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 2014

DR.MAHALINGAM
MCET
COLLEGE OF ENGINEERING AND TECHNOLOGY
Enlightening Professional Minds

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

Regulation 2014

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						
141EI0101	Communication Skills I	2	0	2	3	100
141EI0102	Engineering Mathematics I	3	1	0	4	100
141EI0103	Engineering Physics	3	0	0	3	100
141EI0104	Engineering Graphics	1	3	0	4	100
141EI0105	C Programming	3	0	0	3	100
141EI0106	Fundamentals of Electrical Engineering	3	0	0	3	100
PRACTICAL						
141EI0107	C Programming Laboratory	0	0	2	1	100
141EI0108	Engineering Practices Laboratory - I	0	0	2	1	100
PROFESSIONAL SKILLS COURSE						
141EI0109	Sports for Wellness	0	0	2	1	100
TOTAL		**15**	**4**	**8**	**23**	**900**

Total Hours in a Week: 27

SEMESTER II

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
141EI0201	Communication Skills II	2	0	2	3	100
141EI0202	Engineering Mathematics II	3	1	0	4	100
141EI0203	Material Science	3	0	0	3	100
141EI0204	Electron Devices	3	0	0	3	100
141EI0205	Engineering Chemistry	3	0	0	3	100
141EI0206	Basics of Civil and Mechanical Engineering	3	0	0	3	100
PRACTICAL						
141EI0207	Engineering Physics & Chemistry Laboratory	0	0	2	1	100
141EI0208	Engineering Practices Laboratory - II	0	0	2	1	100
PROFESSIONAL SKILLS COURSE						
141EI0209	Promotion of Students' Wellness	0	0	2	1	100
TOTAL		**17**	**1**	**8**	**22**	**900**

Total Hours in a Week: 26

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SEMESTER III

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
141EI0301	Transforms and Partial Differential Equations	4	0	0	4	100
141EI0302	Electric and Electronic Circuits	3	2	0	4	100
141EI0303	Transducer Engineering	3	0	0	3	100
141EI0304	Electrical Machines and Measurements	3	0	0	3	100
141EI0305	Object Oriented Programming Concepts	3	0	0	3	100
141EI0306	Thermodynamics and Fluid Mechanics	2	2	0	3	100
PRACTICAL						
141EI0307	Electrical Machines and Measurements Laboratory	0	0	4	2	100
141EI0308	Electrical and Electronic Circuits Laboratory	0	0	4	2	100
	One Credit Course	0	0	2	1	100
PROFESSIONAL SKILLS COURSE						
141EI0309	Personal Effectiveness	0	0	2	1	100
TOTAL		**18**	**4**	**12**	**26**	**1000**

Total Hours in a Week: 34

SEMESTER IV

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
141EI0401	Linear Algebra and Numerical Methods	4	0	0	4	100
141EI0402	Linear Integrated Circuits and Applications	3	0	0	3	100
141EI0403	Industrial Instrumentation - I	3	0	0	3	100
141EI0404	Digital Principles and Applications	3	0	0	3	100
141EI0405	Data Structures and Algorithms	4	0	0	4	100
141EI0406	Discrete Time Systems and Signal Processing	3	0	2	4	100
PRACTICAL						
141EI0407	Integrated Circuits Laboratory	0	0	4	2	100
141EI0408	Data structures and object oriented Programming with C++ Laboratory	0	0	4	2	100
XXXX	One Credit Course	0	0	2	1	100
PROFESSIONAL SKILLS COURSE						
141EI0409	Ethical And Moral Responsibility	0	0	2	1	100
TOTAL		**20**	**0**	**14**	**27**	**1000**

Total Hours in a Week: 34

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SEMESTER V

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
141EI0501	Microprocessor and Microcontroller	3	0	2	4	100
141EI0502	Control Systems	3	2	0	4	100
141EI0503	Fiber Optics and Laser Instruments	3	0	0	3	100
141EI0504	Communication Engineering	3	0	0	3	100
141EI0505	Industrial Instrumentation - II	3	0	0	3	100
XXXX	Professional Elective - I	3	0	0	3	100
PRACTICAL						
141EI0506	Transducer and Signal Conditioning Laboratory	0	0	4	2	100
141EI0507	System Simulation Laboratory	0	0	4	2	100
XXXX	One Credit Course	0	0	2	1	100
PROFESSIONAL SKILLS COURSE						
141EI0508	Teamness & Interpersonal Skills	0	0	2	1	100
TOTAL		**18**	**2**	**14**	**26**	**1000**

Total Hours in a Week: 34

SEMESTER VI

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
141EI0601	VLSI Design	3	0	0	3	100
141EI0602	Power Electronics	2	2	0	3	100
141EI0603	Embedded System Design	3	0	0	3	100
141EI0604	Process Control	3	0	0	3	100
141EI0605	Environmental Studies	3	0	0	3	100
XXXX	Professional Elective II	3	0	0	3	100
PRACTICAL						
141EI0606	Process Control and Instrumentation Laboratory	0	0	4	2	100
141EI0607	Embedded System Design Laboratory	0	0	4	2	100
XXXX	One Credit Course	0	0	2	1	100
PROFESSIONAL SKILLS COURSE						
141EI0608	Campus to Corporate	0	0	2	1	100
TOTAL		**17**	**2**	**12**	**24**	**1000**

Total Hours in a Week: 31

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SEMESTER VII

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
141EI0701	Principles of Management	3	0	0	3	100
141EI0702	Logic and Distributed Control System	3	0	0	3	100
XXXX	Professional Elective – III	3	0	0	3	100
XXXX	Open Elective	3	0	0	3	100
PRACTICAL						
141EI0703	Industrial Automation Laboratory	0	0	4	2	100
141EI0704	Advanced Instrumentation Laboratory	0	0	4	2	100
141EI0705	Innovative and Creative Project	0	0	8	4	100
TOTAL		**12**	**0**	**16**	**20**	**900**

Total Hours in a Week: 28

SEMESTER VIII

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
XXXX	Professional Elective – IV	3	0	0	3	100
XXXX	Professional Elective – V	3	0	0	3	100
XXXX	Professional Elective – VI	3	0	0	3	100
PRACTICAL						
141EI0801	Project	0	0	20	10	200
TOTAL		**9**	**0**	**20**	**19**	**500**

Total Hours in a Week: 29

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PROFESSIONAL ELECTIVES

DESIGN ENGINEERING

S. No	Course Code	Course Title	Hours/Week			Credits	Marks
			L	T	P		
1.	141EI9111	ASIC Design	3	0	0	3	100
2.	141EI9112	Digital Image Processing	3	0	0	3	100
3.	141EI9113	Automotive Electronics	3	0	0	3	100
4.	141EI9114	Advanced Microprocessors	3	0	0	3	100
5.	141EI9115	Instrumentation System Design	3	0	0	3	100
6.	141EI9116	Computer Architecture	3	0	0	3	100

SENSORS AND INSTRUMENTATION ENGINEERING

S. No	Course Code	Course Title	Hours/Week			Credits	Marks
			L	T	P		
7.	141EI9117	Analytical Instrumentation	3	0	0	3	100
8.	141EI9118	Instrumentation in Petrochemical Industries	3	0	0	3	100
9.	141EI9119	Power Plant Instrumentation	3	0	0	3	100
10.	141EI9120	Smart and Wireless Instrumentation	3	0	0	3	100
11.	141EI9121	Modern Electronic Instrumentation	3	0	0	3	100
12.	141EI9122	Wireless Sensor Networks	3	0	0	3	100
13.	141EI9123	Bio Medical Engineering	3	0	0	3	100

CONTROL AND AUTOMATION

S. No	Course Code	Course Title	Hours/Week			Credits	Marks
			L	T	P		
14.	141EI9124	Advanced Process Control	3	0	0	3	100
15.	141EI9125	Industrial Drives and Control	3	0	0	3	100
16.	141EI9126	Digital Control and State Variable Methods	3	0	0	3	100
17.	141EI9127	Non Linear Control System	3	0	0	3	100
18.	141EI9128	Industrial Data Communication Networks	3	0	0	3	100
19.	141EI9129	Robotics and Automation	3	0	0	3	100
20.	141EI9130	Hydraulics and Pneumatics	3	0	0	3	100
21.	141EI9131	Virtual Instrumentation	3	0	0	3	100

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SOFTWARE ENGINEERING

S. No	Course Code	Course Title	Hours/Week			Credits	Marks
			L	T	P		
22.	141EI9132	Data Base Management System	3	0	0	3	100
23.	141EI9133	Data Mining and Analytics	3	0	0	3	100
24.	141EI9134	JAVA programming	3	0	0	3	100
25.	141EI9135	Software Testing	3	0	0	3	100
26.	141EI9136	Python Programming	3	0	0	3	100

BASIC SCIENCES

S. No	Course Code	Course Title	Hours/Week			Credits	Marks
			L	T	P		
27.	141EI9137	Probability and Random Process	3	0	0	3	100
28.	141EI9138	Operation Research	3	0	0	3	100

MANAGEMENT

S. No	Course Code	Course Title	Hours/Week			Credits	Marks
			L	T	P		
29.	141EI9139	Disaster Management	3	0	0	3	100
30.	141EI9141	Engineering Economics and Cost Analysis	3	0	0	3	100

OPEN ELECTIVES

S. No	Course Code	Course Title	Hours/Week			Credits	Marks
			L	T	P		
31.	141OE0915	Smart Sensor Technology	3	0	0	3	100
32.	141OE0916	Industrial Internet of Things	3	0	0	3	100

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Course Code:141EI0101	Course Title: COMMUNICATION SKILLS – I (Common to ECE, EEE and EIE)	
Core :General	L: T: P: C	2 : 0 : 2 : 3
Type: Lecture & Practical	Total Contact Hours:	60

Pre-requisites: 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. Write grammatically correct sentences in English.
2. Listen to conversations, comprehend and answer questions.
3. Speak about a process, things, about oneself and others.
4. Read passages, infer and respond to the question.
5. Write short pieces of business correspondence.

Unit I - GRAMMAR 12

Parts of speech - Kinds of sentences – statement, interrogative, imperative and exclamatory – action word and its importance in a sentence –kinds of verbs& forms of verbs - auxiliary verbs and its importance, modal auxiliaries and its usage - Tenses and impersonal passive voices – Spelling - prepositions.

Unit II - LISTENING 12

Listening for specific information – short conversation and monologues, Telephone conversation, extended monologues, listening for gist – conversation, interview and discussion, multiple choice, gap filling, note-taking.

Unit III - SPEAKING 12

Elements of effective speech – exchange of basic personal information –narration –talk on general topics– describing events, pictures and people – Working Mechanism of a machine.

