUENT AND WATER TREATMENT CONTROL 9

Centrifugal pump – On– Off control – pressure control – flow control – throttling control , rotary pumps – On– Off control – pressure control, reciprocating pump – On– Off control and throttling control – chemical oxidation – chemical reduction – naturalization – precipitation – biological control.

UNIT IV – INTRODUCTION TO CEMENT AND BINDING MATERIALS 9

History of binding materials and Cement-Classification of Cement Binders- Lime as Binder, cement and its importance in construction- Cement and its Raw Mill Composition- History of Cement manufacturing process- material composition of

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cement- various unit operation of cement manufacture- the present status and future of cement industry in India.

UNIT V – INSTRUMENTATION AND CONTROL IN CEMENT KILNS – CONVEYOR BELT INSTRUMENTATION 9

Automatic bagging and bottling – preheater – kiln feed control – kiln speed control – kiln draught control – combustion control – cooler control.

Course Outcomes

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

CO1. Explain about Petroleum production and the various equipments involved in the petrochemical industries.

CO2. Describe the distillation column, reactor, heat exchangers and evaporators.

CO3. Illustrate the performance of the pumps and various control loops in Petrochemical Industry.

CO4. Familiarize with the Cement manufacturing process

CO5. Explain the various instrumentation and control loops in Cement Industry.

Text Books

1. Dr. Ram Prasad, "Petroleum Refining Technology", Khanna Publisher, 1st Edition, 2000.
2. Liptak B.G, "Instrument Engineers Handbook", Volume III, 2006.
3. Waddams A.L., Chemicals from Petroleum, Butter and Janner Ltd., 1968
4. F M Lea, Arnold, London "Chemistry of Cement and Concrete" 3rd Edition, 1970

Reference Books

1. Liptak. B. G, "Process Control" , Third edition , Chilton Book Company, Pennsylvania, 1995.
2. Considine. D. M, "Process/Industrial Instruments and control Handbook", McGraw Hill, 4th edition,1993.
3. Robert. H, Perry, Green. D.W, and J.O. Maloney, Perry's – "Chemical Engineers Handbook", McGraw Hill Inc, New York, 7th edition, 1998.

Web References

1. www.nptel.ac.in
2. www.scribd.com/doc/2336259/ABB-Oil-Gas-production-Hand-Book.
3. Norms for limestone exploration for cement manufacture : NCCBM

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Course Code: 16EIE08	Course Title: POWER PLANT INSTRUMENTATION	
Elective	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16EIT42 - Industrial Instrumentation – I
- 16EIT52 - Industrial Instrumentation – II
- 16EIT62 - Process Control

Course Objectives

The course is intended to:

1. Introduce the concept of different power generation techniques
2. Describe the various measurements in power plants
3. Apply the different control schemes in boiler side
4. Apply the different control schemes in furnace side
5. Illustrate the different control schemes in turbine

UNIT I - OVERVIEW OF POWER GENERATION 9

Survey of methods of power generation – hydro, thermal, nuclear, solar and wind power – Importance of instrumentation in power generation – Thermal power plant – Building blocks – Boiler Accessories– sub critical and supercritical boilers – Condensers – Cooling towers.

UNIT II – MEASUREMENTS & ANALYSERS IN POWER PLANTS 9

Measurement of feed water flow, air flow, steam flow and coal flow – Drum level measurement – Steam pressure and temperature measurement – Turbine speed and vibration measurement – Flue gas analyzer – Fuel composition analyzer.

UNIT III – BOILER CONTROL - I 9

Combustion of fuel and excess air – Firing rate demand – Steam temperature control – Control of deaerator – Drum level control: Single, two and three element control – Furnace draft control – implosion – flue gas dew point control – Trimming of combustion air – Soot blowing.

UNIT IV - BOILER CONTROL - II 9

Burners for liquid and solid fuels – Burner management system – Furnace safety interlocks – Coal pulverizer control – Combustion control for liquid and solid fuel fired boilers – air/fuel ratio control – fluidized bed boiler.

UNIT V - CONTROL OF TURBINE 9

Turbine - Types of steam turbines: impulse turbine, reaction turbine and compounding turbines – Turbine governing system – Automatic Load Frequency Control – Turbine oil

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system – Oil pressure drop relay – Oil cooling system.

Course Outcomes

At the end of the course students 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. Apply the different control schemes in boiler side

CO4. Apply the different control schemes in furnace side.

CO5. Elucidate the different control schemes to monitor turbine parameters.

Text Books

1. Sam Dukelow, Control of Boilers, Second Edition, Instrument Society of America, 1991.
2. Rajput R.K., A Text book of Power plant Engineering. Fifth Edition, Lakshmi Publications, 2013

Reference Books

1. Everett Woodruff , Herbert Lammers, Thomas Lammers, Steam Plant Operation,9th Edition McGraw Hill, 2012
2. Krishnaswamy.K and Ponnibala.M., Power Plant Instrumentation, PHI Learning Pvt.Ltd., New Delhi, 2011
3. Liptak B.G., Instrumentation in Process Industries, Chilton Book Company, 2005
4. Jain R.K., Mechanical and Industrial Measurements, Khanna Publishers, New Delhi, 1999.
5. P.K.Nag, Powerplant Engineering, Tata McGraw-Hill Education, 3rd edition, 2007

Web References

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Course Code: 16EIE09	Course Title: SMART AND WIRELESS INSTRUMENTATION	
Elective	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16EIT32 - Transducer Engineering
- 16EIT43 – Microprocessor and Microcontroller
- 16EIT54 – Communication Engineering

Course Objectives

The course is intended to:

1. Provide knowledge on various sensors.
2. Provide knowledge on the project development procedure with communicating devices.
3. Introduce various power harvesting methodologies and power management techniques in WSN.
4. Provide introduction to configure, receive, test and transmit the data using GUI.
5. Provide knowledge on the hardware and software involved in developing the project

UNIT I - SENSORS FUNDAMENTAL 9

Sensor Classification -Sensors Parameters - Thermal Sensors-Humidity Sensors-Capacitive Sensors-Planar Inter digital Sensors - Planar Electromagnetic Sensors- Light Sensing Technology - Moisture Sensing Technology - Carbon Dioxide (CO2) Sensing Technology –Smart Sensors - 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 - 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

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Receiving Sensor Data Using LabVIEW/C++.

UNIT V - WIRELESS SENSOR AND INSTRUMENT APPLICATIONS 9

A Brief Review of Signal Processing Techniques for Structural Health Monitoring - WSN Based Physiological Parameters Monitoring System-Intelligent Sensing System for Emotion Recognition-WSN Based Smart Power Monitoring System.

Course Outcomes

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

CO1. Explain the classification of sensors with its operation.

CO2. Describe the project development procedure with communicating devices like Zigbee, ISA100, Wireless HART.

CO3. Analyze the power harvesting methodologies and power management techniques in WSN.

CO4. Illustrate the steps to configure, receive, test and transmit the data using GUI.

CO5. Elucidate the hardware and software involved in developing the project for applications like structural health, physiological parameters, smart power and emotion monitoring.

Text Books

1. Subhas Chandra Mukhopadhyay "Intelligent Sensing, Instrumentation and Measurements", 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; 1 edition December 2013

Web References

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

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Course Code: 16EIE10	Course Title: WIRELESS SENSOR NETWORKS	
Elective	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16EIT54 - Communication Engineering

Course Objectives

The course is intended to:

1. Understand the Adhoc WSN
2. Know the architecture of WSN
3. Describe the sensor data processing through networking
4. Illustrate the topology structure of WSN
5. Explain the WSN hardware and its s/w tool

UNIT I – INTRODUCTION TO WSN 9

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the Wireless Channel -mobile ad hoc networks (MANETs) and wireless sensor networks (WSNs): concepts and architectures. Applications of Ad Hoc and Sensor Networks. Design Challenges in 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.

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Course Outcomes

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

CO1. Attain the knowledge on Adhoc and 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. Elucidate the plat form of sensor network and its tools

Text Books

1. Holger Karl, Andreas Willig, 'Protocols and Architectures for Wireless Sensor Networks', John Wiley, 2005.
2. Feng Zhao, Leonidas J. Guibas, 'Wireless Sensor Networks- An Information Processing Approach', Elsevier, 2007

Reference Books

1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Prentice Hall Professional Technical Reference, 2008.
2. KazemSohraby, Daniel Minoli, and TaiebZnati, "Wireless Sensor Networks- Technology, Protocols, and Applications", John Wiley, 2007.
3. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.
4. BhaskarKrishnamachari,'Networking Wireless Sensors', Cambridge Press,2005.
5. Mohammad IlyasandImadMahgaob, 'Handbook of Sensor Networks: Compact Wireless And Wired Sensing Systems', Crc Press, 2005

Web References

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Course Code:16EIE11	Course Title : MODERN ELECTRONIC INSTRUMENTATION	
Electives	L : T : P: C	3 : 0 : 0 : 3
Type: Theory	Total Contact hours	45

Prerequisites: The student should have undergone the course(s):

- **NIL**

Course Objectives:

The course is intended to:

1. Introduce different types of electronic instruments and their applications.
2. Provide knowledge on various types of cathode ray oscilloscopes, and different types of signal analyzers.
3. Introduce different types of waveform generators, analyzers and their applications.
4. Educate on virtual instrumentation, its applications, programming and DAQ cards and modules.
5. Provide exposure to telemetry, modulation techniques and multiplexing.

UNIT I – ELECTRONIC INSTRUMENTS 9

Introduction – DC Voltmeter – AC Voltmeter using rectifiers -- True RMS responding voltmeter – Electronic multimeter – Considerations in choosing an analog voltmeter – Digital voltmeter – Microprocessor based ramp type DVM -- Q-Meter – Vector impedance meter.

UNIT II – CATHODE RAY OSCILLOSCOPE & SIGNAL ANALYZERS 9

General purpose cathode ray oscilloscope – Dual trace, dual beam and sampling oscilloscopes – Digital Storage Oscilloscope -- Frequency selective and Heterodyne wave analyzer – Harmonic distortion analyzer – Spectrum analyzer.

UNIT III – WAVEFORM GENERATOR AND DISPLAY DEVICES 9

Standard signal wave generator – AF and Square wave generators – Function generator – Square and Pulse generator - Sweep generator – Electronic Counters.

LED: Seven Segment displays – Dot matrix displays – 3 digit Alphanumeric Displays, LCD Display.

UNIT IV – DATA ACQUISITION SYSTEM 9

Introduction to DAS -- Signal Conditioning of the inputs – Single Channel DAS – Multi Channel DAS – Computer Based DAS – Data logger – DAS Applications

UNIT V – TELEMETRY 9

General telemetry system – voltage, current and position telemetry systems – Radio frequency Telemetry – Modulation Methods -- Frequency modulation, Pulse amplitude

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modulation and Pulse code modulation telemetry systems– Frequency and time multiplexing.

Course Outcomes:

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

CO 1: Describe different types of electronic instruments and their applications.
CO 2: Explain various types of cathode ray oscilloscopes, and different types of signal analyzers.
CO 3: Compare different types of waveform generators and analyzers and their applications
CO 4: Explain the concept of virtual instrumentation, its applications, programming and DAQ cards and modules.
CO 5: Explain different type's telemetry system, modulation techniques and multiplexing.

Text Books:

1. A.D. Helfrick and W.D. Cooper, Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall India Private Ltd., New Delhi, 2010.
2. H.S. Kalsi, Electronic Instrumentation, Tata McGraw-Hill Education Private Ltd, New Delhi, 3rd edition 2013.

Reference Books:

1. A.K. Sawhney, A Course in Electrical & Electronic Measurements and Instrumentation, DhanpatRai and Co, New Delhi, 2010.
2. Jerome J., Virtual Instrumentation using Lab VIEW, Prentice Hall India Private Ltd., New Delhi, 2010.
3. David A Bell, "Electronic Instrumentation and Measurements", Ox for University Press, 2013.
4. J.J. Carr, Elements of Electronic Instrumentation and Measurement, Pearson Education India, New Delhi, 2011.
5. M.M.S. Anand, Electronics Instruments and Instrumentation Technology, Prentice Hall India, New Delhi, 2009.
6. Sanjay Gupta, Virtual Instrumentation using Lab view, Tata McGraw-Hill Education, 2010.

Web References:

1. http://iitg.vlab.co.in/?sub=61&brch=174
2. http://nptel.iitg.ernet.in/courses/Elec_Engg/IIT%20Bombay/Electrical%20and%20Electronic%20Measurements.htm

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Course Code: 16EIE12	Course Title: BIOMEDICAL INSTRUMENTATION	
Elective	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16EIT32 - Transducer Engineering

Course Objectives

The course is intended to:

1. Explain the basic physiology and biomedical applications of different types of transducers.
2. Explain the different Electro Physiological Measurements.
3. Explain the different non electrical parameter measurements on human body.
4. Explain the concept of modern methods of imaging techniques.
5. Explain the concept of medical assisting and therapeutic equipment.

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– 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 –Respiratory rate – Gas volume –- pH of blood, GSR measurements – Plethysmography.

UNIT IV – MEDICAL IMAGING AND PMS 9

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

UNIT V – ASSISTING AND THERAPEUTIC EQUIPMENTS 9

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

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Course Outcomes

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

CO1. Explain the basic physiology and biomedical applications of different types of transducers.

CO2. Explain the different Electro Physiological Measurements.

CO3. Explain the different non electrical parameter measurements on human body.

CO4. Explain the concept of modern methods of imaging techniques.

CO5. Explain the concept of medical assisting and therapeutic equipment.

Text Books

1. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, 3rd Edition, New Delhi, 2014.
2. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2007.

Reference Books

1. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, 4th Edition New York, 2009.
2. Joseph J. Carr and John M. Brown," Introduction to Biomedical Equipment Technology", John Wiley and sons, 4th Edition, New York, 2000.
3. Duane Knudson," Fundamentals of Biomechanics", Springer, 2003.
4. Ed. Joseph D. Bronzino, "The Biomedical Engineering Hand Book", 2nd Edition, Boca Raton, CRC Press LLC, 2000

Web References

1. http://www.mtu.edu/biomedical/research/biosensors/
2. http://www.eecs.umich.edu/courses/bme458

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Course Code: 16EIE13	Course Title: INDUSTRIAL DATA COMMUNICATION NETWORKS (Common to EEE & EIE)	
Elective	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16EIT54 - Communication Engineering

Course Objectives

The course is intended to:

1. Enumerate the layers of the OSI model and TCP/IP.
2. Summarize the different types of industrial Ethernet.
3. Describe the different standards of industrial protocol.
4. Explain the different types of field bus technology.
5. Illustrate the wireless communication standards and Satellite networks.

UNIT I – OSI REFERENCE MODEL 9

ISO-OSI model – Layers in the OSI model – Peer to Peer Process –TCP/IP Protocol Suite– TCP/IP comparison with OSI model – Types of TCP/IP addressing

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.

UNIT III – INDUSTRIAL DATA COMMUNICATION PROTOCOL 9

Serial communication Standards: RS232, 422 and 485 – Protocol Structure Overview – Example Function codes. ASCII based protocol - Modbus protocol – Overview. HART Protocol – Overview – Layers

UNIT IV – FIELD BUS TRCHNOLOGY 9

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 9

Wireless LANs – IEEE 802.11 standard – Blue Tooth Communication - Wireless WANs – Cellular Telephony: 1G, 2G, 3G and 4G/LTEE – Satellite Networks

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Course Outcomes

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

CO1. Enumerate the layers of the OSI model and TCP/IP.

CO2. Summarize the different types of industrial Ethernet.

CO3. Describe the different standards of industrial protocol.

CO4. Explain the different types of field bus technology.

CO5. Illustrate the wireless communication standards and Satellite networks.