Unit IV- READING 12

Business articles -Advertisements – company websites – Interpreting visual information – skimming and scanning -data from email, articles, books and report- Newspaper articles – short Messages- pamphlets, brochures, flyers, leaflets and real-world notices – Error spotting – Cloze Test- extracting relevant information – identifying main and subordinate ideas–comprehension – making inferences – reading critically –

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determining fact versus opinion.

Unit V - WRITING **12**

Formal & informal emails- letter writing- leave letter, permission seeking letter- format, content, set phrases and etiquettes of e-mails and letters- fax –memo- note- reports.

Course Outcomes

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

CO1. Write grammatically correct sentences in English.

CO2. Listen to conversations comprehend, make notes and answer questions.

CO3. Speak about a process, things, about oneself and others.

CO4. Read passages, infer and respond to the question.

CO5. Write short pieces of business correspondence such as emails, letters and reports.

Text Books:

1. M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill Education Pvt. Ltd., New Delhi 2005.

2. 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.https://www.ego4u.com

3. http://www.usingenglish.com

4.http://www.cambridgeenglish.org/exams/business-certificates/business-preliminary/

5. http://writingcenter.unc.edu/handouts/business-letters/

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Course Code: 141EI0102	Course Title: ENGINEERING MATHEMATICS - I (Common to ECE, EEE and EIE)	
Core : General	L: T: P: C	3 : 1 : 0: 4
Type: Theory	Total Contact Hours:	60

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

- Nil

Course Objectives

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.
5. Apply first order ordinary differential equations for solving problems.

Unit I - MATRICES 9+3

Solution of system of equations-Eigen values 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+3

Sequences: Definition and examples – Series: Types and Convergence – Series of positive terms –Tests of convergence: Comparison test, Integral 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+3

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+3

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 cylindrical coordinates – Triple integrals- Volume of Solids.

Unit V - ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER 9+3

Formation of ordinary differential equation-Solution of differential equations of first order and

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first degree: homogeneous form, linear form and exact differential equations - Applications to engineering problems.

Course Outcomes

At the end of this 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.Kreyszig.E, "Advanced Engineering Mathematics", Wiley Publications, 9th edition, 2014.

2.Grewal. B.S, "Higher Engineering Mathematics", 41st Edition, Khanna Publications, Delhi, 2011.

Reference Books:

1.Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2012.

2.Peter V. O'Neil," Advanced Engineering Mathematics", 7th Edition, Cengage learning, 2012.

3.Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2008

4Veerarajan. T, "Engineering Mathematics", Tata McGraw Hill Publishing Co, New Delhi, 5th edition, 2006.

Web References:

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

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Course Code: 141EI0103	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

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

- Nil

Course Objectives

The course is intended to:

1. Explain the properties, generation and applications of ultrasonics.
2. Interpret the thermal properties and their significance.
3. Identify the applications of LASER.
4. Explain the principles of fiber optics in communication systems.
5. Calculate the crystal parameters and analyze different crystal structures and defects.

Unit I - ULTRASONICS 9

Classification of sound, Ultrasonics: Properties of Ultrasonics- Magnetostriction and Piezoelectric generators - Detection — Cavitation and its application – Velocity of ultrasonic waves using acoustical grating- Applications: SONAR-Ultrasonic inspection-NDT: Pulse echo system-Through transmission and reflection modes - Scan displays with respect to flaw detection.

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 advantages

Unit V - 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 – Interplanar distance, Crystal defects: point, line and surface defects and their influence on the electronic properties of materials.

Course Outcomes

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

CO1. Explain the properties, generation and applications of ultrasonics.

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

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 Wiley 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,
4. V Rajendran, "Engineering Physics", Tata McGraw-Hill Co, New Delhi, 2011

Web References:

1.http://www.physicsclassroom.com/class/thermal

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: 141EI0104	Course Title: : ENGINEERING GRAPHICS (Common to ECE, EEE and EIE)	
Core / Elective: Core	L: T: P: C	1: 3: 0: 4
Type: Theory	Total Contact Hours:	60

Prerequisites: The student should have undergone the course:

- Nil

Course Objectives:

The course is intended to:

1. Sketch different curves and explain its application.
2. Prepare orthographic projection from pictorial views and models.
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 **10**

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 **15**

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 **15**

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 **10**

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 **10**

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

Course Outcomes:

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

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CO1. Sketch different curves and explain its application.

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.
2. K. Venugopal, V.A Prabhu Raja, "A Textbook of Engineering Graphics , New Age International (P) Limited, 2009.

Reference Books:

1. Dhananjay A. Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill Publishing Company Limited, 2008.
2. BasantAgarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Cencil Jensen, Jay D. Helsel and Dennis R. Short Engineering Drawing and Design. Tata McGraw Hill Publishing Company Limited, 2012.
4. John.K.C and Verghese.P.I "Machine Drawing", Jovast Publishers, Trissur, 2007.

Web References:

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

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Course Code: 141EI0105	Course Title:C- PROGRAMMING (Common to ECE, EEE and EIE)	
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):

- Nil

Course Objectives

The course is intended to :

1. Comprehend the knowledge on computer systems and problem solving techniques.
2. Identify and construct program. .
3. Develop programs using arrays and strings.
4. Interpret the significance of code reusability and attain memory access through pointers.
5. Relate and justify the prominence of structures and unions.

Unit I - INTRODUCTION 8

Generation and Classification of Computers- Computer Systems-Basic Organization of a Computer –Computer languages-Number System – Binary – Decimal – Conversion. Need for logical analysis and thinking– Algorithm – Pseudo code – Flow Chart.

Unit II - C PROGRAMMING BASICS 11

Problem formulation – Problem Solving - Introduction to C programming –structure of a C program – compilation and linking processes –Identifier- Keywords -Data Types-Variables — Constant-Operators and Expressions – Managing Input and Output operations –Decision Making and Branching – Looping statements-Nested looping-Type Casting-Storage Classes. Example problems.

Unit III - ARRAYS AND STRINGS 8

Arrays — Declaration -Initialization – One dimensional and Two dimensional arrays-Advantages and Limitations of Arrays. String- String operations –Arrays of Strings. Simple programs- Sorting- Searching – Matrix operations.

Unit IV - FUNCTIONS AND POINTERS 9

Function –Built in function-User defined function-– Declaration of function – definition of function-Pass by value – Pass by reference– Recursion. Pointers - Definition – Initialization – Pointers arithmetic –Array of Pointers-Example problems.

Unit V - STRUCTURES AND UNIONS 9

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Need for structure data type – structure definition – Structure declaration –Accessing structure elements –Array of structures–Pointer to Structure - Union - Programs using structures and Unions – Pre-processor directives.

Course Outcomes

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

CO1.Comprehend the knowledge on computer systems and problem solving techniques.

CO2.Identify and construct program using appropriate programming paradigms.

CO3.Develop programs using arrays and strings.

CO4.Interpret the significance of code reusability and attain memory access through pointers.

CO5 .Relate and justify the prominence of structures and unions.

Text Books:

1. PradipDey, ManasGhosh, Fundamentals of Computing and Programming in C, First Edition, Oxford University Press, 2009
2. BehrouzA.Forouzan and Richard F. Gilberg, Computer Science: A Structure program approach using *C*, Cengage learning, 2008

Reference Books:

1. Yashavant P. Kanetkar. Let Us C, BPB Publications, 2011.
2. Kernighan,B.W and Ritchie,D.M, The C Programming language, Second Edition, Pearson Education, 2006.
3. Byron S Gottfried, Programming with C, Schaum's Outlines, Second Edition, Tata McGraw-Hill, 2006.
4. R.G. Dromey, How to Solve it by Computer, Pearson Education, Fourth Reprint, 2007.

Web References:

1. http://www.w3schools.in/c
2. http://www.c4learn.com/learn-c-programming-language/
3. http://www.programmingsimplified.com/c-program-examples

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Course Code: 141EI0106	Course Title:FUNDAMENTALS OF ELECTRICAL ENGINEERING (Common to ECE, EEE and EIE)	
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):

- Nil

Course Objectives

The course is intended to:

1.Explain the various terminologies of electrical quantities.

2.Identify the required passive components for the given applications

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

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

5.Apply appropriate domestic wiring for the given specification.

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,

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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

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, 10th Edition,2010

REFERENCES:

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, Mc. Graw Hill, New Delhi, 1st 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/

5. http://electronicsforu.com/

6.http://www.physicsclassroom.com/

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Course Code: 141EI0107	Course Title: : C PROGRAMMING LABORATORY (Common to ECE, EEE and EIE)	
Core	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. Infer the skills in data processing.
2. Develop program using constructs.
3. Write, compile and debug programs.
4. Apply and practice logical ability.
5. Choose appropriate programming components.

List of Experiments:

1. Text formatting ,table and Mathematical equations in MS word
2. Presentation and Visualization-Chart
3. Program to evaluate an Expression using various types of operators
4. Program using decision making and branching statement
5. Program using loops
6. Program using Arrays and Strings
7. Program using Functions
8. Program using Pointers
9. Program using structures
10. Program using Files.

Course Outcomes:

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

CO1. Infer the skills in data processing.

CO2. Develop program using suitable programming constructs.

CO3. Write, compile and debug programs in C language

CO4. Apply and practice logical ability to solve application oriented problems

CO5. Choose appropriate programming components to solve real-world computing problems.

Web References:

1. Mcgrath Mike C, C Programming in easy steps, Fourth Edition, Tata McGraw-Hill, 2013.

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Course Code: 141EI0108	Course Title : ENGINEERING PRACTICES LABORATORY – I (Electrical & Electronics) (Common to ECE, EEE and EIE)	
Core	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. Draw the basic symbols of Electrical and Electronic Components.
2. Identify the various Electrical and Electronic elements.
3. Execute soldering practice.
4. Verify basic laws and demonstrate basic wiring.
5. Apply the concepts of Electrical Engineering.

List of Experiments:

1. Symbols of Electrical and Electronic components.
2. Identification and verification of Resistor and Capacitor Values
3. Verification of Ohms law.
4. Verification of Kirchhoff's current & voltage law.
5. Soldering practice and continuity checking.
6. Measurement of Voltage and frequency using CRO.
7. Stair case wiring
8. Fluorescent Lamp wiring.
9. House wiring
10. UPS Wiring
11. Measurement of earth resistance using Megger.

Course Outcomes:

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

CO1. Draw the basic symbols of Electrical and Electronic Components.

CO2. Identify the various Electrical and Electronic elements.

CO3Execute soldering practice for Electrical and Electronics circuits.

CO4. Verify basic laws and demonstrate basic wiring.

CO5. Apply the concepts of Electrical Engineering for real time Applications.

Web References:

1. MCET Engineering Practices Laboratory - I Manual.

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Course Code: 141EI0109	Course Title: SPORTS FOR WELLNESS	
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. 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

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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.

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

Web References:

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 maj 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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Course Code:141EI0201	Course Title: COMMUNICATION SKILLS - II (Common to ECE, EEE and EIE)	
Core :General	L: T: P: C	2 : 0 : 2 : 3
Type: Lecture & Practical	Total Contact Hours:	60

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

- 141EI0201 -Communication Skills - I

Course Objectives

The course is intended to

CO1. Write concisely and ensure accuracy through proof reading.

CO2. Listen to lectures and presentations, comprehend and respond

CO3. Use appropriate non-verbal skills to present ideas and participate in discussions.

CO4. Use various reading techniques, make notes and respond.

CO5. Write effectively for various professional situations.

Unit I - GRAMMAR 12

Types of sentences – simple, compound and complex, Concord – One word substitutions, word formation, commonly confused words, idioms and phrases –Editing-punctuation, spelling - correct use of articles-usage of question tags.

Unit II - LISTENING 12

Listening to fill up gapped texts -Listening to identify context and Speaker's opinion-Note Taking-Listening to Conversation, to business lecturers, presentation, interviews, ted talk, pep talk, documentaries and cricket commentaries

Unit III - SPEAKING 12

Non-verbal skills – importance & types - conversational practices, debate Narration, mock interview, GD - impromptu talks, story-telling, likes and dislikes, role plays & presentations on business themes.

Unit IV- READING 12

Exposure to different reading techniques-Intensive & Extensive reading-Reading Comprehension - speed reading-obstacles in reading- eye fixation, regression and sub-vocalization - Note Making– Jumbled Sentences – short stories and Newspaper articles

Unit V - WRITING 12

Free writing on any given topic, Letter of application - content, format & Resume writing-Writing Business Letters- calling for quotations, placing orders, a letter of complaint

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regarding manufacturing defects, Writing Instructions-Proof Reading.

Course Outcomes

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

CO1. Write concisely and ensure accuracy through proof reading.

CO2. Listen to conversations comprehend, make notes and answer questions. Listen to lectures and presentations, comprehend and respond

CO3. Use appropriate non-verbal skills to present ideas and participate in discussions.

CO4. Use various reading techniques, make notes and respond.

CO5. Write effectively for various professional situations.

Text Books:

1. Meenakshi Raman &Sangeetha Sharma, Technical Communication Principles and Practice, Second edition, Oxford Higher Education, New Delhi, 2011.
2. Cambridge BEC Vantage- Practice Tests, Self-study Edition, Cambridge University Press, 2002

Reference Books:

1. R C. Sharma, Krishna Mohan, Business Correspondence and Report Writing, Tata McGraw Hill Publishing Co., Ltd., New Delhi 2002
2. ShaliniVerma,Verbal, Ability and Reading Comprehension, Pearson publications, 2013
3. Edgar Thorpe, Showick Thorpe, Objective English, fifth edition, Pearson publications, 2014.
4. M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill Education Pvt. Ltd., New Delhi 2005.

Web References:

1. www.englishpage.com
2. http://www.cambridgeenglish.org/exams/business-certificates/business-vantage/
3. http://www.skillsyouneed.com/rhubarb/business-writing-tips.html
4. https://owl.english.purdue.edu/owl/
5. www.perfect-english-grammar.com

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Course Code:141EI0202	Course Title: ENGINEERING MATHEMATICS - II (Common To ECE, EEEand EIE)	
Core :General	L: T: P: C	3 : 1 : 0 : 4
Type: Theory	Total Contact Hours:	60

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

- 141EI0101-Engineering Mathematics - I

Course Objectives

The course is intended to

1. Solve second and higher order ordinary differential equations.
2. Understand the concepts of vector differentiation and integration.
3. Apply the Laplace transform techniques.
4. Use the functions of a complex variable and construct analytic functions.
5. Use the concept of complex integration to solve contour integrals.

UNIT I DIFFERENTIAL EQUATIONS OF SECOND AND HIGHER ORDER 9+3

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

UNIT II VECTOR CALCULUS 9+3

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+3

Laplace transform – 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.

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UNIT IV ANALYTIC FUNCTIONS 9+3

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.

UNIT V COMPLEX INTEGRATION 9+3

Statement and applications of Cauchy's integral theorem – 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 this course, students will be able to:

CO1. Solve second and higher order ordinary differential equations

CO2. Understand 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 solve contour integrals.

TEXT BOOKS:

1. Kreyszig.E, "Advanced Engineering Mathematics", Wiley Publications, 9th edition, 2014

2. Grewal. B.S, "Higher Engineering Mathematics", 41st Edition, Khanna Publications, Delhi, 2011.

Reference Books:

1. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2012.
2. Peter V. O'Neil," Advanced Engineering Mathematics", 7th Edition, Cengage learning, 2012.
3. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2008.
4. Veerarajan. T, "Engineering Mathematics", Tata McGraw HillPublishing Co, New Delhi, 5th edition, 2006.

WEB REFERENCES:

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

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Course Code: 141EI0203	Course Title: MATERIAL SCIENCE (Common to ECE, EEE and EIE)	
General	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

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.
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 level with temperature for n -

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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- Magnetic storage devices: Magnetic tape – Hard disc – Magneto optical recording.

Course Outcomes

At the end of this 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, Seventh edition, 2015.

2. S.O. Kasap, "Principles of Electronics Materials and Devices", McGraw Hill Higher Education, New Delhi,Third edition 2007.

3. V Rajendran, "Engineering Physics", Tata McGraw-Hill Co, New Delhi, 2011.

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4: P.K Palanisamy, "Materials science", Scitech publications, Chennai, 2007.

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:141EI0204	Course Title: ELECTRON DEVICES (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):

- 141EI0103 -ENGINEERING PHYSICS

Course Objectives

The course is intended to:

1. Explain the characteristics of PN junction diode.
2. Differentiate the characteristics of special diodes from pn junction diodes.
3. Explain the characteristics of Bipolar junction transistors.
4. Compare and contrast the types of Field effect transistors.
5. Comprehend the operation of basic power devices and display devices.

UNIT I SEMICONDUCTOR DIODE 9

PN junction diode- forward and reverse bias characteristics , Breakdown in PN junction diodes ,Effect of temperature on PN junction diodes, Current equation, Diffusion and drift current , switching characteristics, Piecewise linear characteristics

UNIT II SPECIAL DIODES 9

Zener diode-– Characteristics of Zener diode , Avalanche and Zener breakdown , Zener diode as voltage regulator, Photo diode, Varactor diode ,Tunnel diode, Schottky Diode, PIN diode.

UNIT III BIPOLAR JUNCTION TRANSISTORS 9

Introduction to Bipolar Junction Transistor and its types, construction and working of NPN, and PNP Transistor, Configurations of BJT – Input and output characteristics of CE, CB, CC, Applications of BJT.

UNIT IV INTRODUCTION TO FETs 9

FET and its Types ,construction and working of n- channel and p-channel JFETs , Pinch off voltage and its significance , Construction and working of MOSFETs – Enhancement and Depletion MOSFET, Configurations of MOSFET , MOSFET as switch, Comparison of BJT with FET.

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UNIT V POWER DEVICES AND DISPLAY DEVICES 9

Construction and working principle - UJT, SCR, Diac, Triac, IGBT, OLED,TFT, CCD and their applications

Course Outcomes

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

CO1. Explain the characteristics of PN junction diode.

CO2. Differentiate the characteristics of special diodes from pn junction diodes.

CO3. Explain the characteristics of Bipolar junction transistors.

CO4. Compare and contrast the types of Field effect transistors.

CO5. Comprehend the operation of basic power devices and display devices.

Text Books:

1. Robert Boylestad and Louis Nashelsky, "Electron Devices and Circuit Theory" Pearson PrenticeHall, 10th edition,July 2008.

2. Millman.J&Halkias, SatyebrantaJit, "Electronic Devices & Circuits", TMH, 2nd Education, New Delhi, 2008.

Reference Books:

1. Salivahanan.S, Suresh kumar.N and Vallavaraj.A, "Electronic Devices and Circuits", 2nd Edition, TMH, New Delhi, 2008.
2. Robert.T.Poynter, "Introducing Electronics Devices and Circuits", Pearson Education, 7th Edition, New Delhi, 2006.
3. Streetman Ben G. and Banerjee Sanjay, "Solid State Electronic devices", PHI, 6th Edition, 2006.
4. David A. Bell, "Electronic Devices and Circuits", Oxford, 5th Edition, April 2008.

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=Wf19II0ts84

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Pollachi - 642 003, Coimbatore District, Tamilnadu.

Course Code: 141EI0205	Course Title: ENGINEERING CHEMISTRY (Common to ECE, EEE and EIE)	
General	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

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 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 nano-materials.

UNIT I ELECTROCHEMISTRY AND BATTERIES 9

Cells – Types of cells– Electrochemical and electrolytic cells. Difference between electrochemical cells and Batteries. Batteries – Characteristics, Classifications of batteries, Construction, working and applications - dry cells, 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, galvanic corrosion and differential aeration corrosion, Factors influencing corrosion. Corrosion Control methods – Cathodic protection methods, Surface coatings – Electroplating of Silver and Electro less plating of Nickel, Paints – constituents and its functions.

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. Spectroscopy – Electromagnetic spectrum, Absorption and Emission spectroscopy – UV – Visible Spectroscopy, Flame photometry – 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-calcium carbonate equivalents, units of hardness, disadvantages of hard water. Water conditioning methods – Internal conditioning-Carbonate, Phosphate and Calgon Conditioning. External conditioning – demineralization, Reverse osmosis. Domestic Water Treatment.

UNIT V NANO MATERIALS 9

Introduction – Difference between bulk and Nano materials – size dependent properties of Nano materials, Nano scale materials – Nano particles, Nano clusters, Nano rods and Nano tubes. Synthesis of Nanomaterials: Sol-gel process, Electro deposition, Chemical Vapor condensation and Laser ablation methods. Characterization of Nanomaterials – methods only, Applications of Nano materials in Electronics and communication, Energy science and medicines.

Course Outcomes

At the end of this 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 behavior of nano materials based on size.

Text Books:

1.Wiley Engineering Chemistry, Second Edition, Wiley India Pvt. Ltd. New Delhi, 2011.

2.P.C. Jain and Monica Jain, "Engineering Chemistry", 16th Ed., DhanpatRai Pub, Co., New Delhi, 2004.

Reference Books:

1.Larry Brown and Tom Holme, Chemistry for Engineering Students, 3rd Edition, Cengage Learning, 2015.