Text Books

1. Behrouz A Forouzan, 'Data Communications and Networking', Tata McGraw-Hill, 2013.
2. William Buchanan, 'Computer Buses- Design and Application', CRC Press, 2000.

Reference Books

1. Theodore S Rappaport, 'Wireless Communications: Principles and Practice', Prentice Hall PTR, Second Edition, 2010.
2. Stallings,W., "wireless Communication and networks", second Edition, Prentice Hall of India, 2005.
3. Steve Mackay, Edwin Wright and Deon Reynders, 'Practical Industrial data Networks: Design, Installation and Trouble Shooting', Elsevier International Projects Ltd., 2004.
4. Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, 2010.
5. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill Publisher, 2011.

Web References

1. http://nptel.ac.in/courses/106105082/
2. http://nptel.ac.in/downloads/106105080/
3. http://sine.ni.com/nips/cds/view/p/lang/en/nid/208382
4. http://www.fieldbusinc.com/

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Course Code: 16EIE14	Course Title: ADVANCED PROCESS CONTROL	
Elective	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16EIT62 - Process Control

Course Objectives

The course is intended to:

1. Demonstrate control schemes for satisfying the process requirements
2. Determine system behavior by time and frequency analysis
3. Design advanced controllers based on process model
4. Analyze the multivariable control systems for sensitivity and operability
5. Demonstrate digital controllers dynamic response and stability

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.

Course Outcomes

At the end of the course students 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. Analyze the multivariable control systems for sensitivity and operability

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CO5. Demonstrate digital controllers dynamic response and stability

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.G. Liptak "Instrument Engineers Handbook:Process Control and Optimization"

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", SpringerVerlag, 2004.

Web References

1. nptel.ac.in/downloads/103101003/

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Course Code: 16EIE15	Course Title: DIGITAL CONTROL AND STATE VARIABLE METHODS	
Elective	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites:

The student should have undergone the course(s):

- 16MAT13 - Engineering Mathematics – I
- 16MAT23 - Engineering Mathematics – II
- 16MAT33 - Transforms and Partial Differential Equations
- 16EIT51 - Control Systems
- 16EIT64 - Digital Signal Processing

Course Objectives

The course is intended to:

1. Distinguish the conventional and state variable approaches.
2. Solve the problems on continuous time systems.
3. Analyze the real time problems using discrete data system.
4. Design the digital controller and its algorithms.
5. Analyze the various system stabilities using lyapunov technique.

UNIT I –CONTINUOUS STATE SPACE MODEL 9

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 USING CONTINUOUS TIME 9

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 9

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

UNIT IV – DESIGN OF DIGITAL CONTROLLER 9

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

UNIT V – LIAPUNOV STABILITY 9

Liapunov stability analysis - Stability in the sense of Liapunov - Definiteness of Scalar

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Functions – Quadratic forms - Second method of Liapunov - Liapunov stability analysis of linear time invariant systems.

Course Outcomes

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

CO1. Distinguish the conventional and state variable approaches using continuous time States space model.

CO2. Solve the transfer function using different decomposition techniques in continuous time systems.

CO3. Analyze the stability conditions for real time problems using discrete data system.

CO4. Design the digital controller using different types of algorithms.

CO5. Analyze the various linear and non linear system stabilities using liapunov technique.

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

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Pollachi - 642 003, Coimbatore District, Tamilnadu.

Course Code: 16EIE16	Course Title: NON LINEAR CONTROL SYSTEM	
Elective	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16EIT51 - Control Systems

Course Objectives

The course is intended to:

1. Understand different nonlinearities and analyse the stability of nonlinear system using phase plane analysis.
2. Derive describing functions for static nonlinearities and predict the stability.
3. Infer the stability properties of nonlinear systems.
4. Acquire knowledge of state feedback and state observer based nonlinear control system design.
5. Describe sliding mode controller

UNIT I – PHASE PLANE ANALYSIS 9

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

UNIT II – DESCRIBING FUNCTION ANALYSIS 9

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

UNIT III – STABILITY ANALYSIS 9

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

UNIT IV – STATE FEEDBACK AND STATE OBSERVERS 9

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 9

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.

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Course Outcomes

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

CO1. Demonstrate non-linear system behaviour by phase plane method

CO2. Analyse the stability and existence of periodic solutions of nonlinear system through describing functions.

CO3. Analyse the stability properties of non-linear system using Liapunov's direct and indirect methods.

CO4. Design the non-linear controller using state feedback and state observer

CO5. Design sliding motor controller for given system

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

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Course Code: 16EIE17	Course Title: ROBOTICS AND AUTOMATION	
Elective –	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16MAT13 - Engineering Mathematics - I
- 16MAT23 - Engineering Mathematics - I
- 16EIT31 - Electrical Machines and Measurements
- 16EIT32 - Transducer Engineering

Course Objectives

The course is intended to:

1. Describe the anatomy of Robot
2. Explain the sources used to run the Robot
3. Analyse the kinematics and Dynamics of Robot
4. Develop the program to smooth run of Robot
5. Understand Robot operation used in various Industry application

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 9

Solution of direct and inverse kinematics problem– Robot dynamics - Jacobian work envelope - Robot trajectories – Manipulator path control - Robot cycle time analysis.

UNIT IV – ROBOT PROGRAMMING 9

Methods of Robot programming – lead through programming methods – robot program as a path in space – motion interpolation – wait, signal and delay commands – Branching – capabilities and limitations – Robot programming examples for pick and place application using VAL.

UNIT V – CASE STUDIES 9

Robots in manufacturing and non-manufacturing application – Robot cell layout –

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selection of robot. Applications - material handling, processing operations, assembly and inspection.

Course Outcomes

At the end of the course students 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. Derive kinematics and dynamics equation for functioning robots

CO4. Program a robot using lead through methods

CO5. Describe the operations of Robot used in Industrial Automation

Text Books

1. Mikell P. Groover, MilchelWein Roger Nagel and Nicholas G. Ordy,"Industrial Robotics, Technology, Programming and Applications", McGraw Hill, Last Print, 2005
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. www.nptel.ac.in

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Course Code: 16EIE18	Course Title: HYDRAULICS AND PNEUMATICS	
Elective	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16MET46 - Thermodynamics and Fluid Mechanics

Course Objectives

The course is intended to:

1. Understand the fluid power concept
2. Illustrate the components used in Hydraulic system
3. Describe the different hydraulic valves
4. Elucidate the pneumatic system used in industry application
5. Develop the electrical hydraulic and pneumatic circuit for different applications

UNIT I – FLUID POWER PRINCIPLES AND FUNDAMENTALS 9

Introduction to fluid power – Advantages and Applications – Fluid power systems – Types of fluids –Properties of fluids – Basic of Hydraulics: Pascal's Law, Principles of flow, work, Power and Torque. Properties of air – Perfect Gas Laws

UNIT II – HYDRAULIC SYSTEM AND COMPONENTS 9

Pumping Theory – Pump Classification – Fixed and Variable displacement Pumps: Working, Advantages, Disadvantages and Performances. Hydraulic Actuators: Cylinders, Types and Construction Hydraulic motors – Performance charts. Accessories – Accumulator and Intensifiers.

UNIT III – CONTROL OF HYDRAULIC SYSTEMS 9

Control Components: Direction control, flow control and pressure control valves – Types, Applications – Types of actuation – Pressure Switches – Fluid power ANSI Symbol. Industrial Hydraulic circuits – Regenerative, Double-Pump, sequence, Reciprocation, Synchronization, Fail - Safe, Speed Control – Hydrostatic Transmission.

UNIT IV – PNEUMATIC SYSTEM 9

Compressors – Filter, Regulator, Lubricator, Muffler, Air control Valves, Quick Exhaust Valves, Pneumatic actuators – Introduction to Fluidics – Pneumatic logic circuits AND, OR, MEMORY, etc

UNIT V – ELECTRO-HYDRALIC AND ELECTRO-PNEUMATIC CIRCUITS 9

Sequential circuits – design for simple applications using cascade method – Electro Pneumatic circuits – Microprocessor and PLC – Applications in Hydraulic and Pneumatics – Low cost Automation – Hydraulic and Pneumatic Power Packs –

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Installation, Fault finding and Maintenance.