2.P.W. Atkins and de Paula Julio, "Physical Chemistry", Oxford University Press, 9th Ed. (Indian Student Edition), 2011.

3. S.S. Dara "A text book of Engineering Chemistry" S. Chand & Co. Ltd., New Delhi, 2006. Streetman Ben G. and Banerjee Sanjay, "Solid State Electronic devices", PHI, 6th Edition, 2006.

4.David A. Bell, "Electronic Devices and Circuits", Oxford, 5th Edition, April 2008.

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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:141EI0206	Course Title: BASICS OF CIVILAND MECHANICAL ENGINEERING (Common to ECE, EEE & EIE)	
General	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

The course is intended to:

1. Select the best material and suitable foundation.
2. Gain knowledge about the components of structures.
3. Explain the various alternate sources of energy and components.
4. Explain different manufacturing processes.
5. Discuss the construction and working of IC engines and refrigerators.

UNIT I CIVIL ENGINEERING MATERIALS AND BUILDING COMPONENTS 9

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.

Sub structure: - Bearing capacity of soil – Problems with soil – Type of foundation - Selection of foundation based on soil conditions – Requirement of good foundation – Various types of foundations.

UNIT II BUILDING COMPONENTS, HIGHWAY AND RAILWAY ENGINEERING 9

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

Highway and Railway Engineering: - Importance of transportation networks-classification of highways-Railway Engineering and its components- Classification of Bridges.

UNIT III ALTERNATE SOURCES OF ENERGY, POWER PLANTS AND BOILERS 9

Types of Boilers: Simple Vertical, Babcock and Wilcox and La-Mont Boiler, Differences between fire tube and water tube boiler. Types of steam turbines- working of a single stage impulse and reaction turbines.

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Power Plant: Classification of Power Plants- Steam - Nuclear, Diesel; and Hydro Power Plants. Solar, Wind, Tidal, Geothermal and Ocean Thermal Energy Conversion (OTEC)

UNIT IV MANUFACTURINGPROCESSES 9

Metal Casting - Foundry – Moulding and Casting Processes. Metal Forming - Forging, Rolling, Extrusion processes. Metal Joining processes - Welding, Metal machining – Turning, Milling, Drilling, Shaping

UNIT V THERMAL ENGINEERING 9

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.

Course Outcomes

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

CO1. Select the best material and suitable foundation for the required construction.

CO2. Gain knowledge about the components of structures.

CO3. Explain the various alternate sources of energy and components of a power plant.

CO4. Explain different manufacturing processes like casting, forming, welding and machining operations.

CO5. Discuss the construction and working of IC engines and refrigerators.

Text Books:

1.Jayagopal.L.S&Rudramoorthy.R, "Elements of Civil and Mechanical Engineering", Vikas Publishing House, NewDelhi,2010.

2.Shanmugam.GandPalanichamy.M.S,"BasicCivilandMechanicalEngineering",TataMc GrawHill PublishingCo.,NewDelhi,1996..

Reference Books:

1. Bindra.S.PandArora.S.P,"ThetextbookofBuildingconstruction",DhanpatRaiPublications(P)Ltd., NewDelhi,2011.
2. Civil Engineering Laboratory manual for I st year students.

3.Ananthanarayanan.P,"BasicRefrigerationandAirConditioning",TataMcGrawHillPublishingCo., NewDelhi,2003.

4.Srinivasan. S, "Automotive engineering" Tata McGraw Hill Publishing Co., New Delhi, 2003.

Web References:

1.www.electrical4u.com/power-plants-types-of-power-plant/

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2. www.thelibraryofmanufacturing.com/
3. www.nitw.ac.in/departments/mech/index.php/thermal-engineering-2/

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Course Code:141EI0207	Course Title: ENGINEERING PHYSICS AND CHEMISTRY LABORATORY (Common to ECE, EEE & EIE)	
General	L: T: P: C	0 : 0 : 2: 1
Type: Practical	Total Contact Hours:	30

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

- 141EI0103-Engineering Physics

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 concentration of a solution.

LIST OF EXPERIMENTS

PHYSICS (Any six experiments only)

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. Band gap of a semiconductor-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

CHEMISTRY

1. Preparation of standard solutions
2. Estimation of total hardness of water by EDTA method.
3. Estimation of iron in water by colorimetric method- verification of Beer- Lambert's Law.
4. Estimation of Fe^{2+} by potentiometric titration

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5. Determination of strength of acid by pH metry
6. Determination of corrosion rate by weight loss method
7. Measurement of emf of electrochemical cell – potentiometry

Course Outcomes

At the end of this 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

References:

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, and MCET.

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Course Code: 141EI0208	Course Title: ENGINEERING PRACTICES LABORATORY- II (Civil and Mechanical) (Common to ECE, EEE & EIE)	
General	L: T: P: C	0 : 0 : 2: 1
Type: Practical	Total Contact Hours:	30

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

- Nil

Course Objectives

The course is intended to:

1. Demonstrate the basic plumbing operations.
2. Demonstrate the basic carpentry operations.
3. Explain the various fitting processes.
4. Demonstrate the various sheet metal operations.
5. Demonstrate the basic operations such as forging, moulding and welding.

LIST OF EXPERIMENTS

CIVIL ENGINEERING

1. Study of pipe line joints, its location and functions, valves, tapes, couplings, unions, reducers and elbows in house hold fittings.
2. Hands- on - exercise on basic pipe connections- mixed pipe material connections – pipe connections with different joining components
3. Study of the joints in doors, windows and furniture.
4. Hands on exercise: wood work-Joints by sawing, planning and cutting.
5. Demonstration on carpentry using power tools.

MECHANICAL ENGINEERING

1. Study of tools and joints – planning, chiselling, marking and sawing practice, different joints, use of power tools.
2. Study of tools, chipping, filing, cutting, drilling, tapping, male and female joints, and stepped joints.
3. Exercise on forging of hexagonal bolt.
4. Exercise on sand preparation and moulding making.
5. Selection of different gauge sheets, types of joints, trays and containers.
6. Hands on exercise for making butt joints, lap joints and tee joints using arc welding

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Course Outcomes

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

CO1: Demonstrate the basic plumbing operations.

CO2: Demonstrate the basic carpentry operations.

CO3: Demonstrate the various fitting processes.

CO4: Demonstrate the various sheet metal operations.

CO5: Demonstrate the basic operations such as forging, moulding and welding.

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.

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Course Code: 141EI0209	Course Title: PROMOTION OF STUDENTS' WELLNESS	
General	L: T: P: C	0 : 0 : 2: 1
Type: Practical	Total Contact Hours:	30

Pre-requisites: 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, the students will be able to:

CO1. Maintain physical wellbeing - grooming, BMI, flexibility, muscle strength, body compositions (vatha, pitha, kapa)

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

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

TEXT BOOK:

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

REFERENCES:

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

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.

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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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Course Code: 141EI0301	Course Title: TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS (Common to EEE and EIE)	
Core : General	L: T: P: C	4 : 0 : 0: 4
Type: Theory	Total Contact Hours:	60

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

- 141EI0102-Engineering Mathematics I
- 141EI0202-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 equations.

UNIT I FOURIER SERIES 12

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

UNIT II FOURIER TRANSFORMATION 12

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 12

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 12

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 12

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, First Edition, Oxford University Press, New Delhi, 2015

2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, Wiley India, 2007.

Reference Books:

1Grewal B.S. Higher Engineering Mathematics, 40th Edition, Khanna Publishers, New Delhi, 2007.

2 Bali &Iyengar, A Text Book of Engineering Mathematics, 7th Edition ,Laxmi Publications (P) Ltd., New Delhi, , 2007

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

4.Veerarajan T. Engineering Mathematics for Semester III, 3rd edition, Tata McGraw-Hill (Education) India Pvt.Ltd, 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: 141EI0302	Course Title: ELECTRIC AND ELECTRONIC CIRCUITS	
Core : General	L: T: P: C	3 : 2 : 0: 4
Type: Theory	Total Contact Hours:	75

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

- 141EI0106-Fundamentals of Electrical Engineering

Course Objectives

The course is intended to:

1. Analyze DC and AC circuit Theorems and network reduction techniques.
2. Analyze the transient response of series circuits.
3. Analyze the three phase circuits
4. Explain various rectifiers with adequate filters.
5. Explain the design of various biasing circuits of transistors and amplifiers.

UNIT I NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS **9+6**

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

UNIT II TRANSIENT ANALYSIS OF FIRST AND SECOND ORDER LINEAR CIRCUITS **9+6**

Source free RC and RL Circuit responses – Step response of RC and RL circuits – source free RLC series circuit responses – Step responses of RLC series– Responses of RC, RL and RLC series circuits to sinusoidal excitation.

UNIT III THREE-PHASE CIRCUIT ANALYSIS **9+6**

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

UNIT IV RECTIFIERS, FILTERS AND REGULATORS **9+6**

Rectifiers-Single phase half wave and full wave rectifier and bridge rectifier using diodes- ripple factor- rectification efficiency- transformer utilization factor- rectifier with inductive filter and Capacitor filter- L Section Filter- π Section Filter -series voltage regulation- shunt voltage regulation- SMPS

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Unit V - BJT BIASING AND AMPLIFIERS **9+6**

Transistor Characteristics: CB, CE, CC configurations-Transistor as an Amplifier and Switch- Biasing- Operating point- thermal runaway- stabilization technique- fixed bias-collector to base bias- emitter bias- voltage divider bias

Small signal low frequency transistor amplifier circuits: h-parameter representation of a transistor, Power Amplifiers: Class A, B, AB and C operation- Efficiency of class A and B-amplifier distortion- Push-Pull amplifier and Complimentary Symmetry amplifiers.

Course Outcomes

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

CO1. Analyze DC and AC circuit Theorems and network reduction techniques.

CO2. Analyze the transient response of series circuits.

CO3. Analyze the three phase circuits.

CO4. Explain various rectifiers with adequate filters.

CO5. Explain the design of various biasing circuits of transistors and amplifiers

Text Books:

1. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis",Tata McGraw Hill, Fourth Edition (2010).

2. Charles K. Alexander, Mathew N.O. Sadik, "Fundamentals of Electric Circuits", Fifth Edition, McGraw Hill, (2012).

3. David A. Bell," Electronic Devices and Circuits", Oxford University Press,2009.

4. Robert L. Boylestad and Louis Nashelsky," Electronic Devices and circuit Theory",PHI Tenth Edition,2009.

Reference Books:

1. Joseph A. Edminister, MahmoodNahvi, "Electric circuits", Schaum's series, Tata McGraw-Hill, New Delhi (2003).

2. Millman, Halkias and SatyabrathaJit, Electronic devices and circuits, Tata McGraw Hill publishing company ltd., 2007

3. Sedha. R.S.," A text book of Applied Electronics" ,S.Chand& Company Ltd.,2008.

4. Salivahanan. S., suresh Kumar. N., Vallavaraj. A.," Electronic Devices and Circuits", The Tata McGraw Hill publications, Second Edition, 2008.