Course Outcomes

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

CO1. Explain the principles of fluid power system

CO2. Describe the construction and working of hydraulic system and its components

CO3. Illustrate the working of valves, switches, actuators and industrial hydraulic circuits

CO4. Summarize the working of components in pneumatic control system

CO5. Describe the electro-hydraulic and electro-pneumatic systems with proper installation, fault finding and their maintenance

Text Books

1. Anthony Esposito, "Fluid Power with Applications", 7th edition, Pearson education, 2014
2. Srinivasan, R., "Hydraulic and Pneumatic Controls", 2nd edition, Vijay Nicole Imprints, 2008

Reference Books

1. William W. Reaves, "Technology of Fluid Power", Delmer Publishers, 1997.
2. PetorRohner, "Fluid power logic circuit Design", Macmillon Press Ltd, 1990.
3. Andrew Parr,"Hydraulics& Pneumatics", Jaico Publishing House, 2004.
4. Majumdar, "Oil Hydraulics: Principles and Maintenance", Tata McGraw Hill, 2004.
5. Majumdar, "Pneumatic system: Principles and Maintenance", Tata McGraw Hill, 2004

Web References

1. www.nptel.ac.in

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Course Code: 16EIE19	Course Title: VIRTUAL INSTRUMENTATION (Common to ECE,EEE and EIE)	
Elective	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16GET14 - C- Programming

Course Objectives

The course is intended to:

1. Discuss the importance of virtual instrumentation
2. Develop virtual instruments
3. Apply the concept of Arrays, Strings and File I/O tasks
4. Select suitable Data acquisition system interfaces
5. Examine DAQ hardware's and Lab VIEW

UNIT I – GRAPHICAL SYSTEM DESIGN 9

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 9

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, Physics applications, Speed control, Data visualization, Imaging and Sound. Level, flow, temperature process, biomedical application - Pulse rate

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Course Outcomes

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

CO1. Discuss the importance of virtual instrumentation using Lab view

CO2. Develop virtual instruments using LabVIEW graphical programming tools

CO3. Apply the concept of Arrays, Strings and File I/O tasks in Data acquisition

CO4. Select suitable Data acquisition system interfaces based on the requirement

CO5. Examine DAQ hardware's and LabVIEW in various real time environments

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. http://www.av.it.pt/conftele2009/Papers/125.pdf
2. https://www.researchgate.net/publication/3420671_What_is_virtual_instrumentation
3. http://www.ni.com/pdf/manuals/374629c.pdf

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Course Code: 16EIE20	Course Title: INDUSTRY SAFETY AND STANDARDS	
Elective	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- Nil

Course Objectives

The course is intended to:

1. Explore the knowledge on safety in process industries
2. Understand about industrial hazards and industrial accidents
3. Analyse the environmental factors to be considered in process industries
4. Know about safety symbols, emergency planning and handling procedures
5. Explain the types of Industry standards

UNIT I – SAFETY 9

Background - Development of safety movement – Growth of safety movement – Safety movement nowadays – Safety responsibility and organization – Occupational health and safety programme – Safety principles – Safety policy - Safety inspection – Safety planning – Safety measures in manufacturing industry – Employee participation in safety – Safety and productivity – Relationship of safety with plant design, Equipment design and work environment – Safety economics – Safety legislation.

UNIT II – INDUSTRIAL HAZARDS AND INDUSTRIAL ACCIDENTS 9

Industrial hazards: Introduction – Classification of hazards – Hazard management programme – Hazard control – Major industrial hazards – List of industries involving hazardous processes. Industrial Accidents: Introduction – Types of accidents – Nature/Effects of accidents – Causes – Cost calculation of accident – Accident prevention – Accident reporting – Accident investigation and analysis – Typical accidents in chemical and other industries – Machine guarding

UNIT III – ENVIRONMENTAL FACTORS IN INDUSTRY 9

Environment – Environmental control – Environmental factors in industry – Effect of environmental factors on human body and mind: Temperature – Illumination – Noise – Vibration – Housekeeping – Plant layout – Colour – Humidity and air conditioning.

UNIT V – SAFETY SYMBOLS AND HANDLING EMERGENCIES 9

Safety Signs and Color used in industry – Sign categories – Sign types – Safety colours – Training – Maintenance – Some commonly used safety signs. Handling

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Emergencies: Introduction – Work place emergency – Emergency planning – Need for emergency planning – Emergency planning concepts – Objectives of emergency planning – Emergency planning process – Development of emergency action plan – On-site and off-site emergency planning.

UNIT V – STANDARDS 9

Types of standards: Physical and Documentary – Standards: ISO, NEMA, DIN, BIU and ANSI

Course Outcomes

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

CO1. Gain knowledge on safety in process industries

CO2. Know about industrial hazards and industrial accidents

CO3. Analyse the environmental factors to be considered in process industries

CO4. Know about safety symbols, emergency planning and handling procedures

CO5. Distinguish the types of Industry standards

Text Books

1. Amit Gupta, —Industrial Safety and Environmentll, Laxmi Publication (P) Ltd., New Delhi, 2006.
2. Bob Skelton, —Process Safety Analysis- An Introductionll, Institution of Chemical Engineers, U.K.,

Reference Books

1. Rao, CS, —Environmental Pollution Engineeringll, Wiley Eastern Ltd., New Delhi, 2002.
2. Ralph King, —Safety in the Process Industriesll, Butterworth-Heinemann Ltd., London, 2000.
3. Lees, F.P & M. Sam Mannan , "Loss Prevention in Process Industries: Hazard Identification, Assessment and Control Butterworth-Heinemann publications, London, 4th edition, 2012.

Web References

1. https://onlinecourses.nptel.ac.in/noc16_ee02/preview
2. https://www.industry.siemens.com.cn/industrysolutions/cn/zh/electrification/automation_it/safety-services/process/solution/Documents/Safety-process-industry-en.pdf.
3. https://library.e.abb.com/public/3aea41bdd7bee93dc1257288005051b2/85-87%20SRAS25_72dpi.pdf

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Course Code: 16ITE42	Course Title: DATA BASE MANAGEMENT SYSTEM (Common to ECE,EEE & EIE)	
Elective	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16CST47-Data structures and algorithms

Course Objectives

The course is intended to:

1. Construct the Entity Relationship Model.
2. Convert ER diagram to relational database schema.
3. Apply the normalization technique to obtain the relational database design.
4. Select a query evaluation and optimization technique for a given query.
5. Implement online transactions and control concurrency.

UNIT I - AN OVERVIEW OF DATABASE SYSTEMS 9

Introduction – Database system applications, Database versus file systems, View of data, Data models, Database languages, Database users and administrators, Database system structure, Entity – Relationship Model – Basic concepts, Constraints, Keys, Design issues, ER diagram, Weak entity sets, Design of an ER database schema.

UNIT II - DATA MODELS 9

Relational model - Structure of relational databases – The relational algebra –Tuple relational calculus, Domain relational calculus, SQL – Background, Basic structure, Set operations, Aggregate functions, Null values, Nested sub queries, Views, Joined relations, DDL, Embedded SQL, Dynamic SQL, Integrity and security – Domain constraints, Referential integrity, Assertions, Triggers.

UNIT III - RELATIONAL DATABASES DESIGN 9

Relational database design – First normal form, Second normal form - Pitfalls in relational database design, Functional dependencies, Decomposition, Desirable properties of decomposition, BCNF, Third normal form, Fourth normal form.

UNIT IV - INDEXING AND QUERYING 9

Indexing and hashing – Basic concepts, Ordered indices, B+ tree index files, B tree index files – Static hashing, Dynamic hashing, Comparison of ordered indexing and hashing, Multiple key access - Query Processing – Overview, Measures of query cost, Selection operation, Sorting, Join operation - Query Optimization – Overview,

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Estimating statistics of expression results, Transformation of relational expressions.

UNIT V - TRANSACTION, CONCURRENCY CONTROL AND RECOVERYMANAGEMENT 9

Transactions – Transaction concept, Transaction state, Implementation of atomicity and durability, Concurrent executions, Serializability, Recoverability, Testing for serializability - Concurrency control – Lock based protocols, Timestamp based protocols, Validation based protocols, Multiple granularity, Multiversion schemes, Recovery system – Failure classification, Storage structure, Recovery and atomicity, Log based recovery, Shadow paging, Recovery with concurrent transactions, Buffer management, Failure with loss of nonvolatile storage, Advanced recovery techniques, Remote backup systems.

Course Outcomes

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

CO1. Construct the Entity Relationship Model for obtaining the structure of a database

CO2. Convert ER diagram to relational database schema.

CO3. Apply the normalization technique to obtain the relational database design.

CO4. Select a query evaluation and optimization technique for a given query.

CO5. Implement online transactions and control concurrency

Text Books

1. Silberschatz, Korth, Sudarshan, "Database System Concepts", Sixth Edition, McGrawHill International Edition, New Delhi 2010.
2. Date C.J., Kannan A, Swaminathan S, "An introduction to database systems", Eighth Edition, Pearson Education, New Delhi, 2009.

Reference Books

1. Elmasri, R., Navathe, S.B., "Fundamentals of database systems", Sixth Edition, Pearson Education, New Delhi, 2010.
2. Raghu Ramakrishnan, Johannes Gehrke. "Database Management Systems", Third Edition, McGrawHill International Edition, New Delhi 2007
3. Bipin C Desai, "An Introduction to Database Systems", Eleventh Edition, Galgotia Publications Pvt. Ltd., New Delhi, 2001.
4. JefreyD.Ulman and Jenifer Widom, "A First Course in Database Systems", Third Edition, Prentice-Hall, New Delhi, 2007.
5. C.J.Date, A.Kannan and S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006

Web References

1. http://www.sanfoundry.com/database/
2. http://codex.cs.yale.edu/avi/db-book/db6/slide-dir/
3. www.nptelvideos.in/2012/11/database-management-system.html

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Course Code: 16ITE43	Course Title: DATA MINING AND ANALYTICS (Common to ECE,EEE & EIE)	
Elective	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16ITE42 -Database Management Systems

Course Objectives

The course is intended to:

1. Choose the appropriate pre-processing technique.
2. Apply the techniques of association rule.
3. Evaluate the classification algorithms.
4. Apply the clustering algorithms.
5. Analyze the requirements for a big data analytics

UNIT I - DATA PREPROCESSING 9

Data Mining Overview – Data Objects and Attribute Types – Data Visualization. Data Preprocessing: Data Cleaning – Data Integration – Data Reduction – Data Transformation and Data Discretization.

UNIT II- ASSOCIATION 9

Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and Methods –Basic Concepts – Frequent Itemset Mining Methods – Pattern Evaluation Methods. Advanced Pattern Mining: Pattern Mining: A Road Map – Pattern Mining in Multilevel, Multidimensional Space.

UNIT III - CLASSIFICATION 9

Basic Concepts: Decision Tree Induction – Bayes Classification Methods – Rule Based Classification – Model Evaluation and Selection – Techniques to Improve Classification Accuracy.

UNIT IV- CLUSTERING 9

Cluster Analysis: Partitioning Methods – Hierarchical Methods – Density Based Methods – Grid Based Methods – Evaluation of Clustering.

UNIT V- INTRODUCTION TO BIG DATA 9

Introduction to Big Data: Classification of Digital Data – Characteristics, Evolution and Definition of Big data - Challenges with Big Data – Traditional Business Intelligence (BI) vs Big Data – The Big Data Technology Landscape: Hadoop. Introduction to

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Hadoop: Hadoop Overview – Hadoop Distributors - Hadoop Distributed File System.

Course Outcomes

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

CO1. Choose the appropriate pre-processing technique to solve the given problem.

CO2. Apply the techniques of association rule to real world data.

CO3. Evaluate the classification algorithms with respect to their accuracy.

CO4. Apply the clustering algorithms to group the real world data.

CO5. Analyze the requirements for a big data analytics system for the organization.

Text Books

1. Jiawei Han, MichelineKamber, Jian Pei, "Data Mining: Concepts and Techniques", 3rd Edition, Elsevier, 2012.
2. SeemaAcharya, SubhashiniChellappan, "Big Data and Analytics", 1st Edition, Wiley India, 2015.

Reference Books

1. Jure Leskovec, AnandRajaraman, Jeffery David Ullman, "Mining of Massive Datasets", 2nd Edition, Cambridge University Press, 2014.
2. Ian H.Witten, Eibe Frank, Mark A.Hall, "Data Mining: Practical Machine Learning Tools and Techniques", 3rd Edition, Elsevier, 2011.
3. EMC Education Services, "Data Science and Big Data Analytics", Wiley, 2015.
4. DT Editorial Services, "Black Book- Big Data (Covers Hadoop 2, Map Reduce, Hive, Yarn, PIG, R, Data visualization)", Dream tech Press edition 2016.
5. G. K. Gupta, "Introduction to Data Mining with Case Studies", Eastern Economy Edition, Prentice Hall of India, 2006.

Web References

1. http://hanj.cs.illinois.edu/bk3/bk3_slidesindex.html
2. http://www.mmds.org/
3. http://www.kdnuggets.com/tutorials/index.html

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Course Code:16CSE01	Course Title: PYTHON PROGRAMMING (Common to CSE,EEE & EIE)	
Elective	L: T: P: C	3: 0: 0: 3
Type: Theory	Total Contact Hours:	45

Prerequisites: The student should have undergone the course(s):

- 16GET14- C Programming

Course Objectives

The course is intended to:

1. Identify various syntax and operators in python programming.
2. Illustrate control flow, library functions and file operations.
3. Implement object oriented features in python.
4. Apply database connectivity technique.
5. Design user interfaces.

Unit I - PROGRAMMING CONSTRUCTS 9

Basics: Data Types – Declaring variables - Usage of Operators- Special functions - Python standards in Coding. Sequential Statements - Control statements - Performing Iterations – Strings - Tuples-Sets - Dictionary.

Unit II - FUNCTIONS 9

Functions: Defining & Calling function- Passing arguments to functions: Mutable & Immutable Data Types - Different types of arguments-Recursion-Scope of variables. Standard Library: Math, String, List, Date & Time Modules. Files: Open- Close- Write-Read.

Unit III - OOP IN PYTHON 9

Classes - Objects – Modifiers - Method Invocation – Inheritance – Polymorphism - Packages - Scopes and Namespaces - Interface - Exception Handling.

Unit IV - DATABASE PROGRAMMING 9

DBM files - Pickled objects - Shelve files - Object Oriented Database - SQL Database interfaces - Building record dictionaries - loading database tables from files.

Unit V - GUI PROGRAMMINGAND DATA VISUALIZATION 9

GUI basics-Working with TKinter library- Adding widgets-Binding Events- Message and Entry- Check and Radio button- Menus and list-Canvas-Introduction to Matplotlib-Line and Bar plot-Scatter plot-pie chart-working with multiple figures - 3D plots- Plotting using files.

Course Outcomes

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

1. Identify various syntax and operators in python programming for writing simple programs.

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2. Illustrate control flow, library functions and file operations using user-defined and pre-defined functions.
3. Implement object oriented features in python for writing reusable codes.
4. Apply database connectivity technique for real time applications.
5. Design user interfaces using python based GUI components.

Text Books:

1. Peter Wentworth, Jeffrey Elkner, Allen B. Downey, and Chris Meyers, "How to Think Like a Computer Scientist: Learning with Python", Third Edition, O'Reilly, 2014.
2. MarkLutz,"Powerful Object Oriented Programming Python", Fourth Edition, O'Reilly, 2012.

Reference Books:

1. Mark Lutz, "Learning Python, Powerful OOPs", O'Reilly, 2011.
2. Zelle, John M, "Python Programming: An Introduction to Computer Science", Franklin Beedle& Associates, 2003.
3. Budd, Timothy, "Exploring Python", McGraw-Hill Science, 2009.
4. Matplotlib for Python Developers: Effective techniques for data visualization with Python, 2nd Edition, Kindle Edition.