Web References:

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

2.http://www.nptelvideos.in/2012/12/basic-electronics-drchitralekha-mahanta.html

BoS Chairman

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Kalaignar Karunanidhi College of Engineering and Technology,
Pollachi - 642 003, Coimbatore District, Tamilnadu.

Course Code:141EI0303	Course Title: TRANSDUCER ENGINEERING	
General	L: T: P: C	3 : 0 : 0: 3
Type: Theory	Total Contact Hours:	45

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

- 141EI0103 - Engineering Physics

Course Objectives

The course is intended to:

1. Analyze the characteristics and performance of transducers.
2. Explain the principle and application of resistance transducers.
3. Describe the principle and application of variable inductance and capacitance transducers.
4. Select suitable transducer based on the application.
5. Illustrate the advanced types of transducers.

UNIT I CHARACTERISTICS OF TRANSDUCERS 9

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

UNIT II VARIABLE RESISTANCE TRANSDUCERS 9

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

UNIT III VARIABLE INDUCTANCE AND CAPACITANCE TRANSDUCERS 9

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

UNIT IV OTHER TRANSDUCERS AND SELECTION OF TRANSDUCERS 9

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

UNIT V SPECIAL TRANSDUCERS 9

Digital transducers – Smart sensors - Fiber optic sensors, Film sensors, MEMS – Nano

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sensors – Radar and its applications-Position sensing transducers – Vibration sensing transducers.

Course Outcomes

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

CO1. Analyze the characteristics and performance of transducers.

CO2. Explain the principle and application of resistance transducers.

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

CO4. Select suitable transducer based on the application.

CO5. Illustrate the advanced types of transducers.

Text Books:

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

Reference Books:

1. Doebelin. E.A., „"Measurement Systems – Applications and Design", Tata McGraw Hill, New York, 2000.

2. Hermann K.P.Neubert, "Instrument Transducers: An Introduction to their performance and design", Clarendon Press, 1975, 2nd edition, Illustrated.

3. Patranabis. D., „"Sensors and Transducers", Prentice Hall of India, 2003.

4. John A. Allocca, Allean Stuart „"Transducer Theory and Applications", Reston publishing

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: 141EI0304	Course Title: : ELECTRICAL MACHINES AND MEASUREMENTS	
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):

- 141EI0106-Fundamentals of Electrical Engineering
- 141EI0108-Engineering Practices Laboratory

Course Objectives:

The course is intended to:

1. Explain the construction, working principles of DC and AC machines .
2. Illustrate the constructional details and working principle of transformer.
3. Describe the measurement techniques for current and voltage,
4. Explain the resistance and impedance measurement methods.
5. Describe the measurement techniques for power and energy.

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 AC MACHINES 9

Transformer: Principle of operation - EMF equation- Induction Motors: Construction – Types – Principle of operation- Torque equation-slip-torque characteristics- Starting methods -Speed control. Single phase induction motor- Construction -working principle- Types of starting methods- Double field revolving theory.

UNIT III MEASUREMENT OF VOLTAGE AND CURRENT 9

Galvanometers – Ballistic, D'Arsonal galvanometer – Theory, Calibration, application – Principle, construction, operation and comparison of moving coil, moving iron meters, dynamometer, induction type and thermal type meter, rectifier type

UNIT – IV RESISTANCE AND IMPEDANCE MEASUREMENT 9

Measurement of Low and medium resistance – Ammeter, voltmeter method – Wheatstone bridge, Kelvin double bridge – series and shunt type ohmmeter

AC Bridges – Maxwell bridge – Wein's bridge – Schering bridge – Hay's bridge –

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Errorsin AC bridge methods and their compensation.

UNIT – V MEASUREMENT OF POWER AND ENERGY 9

Electrodynamometer type wattmeter – Theory and its errors – Methods of correction – LPF wattmeter – Phantom loading – Induction type kWh meter – Induction type energy meter – Calibration of wattmeter and Energy meter – Current Transformer – Potential Transformer.

Course Outcomes:

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

CO1. Explain the construction and working principles of DC and AC machines and study their performance.

CO2. Illustrate the constructional details and working principle of transformer.

CO3. Describe the measurement techniques for current and voltage.

CO4. Explain the resistance and impedance measurement methods.

CO5 Describe the measurement techniques for power and energy.

Text Books:

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

2. Sawhney. AK., – PuneetSawhney, "A Course in Electrical and Electronic Measurements and Instrumentation", Twelth edition", DhanpatRai& Co., New Delhi, 2006.

Reference Books:

1. Thereja. BL. and Thereja. AK., "A Text Book of Electrical Technology", Vol.I, S.Chand, New Delhi, 2010.

2.Del Toro, V., "Electrical Engineering Fundamentals", Prentice Hall of India, New Delhi, 1995.

3.Cotton, H., "Advanced Electrical Technology", Sir Isaac Pitman and SonsLtd., London, 1999.

4. Ernest Doeblin ,"Measurement Systems – Application and Design", Second Edition, Tata McGraw-Hill Ltd. New Delhi, 2004.

Web References:

1. www.nptel.ac.in/courses/108105017
2. www.nptel.ac.in/courses/108106072
3. http://nptel.ac.in/courses/108105053

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Course Code: 141EI0305	Course Title:OBJECT ORIENTED PROGRAMMING CONCEPTS	
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):

- C Programming

Course Objectives

The course is intended to :

1. Explain the object-oriented paradigm and C++ programming
2. Describe various control flows and memory management techniques
3. Implement various principles of object orientation
4. Explain file handling techniques with C++ programming
5. Explain the trouble shooting procedures in OOPS

Unit I - INTRODUCTION 9

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

UNIT II CONTROL FLOW &DYNAMIC MEMORY MANAGEMENT 9

Function declaration - Call by value and Call be reference - Friend functions - Accessing functions between classes - Dynamic Memory Allocation – Constructors – Destructors – Realloc - Operator Overloading

UNIT III OOP PRINCIPLES 9

Inheritance - Types of Inheritance – Polymorphism: Function overloading - Virtual functions - Abstraction - Abstract Class and Virtual base class - Encapsulation and Data Hiding

UNIT IV FILE HANDLING 9

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

UNIT V TEMPLATES AND EXCEPTION HANDLING 9

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

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Course Outcomes

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

CO1. Explain the object-oriented paradigm and C++ programming with their fundamentals

CO2. Examine various control flows and memory management techniques

CO3.Implement various principles of object orientation

CO4. Illustrate handling of files with C++ programming

CO5 Summarize the trouble shooting procedures in OOPS

Text Books:

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

Reference Books:

1. Ira Pohl, "Object oriented programming using C++", Pearson Education Asia, 2007.

2. Malik.D.S, "C++ Programming from Problem Analysis to Program Design", 3rd Edition, Thomson course Technology, New Delhi, 2007.

3. John.R.Hubbard, "Programming with C++", Schaums outline series, Tata McGraw Hill, New Delhi ,2003.

4. Herbert Schildt, "The Complete Reference: Java2", Fifth edition, Tata McGraw Hill, Noida, 2007.

Web References:

1.www.nptel.ac.in/courses

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Course Code: 141EI0306	Course Title:THERMODYNAMICS AND FLUID MECHANICS	
Core / Elective: Core	L: T: P: C	2: 2: 0: 3
Type: Theory	Total Contact Hours:	45

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

- 141EI0103-Engineering Physics
- 141EI0206-Basics of Civil and Mechanical Engineering

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.

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

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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 the 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 machines

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

REFERENCES:

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
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: 141EI0307	Course Title: : ELECTRICAL MACHINES AND MEASUREMENTS 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):

- 141EI0106-Fundamentals of Electrical Engineering
- 141EI0108-Engineering Practices Laboratory.

Course Objectives:

The course is intended to:

1. Determine the performance of DC Machines
2. Predict the performance characteristics of Induction motor and transformer.
3. Measure current and voltage using CT and PT
4. Calibrate Wattmeter, Energy meter.
5. Analyze the performance of DC and AC bridges

List of Experiments:

[A] 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.

[B] MEASUREMENTS LABORATORY

1.Calibration of Wattmeter and Energy meter.
2. Measurement of Resistance using Wheatstone's and Kelvin's double bridge.
3. Measurement of Reactive power, Power & Energy
4. Measurement of Inductance using Anderson's bridge.
5. Measurement of Capacitance using Schering Bridge.
6. Measurement of Current and Voltage using CT and PT.

Course Outcomes:

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

CO1: Determine the performance analysis of DC motors.

CO2: Analysis the performance of self and separately excited DC generator.

CO3: Predict the performance characteristics of Induction motor and transformer.

CO4: Calibration of Wattmeter, Energy meter, PT and CT to calculate error.

CO5: Analyze the performance of DC and AC bridges.

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Course Code: 141EI0308	Course Title: ELECTRICAL AND 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):

- 141EI0204-Electron Devices

Course Objectives:

The course is intended to:

1. Verify different electrical circuit theorems.
2. Verify the characteristics of electron devices
3. Verify the characteristics of thyristor.
4. Design various rectifiers and voltage regulators.
5. Design and analyse various transistor biasing circuits

List of Experiments:

1. Verification of Thevenin's and Norton's theorem
2. Verification of superposition and maximum power transfer theorem.
3. Characteristics of CE and CB configuration of a Transistor.
4. Characteristics of UJT
5. Characteristics of JFET
6. Characteristics of SCR, DIAC and TRIAC.
7. Characteristics of Half-wave rectifier and Full wave rectifier with and without filters.
8. Characteristics of Bridge rectifier without & with filter
9. Series voltage regulator using Transistor.
10. Transistor biasing circuits for different quiescent operating point.

Course Outcomes:

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

CO1. Verify different electrical circuit theorems.

CO2. Verify the characteristics of electron devices

CO3. Verify the characteristics of thyristor.

CO4. Design various rectifiers and voltage regulators.

CO5. Design and analyse various transistor biasing circuits

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Course Code: 141EI0309	Course Title: : PERSONAL EFFECTIVENESS	
General	L: T: P: C	0: 0: 2: 1
Type: Practical	Total Contact Hours:	30

Course Objectives:

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 ITHE 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 WORKING

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

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

Course Outcomes:

At the end of the course students 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
		Total	= 100 marks		

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		Mark will be entered in Examination Portal for 100 marks		Internal faculty members
		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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Course Code:141EI0401	Course Title: LINEAR ALGEBRA AND NUMERICAL METHODS (Common to EEE and EIE)	
Core :General	L: T: P: C	4 : 0 : 0: 4
Type: Theory	Total Contact Hours:	60

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

- 141EI0102-Engineering Mathematics I
- 141EI0202-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 12

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 12

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 12

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 12

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 12

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 and non-linear equations to calculate the dominant Eigen value.