Web References:

1. Python tutorial URL:https://docs.python.org/3/tutorial/
2. Advanced Python URL:https://www.learnpython.org/
3. Python basic tutorial URL:www.pyschools.com/
4. Data Visualization https://www.datacamp.com/courses/introduction-to-data-visualization-with-python/

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Pollachi - 642 003, Coimbatore District, Tamilnadu.

Course Code: 16CSE25	Course Title: JAVA PROGRAMMING (Common to ECE,EEE & EIE)	
Elective	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16GET14 - C Programming

Course Objectives

The course is intended to:

1. Describe the distinct properties and features of Java.
2. Implement name spaces, concurrency and handle exceptions.
3. Employ Java standard library functions.
4. Apply Java utility, input/output functions.
5. Develop Java applications.

UNIT I -INTRODUCTION 9

Overview of Java – Data types, operators, control flows –Class fundamentals, objects and constructors –Method overloading- argument passing, Returning objects, recursion – Method Overriding and Dynamic Method dispatch- Abstract class

UNIT II-PACKAGES, EXCEPTIONS AND THREADS 9

Packages and access protection – Interfaces and extending interfaces – Exception fundamentals and types – Try, catch, throw, throws and finally; Chained Exceptions – Thread model, Creating threads and thread priorities – Synchronization –Inter thread communication

UNIT III- JAVA UTILITIES 9

String Handling –String Buffer class and functions – Library Functions – Math – Process – Clone – System Functions

UNIT IV -COLLECTIONS AND I/O STREAMS 9

Collections – Classes and Interfaces – Iterators and User defined collections – String Tokenizer – Java I/O classes and Interfaces - Streams – Byte Streams - Character Streams – File concepts

UNIT V-EXPLORING SWING 9

Java Swing – Features –Components and Containers – Event handling – Exploring Swing – Menus – Java Database Connectivity

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Course Outcomes

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

CO1. Describe the distinct properties and features of Java

CO2. Implement name spaces, concurrency and handle exceptional conditions in programs

CO3. Employ Java standard library functions for solving complex problems

CO4. Apply Java utility, input/output functions and file manipulators

CO5. Develop Java applications using user interfaces and database connectivity

Text Books

1. Herbert Schildt, "Java the Complete Reference", Mcgraw Hill Education, Ninth Edition, 2014
2. Mahmoud Parsian, "JDBC Metada, MySQL and Oracle Recipes: A Problem-Solution Approach", Apress Publications, 2006

Reference Books

1. Bart Baesens, Aimee Backiel, SeppeVandenBrocke, "Beginning Java Programming: The Object Oriented Approach", John Wiley & Sons, 2015.
2. Daniel Liang, "Introduction to Java Programming, Comprehensive Version", Pearson Education, Ninth Edition, 2014.
3. James M Slack, Programming and Problem solving with JAVA, Thomson Learning, 2002.
4. C Thomas Wu, An Introduction to Object Oriented programming with Java, Tata McGrawHill, 2005.
5. Cay S. Horstmann and Gary Cornell, "Core Java: Volume I – Fundamentals", Eighth Edition, Sun Microsystems Press, 2008.

Web References

1. https://docs.oracle.com/javase/tutorial/java/index.html
2. http://javabeginnerstutorial.com/core-java/
3. http://www.w3schools.in/java/

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Head of the Department,
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Pollachi - 642 003, Coimbatore District, Tamilnadu.

Course Code: 16CSE26	Course Title: SOFTWARE TESTING (Common to ECE,EEE & EIE)	
Elective	L : T : P : C	3 : 0 : 0 : 3
Type: Theory	Total Contact hours	45

Prerequisites: The student should have undergone the course(s):

- 16GET14- C Programming

Course Objectives

The course is intended to:

1. Describe the software testing principles and its characteristics.
2. Choose the appropriate testing for software development.
3. Design Test cases suitable for a software development in various domains.
4. Justify the importance of planning, documenting and validating the test plan.
5. Illustrate the need for automatic testing tools.

UNIT I- TESTING FUNDAMENTALS 9

Introduction to testing as Engineering Activity –Testing Fundamentals: Basic Definitions- Testing principles-Tester's role –Defects, Hypotheses and Tests

UNIT II- LEVELS OF TESTING 9

The need for levels of Testing- Unit Test: Functions, Procedures, Classes, and Methods as Units- Unit Test: The Need for Preparation- Unit Test Planning- Designing the Unit Tests- Running the Unit Tests and Recording Results- Integration Test: Goals- Integration Strategies for Procedures and Functions- Integration Strategies for Classes- Designing Integration Tests- Integration Test Planning- System Test: The Different Types- Regression Testing- Alpha, Beta, and Acceptance Tests

UNIT III - DESIGNING TEST CASES 9

Test case design strategies-Using Black Box approach to Test Case design-Random Testing – Equivalence class partitioning –Boundary value Analysis-Cause effect testing and state transition testing-Error Guessing - Using White Box Approach to Test case design – Test Adequacy Criteria –Coverage and Control Flow Graphs – Covering Code Logic – Paths –Additional test design approaches- code complexity testing – Evaluating Test Adequacy Criteria.

UNIT IV - TEST MANAGEMENT 9

Test Planning: Preparing a plan – scope management – deciding test strategy – responsibilities –resource requirements – test deliverables –testing tasks – Test management: standards – infrastructure management- People management – product

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release - Test Process – Test Reporting

UNIT V- TEST AUTOMATION 9

Test Automation – Terms – Skills required – Scope of automation- Design and Architecture for Automation – Process Model – Selecting Test tools – automation for extreme Programming- Test Metrics and Measurements

Course Outcomes

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

CO1. Describe the software testing principles and its characteristics

CO2. Choose the appropriate testing during the phases of software development

CO3. Design Test cases suitable for a software development in various domains

CO4. Justify the importance of planning, documenting and validating the test plan.

CO5. Illustrate the need for automatic testing tools

Text Books

1. Ilene Burnstein,"Practical Software Testing: A Process-Oriented Approach", Springer International Edition, 2013
2. SrinivasanDesikan and Gopalaswamy Ramesh, "Software Testing – Principles and Practices", Pearson Education, 2006

Reference Books

1. Ron Patton, "Software Testing", Sams Publishing, Pearson Education,Second Edition,2009.
2. Boris Bezier, "Software Testing Techniques",Dreamtech, Second Edition, Reprint 2009
3. Aditya P. Mathur, "Foundations of Software Testing: Fundamental Algorithms and Techniques",Pearson Education, 2008.
4. Edward Kit," Software Testing in the Real World – Improving the Process", Pearson Education, 1995.
5. RenuRajani, Pradeep Oak, "Software Testing – Effective Methods, Tools and Techniques", Tata McGraw Hill, 2004.

Web References

1. http://nptel.ac.in/courses/106105150/
2. Lecturehttps://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-00-introduction-to-computer-science-and-programming-fall-2008/video-lectures/lecture 11/
3. http://www.testingtools.com/

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K. S. Rangasamy College of Engineering and Technology,
Pollachi - 642 003, Coimbatore District, Tamilnadu.

Course Code: 16ECE27	Course Title: DISASTER MANAGEMENT (Common to ECE,EEE & EIE)	
Elective	L : T : P : C	3 : 0 : 0 : 3
Type: Theory	Total Contact hours	45

Prerequisites: The student should have undergone the course(s):

- 16ENT11 - Communication Skills–I
- 16ENT21 - Communication Skills–II

Course Objectives

The course is intended to:

1. Distinguish the natural and manmade disasters
2. Explain the environment hazards and level of toxicology
3. Analyze the causes and effects of Earthquake and Tsunami formation
4. Analyze the causes and effects of Cyclone formation
5. Describe about modern technological tools in disaster management

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.

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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.