CO4. Predict the unknown values from the given set of data & apply numerical techniques to 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, 3rdEdition, Pearson Education, 2009.

2. Simantha Pal and Subodh C. Bhunia, Engineering Mathematics, First Edn., Oxford

Reference Books:

1. Gilbert Strang, Linear algebra and its Applications, 4th Edition, Cengage Learning India Private Limited, 2012.

2. Jain M. K., Iyengar, S. R. and Jain, R. K, Numerical Methods for Scientific and Engineering Computation, Fifth Edn., New age International Publications, 2007.

3. Gerald C.F., and Wheatley P.O., Applied Numerical Analysis, Sixth Edn., Pearson Education Asia, New Delhi, 2006.

4. Grewal, B.S. and Grewal, J. S., Numerical methods in Engineering and Science, Sixth Edition, Khanna Publishers, New Delhi, 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: 141EI0402	Course Title: LINEAR INTEGRATED CIRCUITS AND APPLICATIONS	
Core :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):

- 141EI0204-Electron Devices
- 141EI0302-Electric and Electronic Circuits

Course Objectives

The course is intended to

1. Explain the fabrication process of Linear ICs.
2. Explain the characteristics and frequency response of Op-Amp ICs.
3. Explain the special applications of Op-Amp.
4. Illustrate the internal functional blocks and the applications of special ICs like Timers, VCO, PLL circuits, regulator Circuits.
5. Describe the Op-Amp based design.

UNIT I IC FABRICATION 9

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

UNIT II CHARACTERISTICS AND BASIC APPLICATIONS OF OPAMP 9

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

UNIT III SPECIAL APPLICATIONS OF OPAMP 10

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

UNIT IV SPECIAL FUNCTION ICs 9

555 Timer circuit – Functional block, characteristics & applications – 566 voltage controlled

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oscillator circuit – 565 Phase lock loop circuit functioning and applications, Analog multiplier ICs – IC voltage regulators: Fixed and Variable regulators – 78XX, 79XX, 317, 723 regulators, Switching regulator, Opto-Coupler ICs.

UNIT V CASE STUDIES – OPAMP BASED DESIGNS 8

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

Course Outcomes

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

CO1. Explain the IC fabrication process.

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

CO3. Summarize the special applications of Op-Amp.

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

CO5. Describe the Op-Amp based design.

Text Books:

1. Ramakant A. Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003.

2. Roy Choudhary. D., Sheil B. Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.

Reference Books:

1.David A. Bell, 'Op-amp & Linear ICs', Prentice Hall of India, 2nd edition, 2005.

2. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', Tata McGraw Hill, 2003.

3. Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear ICs', Pearson Education, 4th edition, 2002.

Web References:

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

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Course Code:141EI0403	Course Title: INDUSTRIAL INSTRUMENTATION - I	
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):

- 141EI0303-Transducer Engineering
- 141EI0103-Engineering Physics

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 measuring instruments.
5. Provide knowledge on non-contact type temperature measuring instruments.

UNIT I MEASUREMENT OF FORCE, TORQUE AND VELOCITY 9

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

UNIT II MEASUREMENT OF ACCELERATION, VIBRATION AND DENSITY 9

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

UNIT III PRESSURE MEASUREMENT 9

Units of pressure – Unit conversions – Manometers – Types - Elastic type pressure gauges: Bourdon tube, Bellows and Diaphragms - Electrical methods: Elastic elements with LVDT and strain gauges, Capacitive type pressure gauge, Piezo-resistive pressure sensor and Resonator pressure sensor.

Measurement of vacuum: McLeod gauge, Thermal conductivity gauges and Ionization

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gauges: Cold cathode type and hot cathode type - calibration of pressure gauges - Dead weight tester.

UNIT IV TEMPERATURE MEASUREMENT 9

Units and Conversions - Definitions and standards - Primary and secondary fixed points – Calibration of thermometers - Filled in system thermometers – Types, Sources of errors in filled in systems and their compensation-Bimetallic thermometers – Thermowell - RTD – Characteristics - 3 lead and 4 lead RTDs - Signal conditioning of RTDs – Thermistors and its characteristics.

UNIT V THERMOCOUPLES AND RADIATION PYROMETERS 9

Thermocouples - Laws of thermocouple – Response of thermocouple - Cold junction compensation techniques – Thermopiles - Radiation fundamentals - Total radiation pyrometers – Optical pyrometers - Two color radiation pyrometers – IR Pyrometer - Fibre Optic temperature measurement. Selection of Temperature measuring instruments.

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. Doebelin. E.O., 'Measurement Systems – Application and Design', Tata McGraw Hill publishing company, 2004.

2. Jain. R.K., 'Mechanical and Industrial Measurements', Khanna Publishers, New Delhi,1999.

Reference Books:

1. Patranabis. D., 'Principles of Industrial Instrumentation', Tata McGraw Hill Publishing Company Ltd, 1996.

2. Sawhney. A.K. and Sawhney. P., 'A Course on Mechanical Measurements, Instrumentation and Control', DhanpathRai and Co, 2004.

3. Nakra. B.C. &Chaudary. K.K., 'Instrumentation Measurement & Analysis', Tata McGraw Hill Publishing Ltd, 2004.

4. Singh. S.K., 'Industrial Instrumentation and Control', Tata McGraw Hill, 2003.

Web References:

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

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

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Course Code: 141EI0404	Course Title: DIGITAL PRINCIPLES & APPLICATIONS	
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):

- 141EI0204-Electron Devices

Course Objectives:

The course is intended to:

1. Illustrate the number systems, Boolean laws.
2. Design combinational circuits.
3. Design various synchronous sequential circuits.
4. Design counters and asynchronous sequential circuits.
5. Explain the internal circuitry and logic behind digital system.

UNIT I BOOLEAN ALGEBRA 9

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

UNIT II COMBINATIONAL LOGIC 9

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

UNIT III SYNCHRONOUS SEQUENTIAL LOGIC 9

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

UNIT IV COUNTERS AND ASYNCHRONOUS SEQUENTIAL LOGIC 9

Ripple counters –Design of Synchronous counters, Ring counters and Sequence detector - Registers – shift registers- Universal shift register. Analysis of Asynchronous Sequential – primitive state / flow table – Minimization of primitive state table –state assignment –

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Excitation table - cycles – Races –Hazards: Static –Dynamic –Essential –Hazards elimination.

UNIT V APPLICATIONS 9

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

Course Outcomes:

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

CO1. Explain about basics of digital electronics.

CO2. Solve problems related to number systems and Boolean algebra.

CO3. Identify, analyze and design combinational circuits.

CO4. Design various synchronous and asynchronous sequential circuits.

CO5. Explain the internal circuitry and logic behind any digital system.

Text Books:

1. Morris Mano. M., Digital Design, 4th Edition Pearson Education Pvt. Ltd, 2008

2. Donald D. Givone, Digital Principles and Design, TMH, New Delhi, 2002

Reference Books:

1. Charles H.Roth. Fundamentals of Logic Design, Thomson Learning, 2003.

2. S. Salivahanan and S. Arivazhagan, Digital Circuits and Design, 2nd Edition, Vikas Publishing House Pvt. Ltd, New Delhi, 2004

Web References:

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

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Course Code: 141EI0405	Course Title:DATA STRUCTURES AND ALGORITHMS	
Core / Elective: Core	L: T: P: C	4: 0: 0: 4
Type: Theory	Total Contact Hours:	60

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

- 141EI0105-C Programming

Course Objectives

The course is intended to :

CO1: Explain the working of various linear data structures

CO2. Summarize the concept of hashing and priority queue

CO3. Describe the working of various non linear data structures.

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

CO5. Demonstrate different algorithm design techniques

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

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

UNIT II HASHING AND PRIORITY QUEUES 8+3

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

UNIT III NON LINEAR DATA STRUCTURES 10+3

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

UNIT IV SEARCHING AND SORTING 9+3

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

UNIT V ALGORITHM DESIGN TECHNIQUES 9+3

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

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Course Outcomes

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

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

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

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

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

CO5. Summarize the algorithm design techniques.

Text Books:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 3rd edition, Pearson Education Asia, New Delhi 2007. (UNIT -III, IV, V)

2. Balagurusamy.E, "Object Oriented Programming with C++", 4th edition, Tata McGraw Hill, New Delhi 2008. (UNIT -I, II)

Reference Books:

1. Alfred V. Aho, John E. Hopcroft and Jeffry D. Ullman, Data Structures and Algorithms, Pearson Education, New Delhi, 2006

2. Sahni, "Data Structures Using C++", McGraw-Hill, New Delhi, 2006.

3. Seymour, "Data Structures", McGraw-Hill, New Delhi, 2007.

4. Robert Lafore, Object oriented programming in C++, Galgotia Publication, New Delhi.

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: 141EI0406	Course Title:DISCRETE TIME SYSTEMS AND SIGNAL PROCESSING	
Core / Elective: Core	L: T: P: C	3: 0: 2: 4
Type: Theory	Total Contact Hours:	75

Prerequisites: The student should have undergone the course:

- 141EI0202 - Engineering Mathematics II

Course Objectives

The course is intended to:

1. Classify signals and systems & write their mathematical representation.
2. Analyze discrete time systems.
3. Analyze various domain transformation techniques & their computations.
4. Analyze analog filters and their design for digital implementation.
5. Explain about programmable digital signal processors& quantization effects.

UNIT I INTRODUCTION 9

Mathematical representation of signals, classification of signals: continuous and discrete, energy and power, periodic and non-periodic, even and odd, Elementary signals, Linear convolution of signals, Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, , time variance, sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect.

UNIT II DISCRETE TIME SYSTEM ANALYSIS 9

Frequency domain representation of Signals, Discrete Time Fourier transforms(DTFT), magnitude and phase representation, Z-transform and its properties, inverse z-transforms; difference equation – Solution by Z-transform, application to discrete systems - Stability analysis

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION 9

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

UNIT IV DESIGN OF DIGITAL FILTERS 9

Analog filter design – Butterworth and Chebyshev approximations; IIR Filters, digital design using impulse invariant and bilinear transformation - pre warping, FIR design:

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Windowing Techniques – Need and choice of windows – Linear phase characteristics. FIR & IIR filter realization – Parallel & cascade forms.