Course Outcomes

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

CO1. Distinguish the natural and manmade disasters

CO2. Explain the environment hazards and level of toxicology

CO3. Analyze the causes and effects of Earthquake and Tsunami formation

CO4. Analyze the causes and effects of Cyclone formation

CO5. Describe about modern technological tools in disaster management

Text Books

1. PardeepSahni, Madhavimalalgoda and Ariyabandu, "Disaster risk reduction in south Asia", PHI Publisher, 2010
2. AmitaSinhal, "Understanding earthquake disasters" TMH, 2010.

Reference Books

1. PardeepSahni, AlkaDhameja and Uma medury, "Disaster mitigation: Experiences and reflections", PHI Publisher, 2001.
2. Jeff Groman, "The atlas of Natural Disasters", Friedman/Fairfax publishing, 2002
3. Jaikrishna and Chandrasekar, "Elements of Earthquake Engineering", South Asian Publishers, 2000.

Web References

1. http://nptel.ac.in/courses/122102006/mod2/5.htm
2. http://nptel.ac.in/courses/105104136/Module%201/Lecture%202.pdf

BoS Chairman

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Department of Electronics and Instrumentation Engineering,
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Perundurai - 642 003, Erode District, Tamilnadu.

Course Code: 16MEE49	Course Title: ENGINEERING ECONOMICS AND COST ANALYSIS (Common to ECE,EEE & EIE)	
Elective	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45

Prerequisites: The student should have undergone the course(s):

- 16MAT13 - Engineering Mathematics– I
- 16MAT23 - Engineering Mathematics – II

Course Objectives

The course is intended to:

1. Calculate the breakeven point
2. Apply different interest formulae.
3. Compare economic alternatives.
4. Develop an equipment replacement policy.
5. Calculate depreciation of an equipment

UNIT I – INTRODUCTION TO ECONOMICS 9

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

UNIT II - VALUE ENGINEERING 9

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 with problems.

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

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Pollachi - 642 003, Coimbatore District, Tamilnadu.

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.

UNIT V- DEPRECIATION 9

Depreciation- 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. Case study

Course Outcomes

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

CO1. Categorize different cost and calculate the breakeven point for a given business situation

CO2. Apply different interest formulae and their application in decision making process.

CO3. Evaluate present value, future value and annual worth analysis on one or more economic alternatives.

CO4. Determine the economic value of an asset and develop a better replacement policy for given equipment.

CO5. Evaluate the depreciation of equipment per period

Text Books

1. PanneerselvamR, "Engineering Economics", Prentice Hall of India Ltd, NewDelhi, 2014
2. Chan S.Park, "Contemporary Engineering Economics", Prentice Hall of India, 2010.

Reference Books

1. Donald.G. Newman, Jerome.P.Lavelle, "Engineering Economics and analysis" Engg. Press, Texas, 2010.
2. Degarmo, E.P., Sullivan, W.G and Canada, J.R, "Engineering Economy", Macmillan, New York, 2010.
3. Grant.E.L.,Ireson.W.G., and Leavenworth, R.S, "Principles of Engineering Economy", Ronald Press, New York,1990.

Web References

1. https://en.wikipedia.org/wiki/Engineering_economics
2. https://en.wikipedia.org/wiki/Cost%E2%80%93benefit_analysis

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Perundurai - 638 060, Erode District, Tamilnadu

Course Code: 16MAE03	Course Title: DISCRETE MATHEMATICS (Common to ECE,EEE & EIE)	
Elective	L : T : P : C	3 : 2 : 0 : 4
Type: Theory	Total Contact hours	75

Prerequisites: The student should have undergone the course(s):

- 16MAT13 - Engineering Mathematics– I
- 16MAT23 - Engineering Mathematics – II

Course Objectives

The course is intended to:

1. Organize the concepts of propositional logic in programming languages.
2. Apply the theory of predicate calculus to test the validity of arguments.
3. Interpret the concept of various algebraic structures.
4. Classify several types of Graphs and its algorithms in computer programs.
5. Categorize the different types of trees.

UNIT I – PROPOSITIONAL LOGIC 9

Propositions – Logical Connectives – Tautologies and Contradictions – Contra Positive – Logical Equivalences and Implications – Normal Forms – Principal Conjunctive and Disjunctive Normal Forms – Rules of Inferences

UNIT II - PREDICATE CALCULUS 9

Predicates – Quantifiers – Free and Bounded variables – Universe of Discourse – Rules of Universal Specification and Generalization – Validity of Arguments.

UNIT III - GROUPS 9

Algebraic Systems – Properties – Semigroups – Monoids – Homomorphism Subsemigroups and Submonoids– Cosets and Lagrange's Theorem – Normal Subgroups.

UNIT IV - GRAPHS 9

Basic Definitions – Degree of Vertex –Matrix Representation of a Graphs - Paths Cycles and Connectivity – Eulerian and Hamiltonian Graphs.

UNIT V- TREES 9

Introduction to Trees – Spanning Tree – Minimum Spanning Tree – Binary Trees – Rooted and Binary Trees– Tree Traversal – Expression Trees.

Course Outcomes

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

CO1. Organize the concepts of propositional logic in programming languages using logical connectives.

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CO2. Apply the theory of predicate calculus to test the validity of arguments using quantifiers.

CO3. Interpret the concept of various algebraic structures using groups and subgroups.

CO4. Classify several types of Graphs and its algorithms in computer programs using fundamental concepts of Graph Theory.

CO5. Categorize the different types of trees using fundamental concepts of Graph Theory

Text Books

1. T.Veerarajan, "Discrete Mathematical Structures with Graph Theory and Combinatorics", Tata McGraw–Hill Education Private Limited, New Delhi, 2011.

Reference Books

1. Kenneth H.Rosen, "Discrete Mathematics and its Applications", Special Indian edition, Tata McGraw-Hill Pub. Co. Ltd., New Delhi, 2007.
2. Trembly J.P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw–Hill Pub. Co. Ltd, New Delhi, 2007
3. Seymour Lipschutz and Mark Lipson, "Discrete Mathematics",2nd Edition, Schaum's Outlines, Tata McGraw-Hill Pub. Co. Ltd., New Delhi, 2007.

Web References

1. http://nptel.ac.in/courses/111104026/
2. http://nptel.ac.in/courses/106106094/
3. http://nptel.ac.in/video.php?subjectId=106106094

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Course Code: 16MAE04	Course Title: OPERATIONS RESEARCH (Common to ECE,EEE & EIE)	
Elective	L : T : P : C :	3 : 2 : 0 : 4
Type: Theory	Total Contact hours :	75

Prerequisites: The student should have undergone the course(s):

- 16MAT13 - Engineering Mathematics– I
- 16MAT23 - Engineering Mathematics – II
- 16GET14 - C Programming

Course Objectives

The course is intended to:

1. Find the value of the given objective functions.
2. Solve transportation problems
3. Solve assignment problems
4. Find shortest path and total project cost
5. Calculate the sequence for the given sequencing models

UNIT I – LINEAR PROGRAMMING PROBLEM 9

Introduction to Operations Research: Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem – Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables, big-M method.

UNIT II - TRANSPORTATION MODEL 9

Transportation Problem. Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and MODI method.

UNIT III - ASSIGNMENT MODEL 9

Assignment model. Formulation. Hungarian method for optimal solution. Solving unbalanced problem. Traveling salesman problem and assignment problem.

UNIT IV - NETWORK ANALYSIS 9

Network Techniques: Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem. Project Management: Phases of project management, guidelines for network construction, CPM and PERT.

UNIT V- SEQUENCING PROBLEM 9

Sequencing models. Solution of Sequencing Problem – Processing n Jobs through 2 Machines – Processing n Jobs through 3 Machines – Processing 2 Jobs through m machines – Processing n Jobs through m Machines.

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Course Outcomes

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

CO1. Find the value of the given objective functions using linear programming techniques

CO2. Solve transportation problems using optimality tests to minimize transportation cost

CO3. Solve assignment problems using Hungarian method to obtain optimal solution

CO4. Find shortest path and total project cost using various network techniques

CO5. Calculate the sequence to optimize time and cost for the given sequencing models

Text Books

1. P. Sankaralyer, "Operations Research", Tata McGraw-Hill, 2008.
2. A.M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education, 2005

Reference Books

1. Wayne L. Winston, "Operations Research" Thomson Learning, 2003
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education, 2003
3. R. PanneerSelvam, "Operations Research" PHI Learning, 2008.
4. V. K. Khanna, "Total Quality Management" New Age International, 2008.

Web References

3. http://nptel.ac.in/courses/112106131/1

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Pollachi - 642 003, Coimbatore District, Tamilnadu.

Course Code: 16OET17	Course Title: SMART SENSOR TECHNOLOGY	
Open Elective	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45 Hours

Prerequisites: The student should have undergone the course(s):

- Nil

Course Objectives

The course is intended to:

1. Explain the Structure of Smart Sensors
2. Describe the data acquisition through the sensor
3. Elucidate the communication used for smart sensor
4. Illustrate the wireless communication technology used for smart sensor
5. Provide knowledge on inbuilt sensors in smart devices

UNIT I – INTRODUCTION TO SMART SENSORS 9

Mechanical to Electronic transition in Sensing – Nature of Sensor – Integration of Micromachining and Microelectronics - Evolution of Smart Sensors - Components of Smart Sensors – General Architecture of Smart Sensors

UNIT II – DATA ACQUISITION THROUGH SENSOR 9

Amplification and Signal Conditioning: Instrumentation amplifier – Sleep mode Circuitry - Rail to Rail operational amplifier - 4-20ma Signal transmitter – Digital conversion: sampling, Quantizing and encoding – MCU control and sensor interface – Techniques and system integration: Linearization – PWM Control – Auto zero and Auto range – Diagnostics – Reducing EMC and RFI

UNIT III – COMMUNICATION FOR SMART SENSOR 9

Overview of Communication Organization and standards – Automotive protocols: CAN – LIN – Media Oriented Systems Transport – Flex ray - Industrial usage of CAN – MCU with integrated CAN – LonTalk Protocol – MI bus – Other aspects of Network communications

UNIT IV – WIRELESS SENSING 9

Introduction of RF and Spread spectrum – Wireless data and communication – Zigbee – ANT+ - 6LoWPAN – NFC – Zwave – Dust networks – RF Sensing: Surface acoustic waves - RADAR – LIDAR – GPS – Remote emission sensing – Intelligent transportation system - RFID – Telemetry

UNIT V – SMART SENSOR DEVICES 9

Case Study: Sensors in Mobile phones: Accelerometer, Gyroscope, Touch sensor, Proximity Sensor, Ambient light sensor, Hall sensor and Finger print sensor – Sensors

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in Automotive vehicles: Air flow sensor, Engine speed sensor, Manifold Absolute Pressure Sensor, Spark Knock Sensor, Fuel Temperature Sensor, Voltage Sensorand ABS - Sensors in Wearables: Electro-chemical Bio Sensor, Wearable electrodes, Stain, temperature and pressure sensors

Course Outcomes

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

CO1. Explicate the Structure of Smart Sensors and build the sensor

CO2. Describe the data acquisition from sensor to other devices

CO3. Summarize the various communication protocol used for data processing

CO4. Elucidate wireless technology used in sensor system

CO5. Explain the sensors used in various smart devices

Text Books

1. Randy Frank "Understanding Smart Sensors" 3rd Edition, CRC Press, 2014
2. Krzysztof Iniewski "Smart Sensors for Industrial applications" CRC Press, 2013

Reference Books

1. Kevin Yallup, Krzysztof Iniewski "Technologies for Smart Sensors and Smart fusion" CRC Press, 2014
2. Gerard Meijer, Kofi Makinwa, MichielPertijs "Smart Sensor Systems: Emerging Technologies and applications" John wiley and Sons Ltd, 2014
3. S.C.Mukhopadhyay, G.S.Gupta "Smart Sensors and Sensing Technology" Springer, 2008

Web References

1. https://new.abb.com/motors-generators/service/advanced-services/smart-sensor
2. https://www.intersil.com/en/applications/industrial/smart-sensor.html
3. http://www.smartsensors.com/

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Pollachi - 642 003, Coimbatore District, Tamilnadu.

Course Code: 16OET18	Course Title : INDUSTRIAL INTERNET OF THINGS	
Open Elective	L : T : P: C	3:0:0:3
Type: Theory	Total Contact hours:	45

Prerequisites:

- NIL

Course Objectives

The course is intended to:

1. Indicate the various industrial revolutions and architecture of IIoT.
2. Provide knowledge on Networking protocols used IoT based solutions
3. Realize an IoT application using physical devices and programming tools
4. Introduce the concept of process data analytics.
5. Provide an insight into the application of IIoT

UNIT I – Introduction and Architecture of IIoT 9

The Various Industrial Revolutions - Digitalisation and the Networked Economy -Drivers, Enablers, Compelling Forces and Challenges for Industry 4.0-Comparison of Industry 4.0 Factory and Today's Factory -Trends of Industrial Big Data and Predictive Analytics for Smart Business Transformation.

IoT Architecture, WoT and M2M - IoT Enabling Technologies - IoT Levels and templates.

UNIT II – IoT Network protocols 9

Understanding Internet Protocols: Simplified OSI Model, Network Topologies, Standards, Salient features of IPV4 – Specifications of IPV6, Types of Internet Networking - Ethernet, WiFi, Bluetooth, Bluetooth Low Energy (BLE), Zigbee,6LoWPAN, RFID, NFC.

UNIT III – Physical And Logical Design 9

System Design of Connected Devices: Embedded Devices, Embedded Hardware, Connected Sensors and Actuators, Controllers, Battery Life Conservation and designing with Energy Efficient Devices, Physical design using prototyping boards - choice of processor, interfacing and networking - Logical Design – Open source platforms - Case study: Environmental monitoring using Python programming and Raspberry Pi prototyping board.

UNIT IV – PROCESS DATA ANALYTICS 9

Process analytics - Dimensions for Characterizing process- process Implementation technology Tools and Use Cases- open source and commercial tools for Process analytics- Big data Analytics for process data - Analyzing Big process data problem –

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Pollachi - 642 003, Coimbatore District, Tamilnadu.

Crowd sourcing and Social BPM - Process data management in the cloud.

UNIT V – CASE STUDY 9

Smart Manufacturing – IIoT in oil and gas industry -Smart Cities- Precision healthcare-Precision mining

Course Outcomes

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

CO1. Describe various industrial revolutions and architecture of IoT

CO2. Summarize the communication protocols suitable for IoT

CO3. Select suitable physical devices for IoT application

CO4. Describe the concept of process data analytics

CO5. Indicate the role and advantages of IIoT in various applications

Text Books

1. ArshdeepBahga and Vijay Madisetti, "Internet of Things A Hands-on Approach", Universities Press (India), 2015
2. Elizabeth Goodman, Alfred Lui,MartinCharlier, Ann Light, Claire Rowland Designing Connected Products, 1st Edition,O'Reilly Media Inc, 2015
3. Beheshti, S.-M.-R., Benatallah, B., Sakr, S., Grigori, D., Motahari-Nezhad, H.R., Barukh, M.C., Gater, A., Ryu, S.H. "Process Analytics Concepts and Techniques for Querying and Analyzing Process Data" Springer International Publishing Switzerland, 2016.

Reference Books

1. Lucas Darnell, "The Internet of Things (A Look at Real World Use Cases and Concerns)", Kindle Edition, 2016,
2. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
3. Joe Biron& Jonathan Follett "Foundational Elements of an IOT Solution - The Edge, Cloud and Application Development", O'reilly, First Edition, March 2016

Web References

1. https://onlinecourses.nptel.ac.in/noc17_cs22/preview
2. https://onlinecourses.nptel.ac.in/noc17_ee20/preview
3. https://www.udemy.com/internet-of-things-from-beginner-to-making-you-first-device/

BoS Chairman

Head of the Department,
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Perundurai - 638 060, Erode District, Tamilnadu