UNIT V DIGITAL SIGNAL PROCESSORS 9

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

LAB EXPERIMENTS: 30

USING MATLAB

1. Generation of Signals
2. Linear and circular convolution of two sequences
3. Sampling and effect of aliasing
4. Design and Analysis of FIR filters using Windows
5. Design and Analysis of IIR filters using Windows
6. Calculation of FFT of a signal

Course Outcomes

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

CO1.Classify signals and systems & write their mathematical representation.

CO2.Analyze discrete time systems.

CO3. Analyze various domain transformation techniques & their computations.

CO4 Analyze analog filters and their design for digital implementation.

CO5. Explain about programmable digital signal processors& quantization effects.

Text Books:

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, PHI. 2003.
2. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', McGraw Hill Edu, 2013.
3. Robert Schilling & Sandra L.Harris, Introduction to Digital Signal Processing using Matlab", Cengage Learning, 2014.

Reference Books:

1. Poorna Chandra S, Sasikala. B ,Digital Signal Processing, Vijay Nicole/TMH, 2013.
2. B.P.Lathi, 'Principles of Signal Processing and Linear Systems', Oxford University Press, 2010.
3. Taan S. ElAli, 'Discrete Systems and Digital Signal Processing with Mat Lab', CRC Press, 2009.
4. SenM.kuo, woonseng...s.gan, "Digital Signal Processors, Architecture, Implementations & Applications, Pearson, 2013.
5. DimitrisG.Manolakis, Vinay K. Ingle, applied Digital Signal Processing, Cambridge, 2012.
6. Lonnie C.Ludeman ,"Fundamentals of Digital Signal Processing", Wiley, 2013.

Web References:

1.http://www.nptelvideos.in/2012/12/advanced-digital-signal-processing.html

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Course Code: 141EI0407	Course Title: : INTEGRATED 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):

- 141EI0204-Electron Devices
- 141EI0302-Electric and Electronic Circuits

Course Objectives:

The course is intended to:

1. Verify logic gates and Implement of Boolean Functions using logic gates.
2. Design combinational and sequential logic circuits.
3. Demonstrate applications of Op-Amp.
4. Verify multivibrators and frequency multiplier circuits.
5. Simulate the analog and digital circuit.

List of Experiments:

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

Course Outcomes:

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

CO1: Verify logic gates and Implement of Boolean Functions using logic gates.

CO2: Implement combinational and sequential logic circuits.

CO3: Demonstrate applications of Op-Amp.

CO4: Implement multivibrators and frequency multiplier circuits

CO5: Simulate the analog and digital circuit using SPICE.

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Course Code: 141EI0408	Course Title:DATA STRUCTURES AND OBJECT ORIENTED PROGRAMMING WITH C++ 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):

- 141EI0105-C Programming

Course Objectives:

The course is intended to:

1. Write Programs to implement object oriented concepts.
2. Develop programs to use linear data structures like array, linked list, stack and queue.
3. Implement non-linear data structures such as Trees and graphs.
4. Solve problems using divide and conquer and greedy technique for sorting.
5. Implement searching problems using backtracking and dynamic programming.

List of Experiments:

1. BasicProgramsfor C++ Concepts using classes and objects.
2. BasicProgramsfor C++ Concepts using Inheritance, Constructors, Destructors, Polymorphism
3. Array based implementation of List ADT
4. Array based implementation of Stack ADT and Queue ADT
5. Linked list implementation of Singly / Double Linked List
6. Implementation of Binary Search Tree
7. Implementation of Dijkstra's / Floyd's Algorithms
8. Implementation of Prim's / Kruskal's Algorithms
9. Implementation of Merge / Quick sort
10. Implementation of Linear / Binary Search

Course Outcomes:

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

CO1. Write Programs to implement object oriented concepts

CO2. Develop programs to use linear data structures like array, linked list, stack and queue.

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

CO4: Solve problems using divide and conquer and greedy technique for sorting

CO5: Implement searching problems using backtracking and dynamic programming

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Course Code: 141EI0409	Course Title: : ETHICAL AND MORALRESPONSIBILITY	
General	L: T: P: C	0: 0: 2: 1
Type: Theory/ Practical	Total Contact Hours:	30

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 hours)*

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 hours)*

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 hours)*

Importance of code of conduct and its role; Evolving draft Code of conduct for different roles – son/daughter, student, future employee &citizen;Reflectionon 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 hours)*

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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.

NOTE:(*- Includes review sessions)

Course handouts (compiled by PS team, MCET)

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

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

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

REFERENCES:

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

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Assessments:

SNo	Test/Examination	Criterion	Reduced Marks	Remarks
1	Continuous evaluation	Work book entry & self-analysis = 40 % Test (KT &SKT) = 20 % Evaluation of class response = 40 %	60 %	Test conducted just after CCET 3
2	Comprehensive Examination	Test (KT & SKT) = 50 marks Viva – voce = 50 marks	40 %	Conducted at the end of semester by the Execution Faculty member and another senior faculty involved in the course.
		Condition for clearing the course	50%	

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	

END OF SEMESTER - IV

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Course Code:141EI0501	Course Title: MICROPROCESSOR AND MICROCONTROLLER	
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):

- 141EI0404 - Digital Principles and Applications

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 30

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 architecture of 8051 Microcontroller

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.KennethJ.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:

1http://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:141EI0502	Course Title: CONTROL SYSTEMS (Common to EEE and EIE)	
Core	L: T: P: C	3 : 2 : 0: 4
Type: Theory	Total Contact Hours:	75

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

141EI0102 - Engineering Mathematics – I
141EI0202 - Engineering Mathematics - II

Course Objectives

The course is intended to:

1.Model electrical and mechanical systems

2. Determine the time response and time domain specifications.

3. Analyze the given first order and second order systems.

4. Analyze the system stability.

5. Design compensator.

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.

Unit V - COMPENSATOR DESIGN **9+6**

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

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Course Outcomes

At the end of this 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 .Analyze 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, 5th Edition, 2009.

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,Fifth Edition, 2009.

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:141EI0503	Course Title: FIBER OPTICS AND LASER INSTRUMENTS	
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):
141EI0203 - Material Science

Course Objectives

The course is intended to:

1. Apply the basic concepts of optical fibres and their properties.
2. Describe the Industrial applications of optical fibres.
3. Summarize the Laser fundamentals.
4. Explain the Industrial application of lasers
5. Illustrate 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

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

Unit V - MEDICAL APPLICATIONS OF LASER 9

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

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Course Outcomes

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

CO1. Apply the basic concepts of optical fibres and their properties..

CO2. Describe the Industrial applications of optical fibres.

CO3. Summarize the Laser fundamentals.

CO4. Explain the Industrial application of lasers

CO5. Illustrate the 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/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: 141EI0504	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:

- 141EI0406 - Discrete Time Systems and Signal Processing

Course Objectives:

The course is intended to:

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

Unit I - AMPLITUDE AND FREQUENCY MODULATION 9

Amplitude modulation: Principle, Spectrum, Modulation index, DSB-C, DSB-SC and SSB generation, transmission and reception, Super heterodyne receiver, Noise in AM receiver. Frequency modulation: Principle, Spectrum, Modulation index, FM generation, transmission and reception, Noise in FM systems, Pre-emphasis and De-emphasis.

Unit II - PULSE AND SPREAD SPECTRUM MODULATION 9

Pulse Modulation: Sampling theorem, Principles of PAM, PPM, PWM, PCM, DPCM, DM and ADM, Quantization noise in PCM. Spread spectrum modulation: Pseudo noise sequence, Direct sequenced spread spectrum, Frequency hopping spread spectrum.

Unit III - BASEBAND PULSE TRANSMISSION 9

Baseband coding techniques: Polar / Bipolar, RZ/NRZ and Manchester - M-ary PAM transmission, Baseband receiver: Error probability, Optimum and matched filter techniques, Optimum linear receiver, Probability of error.

Unit IV - PASSBAND DIGITAL TRANSMISSION 9

Digital modulation systems: Pass band transmission model, Asynchronous transmission, ASK, BFSK, BPSK and QPSK - Coherent reception - Signal space representation - Probability of error - Comparison of data transmission systems.

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Unit V - COMMUNICATION SYSTEMS 9

Concept of multiplexing: FDM and TDM. Multiple Access: FDMA, TDMA and CDMA. Telephone switching - Mobile telephonic communication - Satellite communication - Radar system - Microwave communication.

Course Outcomes:

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

CO1.Describe different amplitude and frequency modulation schemes.

CO2.Explain the different pulse and spread spectrum modulation schemes.

CO3.Describe the various baseband and pulse transmission techniques.

CO4.Illustrate the various digital communication techniques.

CO5.Summarize the various communication systems.

Text Books:

1. Taub&Schiling "Principles of Communication Systems" Tata McGraw hill 2007.
2. J.Das "Principles of Digital Communication" New Age International, 1986.

Reference Books:

1. Kennedy and Davis "Electronic Communication Systems" Tata McGraw hill, 4th Edition, 1993.
2. Sklar "Digital Communication Fundamentals and Applications" Pearson Education, 2001.
3. Bary le, Memuschmidt, "Digital Communication", Kluwer Publication, 2004.
4. B.P.Lathi "Modern Digital and Analog Communication Systems" Oxford University Press, 1998.

Web References:

1. http://nptel.ac.in/courses/117102059

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Course Code: 141EI0505	Course Title:INDUSTRIAL INSTRUMENTATION- II	
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:

- 141EI0303 - Transducer Engineering
- 141EI0403 - Industrial Instrumentation - I

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 -

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Ultrasonic gauge – Boiler drum level measurement:– Differential pressure and 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.Compare and contrast the different types of mechanical flow meters and their installation.

CO2.Describe the area flow meters, mass flow meters and electrical type flow meters

CO3.Select the suitable flow meters for various applications

CO4.Explain the various level measurement techniques adopted in industries

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)", 4th Edition, CRC Press, 2005.
2. Singh,S.K., "Industrial Instrumentation and Control", 3rd Edition, Tata McGrawHill Education Pvt. Ltd., New Delhi, 2010.
3. Jain, R.K., "Mechanical and Industrial Measurements", Khanna Publishers, Delhi, 2008.

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: 141EI0506	Course Title: TRANSDUCER AND SIGNAL CONDITIONING LABORATORY	
Core / Elective: Core	L: T: P: C	0: 0: 4: 2
Type: Practical	Total Contact Hours:	45

Prerequisites:

The student should have undergone the course:

- 141EI0303 - Transducer Engineering
- 141EI0403 - Industrial Instrumentation - I

Course Objectives

The course is intended to:

1. Demonstrate the operating principle and working of different transducers.
2. Analyze the characteristics of Resistive, Inductive and capacitive transducer.
3. Analyze the characteristics of Piezoelectric and hall effect transducer.
4. Demonstrate the working of I/P, P/I converter and shaft angle encoder.
5. Design and develop the signal conditioning circuits for sensors.

List of Experiments:

1. Strain gauge and load cell characteristics.
2. Characteristics of Resistive and Capacitive transducers.
3. Characteristics of Photoelectric and Piezoelectric transducers
4. Characteristics of LVDT and Hall effect transducers
5. Characteristics of thermocouple, thermistor and RTD
6. P/I and I/P converters
7. Measurement of angular velocity and angular displacement
8. Characteristics of strain gauge type torque transducers.
9. Signal conditioning circuit for temperature sensor
10. Signal conditioning circuit for optical sensor
11. Study of humidity and moisture sensors

Course Outcomes

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

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

CO2.Analyze the characteristics of Resistive, Inductive and capacitive transducer.

CO3.Analyze the characteristics of Piezoelectric and halleffect transducer.

CO4.Demonstrate the working of I/P, P/I converter and shaft angle encoder.

CO5.Develop the signal conditioning circuits for sensors.

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Course Code: 141EI0507	Course Title: SYSTEM SIMULATION LABORATORY	
Core	L: T: P: C	0: 0: 4: 2
Type: Practical	Total Contact Hours:	45

Prerequisites:

The student should have undergone the course(s):

- 141EI0304 – Electrical Machines and Measurements

Course Objectives:

The course is intended to:

1. Model the control systems.
2. Analyse the stability of Linear Time Invariant System.
3. Explain the non-linear system behavior using inverted pendulum.
4. Create simple programs in VI
5. Demonstrate the interfacing of physical systems measurements using DAQ cards.

List of Experiments:

1. DC speed control system.
2. Transfer function of DC motor
3. Characteristics of AC servo motor
4. Linear system analysis (Time domain analysis, Error analysis) using MATLAB.
5. Stability analysis (Bode, Root Locus) of Linear Time Invariant system using MATLAB
6. Stability analysis (Nyquist) of Linear Time Invariant system using MATLAB
7. Control of Inverted pendulum
8. Creating simple VIs, Editing, Debugging and SubVI
9. Creating Array manipulation using FOR loop and timed WHILE loop
10. Waveform Chart and graph operations with interfacing conventional Instruments
11. Temperature signal interface using USB 6009
12. CRO and Function generator interface using M Series DAQ card

Course Outcomes:

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

CO1. Model the control system to predict their performance

CO2. Analyze the stability of Linear Time Invariant System using MATLAB simulation.

CO3. Create simple programs in VI

CO4. Conduct experiments to interface instruments with M series DAQ card.

CO5. Conduct experiment to interface temperature signal using USB 6009

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Course Code : 141EI0508	Course Title: TEAMNESS AND INTERPERSONAL SKILLS	
General	L : T : P: C	0 : 0 : 2 : 1
Type: Practical	Total Contact hours:	30 Hours

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 – 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

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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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Course Code:141EI0601	Course Title: VLSI DESIGN (Common to ECE, EEE and EIE)	
Core :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):

- 141EI0402- Linear Integrated Circuits and Applications
- 141EI0404 - Digital Principles and Applications

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 Faults – Modeling of Faults : Stuck at faults – Bridging Faults – Break and transistor stuck on / open faults– Delay Faults –Temporary Faults – design for testability : Ad-hoc testing, Scan design, BIST, IDDQ testing, Boundary scan

Course Outcomes

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

CO1: Describe the VLSI design flow and MOS fabrication techniques.

CO2: Explain the characteristics of MOS Transistor and operation of CMOS inverter.

CO3: Design of Digital Circuits using various CMOS Logic Styles.

CO4: Develop VHDL Programs for data path elements.

CO5: Explain the different types of fault and testing principles.

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, 2010.
3. P.K. Lala, "Digital Circuit Testing and Testability", Academic Press, 2002.

Reference Books:

1. Neil H.E. Weste and Kamran Eshraghian, "Principles of CMOS VLSI Design", Pearson Education ASIA, 2nd edition, 2002.
2. John P.Uyemura "Introduction to VLSI Circuits and Systems", John Wiley and Sons, Inc., 2011.
3. Eugene D.Fabricius, "Introduction to VLSI Design", McGraw Hill Int. Ed., 1990.
4. Douglas Perry, "VHDL" 3rd edition, McGrawHill, 1998.
5. Pucknell, "Basic VLSI Design", Prentice Hall of India Publication, 2005.
6. Wayne Wolf, "Modern VLSI Design System on chip", Pearson Education, 2002.

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Course Code:141EI0602	Course Title: POWER ELECTRONICS (Common to EEE and EIE)	
Core	L: T: P: C	2 :2 : 0 :3
Type: Theory	Total Contact Hours:	60

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

- 141EI0204 - Electron Devices

Course Objectives

The course is intended to

1. Explain various power switching devices
2. Compute the performance parameters.
3. Identify a DC-DC converter.
4. Explain the operation of inverters and harmonic reduction.
5. Describe the operation of AC voltage controller and cyclo converter

UNIT I POWER SWITCHES **6+6**

Power Diode: reverse recovery characteristics, types

SCR: Two transistor model, turn-on methods, commutation techniques, dynamic behavior, types, series and parallel connection, UJT trigger circuit, protection circuits: over voltage and over current and snubber circuits, losses and cooling– TRIAC & GTO: Construction, dynamic behavior and driver circuit

MOSFET& IGBT: Construction, dynamic behavior and driver circuit

UNIT II CONTROLLED RECTIFIERS 6+6

Controlled Rectifiers: 1 pulse, 2 pulse, 3 pulse and 6 pulse converters with R and RL loads, dual converter, performance parameters, estimation of average load voltage and effect of source impedance.

UNIT - III DC CONVERTERS 6+6

Choppers: Principle of step-up and step-down operation, Time ratio control and current limit control, types, forced commutation techniques (voltage, current and load).

Switching regulators: Operation of Buck, Boost and Buck-boost regulators.

UNIT - IV INVERTERS **6+6**

Inverter: single-phase half and full bridge, three-phase six step VSI and CSI, Control: voltage control of single phase inverter, output AC voltage control and harmonic reduction.

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UNIT -V AC-AC CONVERTER 6+6

AC voltage controller: types of control - on-off, phase angle control and sequence control, Single phase: With R and RL loads, Three phase: Star and Delta connected loads.

Course Outcomes:

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

CO 1: Outline the overview of power semiconductor devices their dynamic characteristics

CO 2: Compute the performance parameters of controlled rectifiers.

CO 3: Identify a DC-DC converter for a given application

CO 4: Explain the modulation techniques of PWM inverter and harmonic reduction methods

CO 5: Describe the operation of AC voltage controller and cyclo converter.

TEXT BOOKS:

1. Muhammad H. Rashid, "Power Electronics: Circuits, Devices and Applications", Pearson Education, Third Edition (reprint), 2011.
2. P. S. Bimbhra, "Power Electronics", Khanna Publishers, Third Edition, 2004.

Reference Books:

1. Ned Mohan, T.M.Undeland, W.P.Robbins, "Power Electronics: Converters, Applications and Design", John Wiley and Sons, Third Edition (reprint), 2009.
2. Joseph Vithayathil, "Power Electronics: Principles and Applications",Tata McGraw-Hill, New Delhi,2010.
3. M.D.Singh and K.B.Khanchandani, 'Power Electronics', Tata McGraw Hills Publishing Company Limited, Second Edition, 2006.
4. Philip T. Krein, 'Elements of Power Electronics', Oxford University Press, First Edition, 2012.
5. Cyril W Lander: Power Electronics, Third Edition, McGraw Hills International Editions,1993.

WEB REFERENCES

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2. http://www.nptelvideos.in/2012/11/industrial-drives-power-electronics.html
3. http://cusp.umn.edu/power_electronics.php
4. http://ecee.colorado.edu/copec/book/slides/slidedir.html

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Course Code: 141EI0603	Course Title: EMBEDDED SYSTEM DESIGN	
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):

- Microprocessor and Microcontroller

Course Objectives

The course is intended to:

1. Illustrate the basic functions, components and importance of embedded systems
2. Provide knowledge on Selection of the features of PIC Micro controller for real time
3. Apply the Real Time Models based on application area
4. Indicate where and when to use an RTOS
5. Analyze the various Hardware and Software modules present in an Embedded

UNIT I INTRODUCTION 9

Embedded systems: Definition, Characteristics - Categories - Applications - Design challenges – Processors in the embedded system –Processor and Memory organization – DMA – Timer and Counting devices – Device drivers and interrupt service mechanism.

UNIT II PIC MICROCONTROLLER 9

PIC 16F8XX – Pin diagram – Registers – Program and Data Memory– I/O Ports – Serial Port Expansion – SPI and I2C – Timers – ADC – Interrupts – Simple Programs using PIC.

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 (RTOS) 9

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

RTOS Concepts - II: Timers- Memory Management in RTOS- Interrupt Routines in an RTOS environment - Priority inversion problem

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UNIT - V CASE STUDIES 9

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

Course Outcomes

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

CO1: Illustrate the basic functions, components and importance of embedded systems

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

CO3: Apply the Real Time Models based on application area

CO4: Indicate where and when to use an RTOS

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

Text Books:

1. Rajkamal, "Embedded Systems: Architecture, Programming and Design", Tata McGraw-Hill, New Delhi, 2008.
2. John.B.Peatman, "Design with Microcontrollers", Pearson Education, 2008

Reference Books:

1. Frank Vahid, Tony D. Givargis, John Wiley & Sons, "Embedded System Design-A Unified Hardware/Software Introduction" Wiley India, 2009.
2. Tammy Noergaard, "Embedded Systems Architecture", Elsevier, 2005.
3. Tim Wilhurst, "An Introduction to the Design of Small Scale Embedded Systems",
4. Ajay V. Deshmukh, "Microcontrollers Theory and Applications", Tata McGraw Hill

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: 141EI0604	Course Title: PROCESS CONTROL	
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):

- Engineering Mathematics
- 141EI0502 - 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 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 III 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 IV FINAL CONTROL ELEMENTS 9

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

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UNIT V MULTILOOP CONTROL 9

Feed-forward control – Ratio control – Cascade control-selective control – Inferential control – Split-range and introduction to multivariable control – case studies from distillation column and boiler systems

Course Outcomes

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

CO1: Explain the mathematical model and dynamic behavior 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. Krishnasamy, K., "Process Control", New age international,2009

Reference Books:

1. Bequette, B.W., "Process Control Modeling, Design and Simulation", Prentice Hall of India, 2003.
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,
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, 1999.

Web References:

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

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Course Code:141EI0605	Course Title: PROCESS CONTROL AND INSTRUMENTATION LABORATORY	
Core	L: T: P: C	0 : 0 : 4: 2
Type: Practical	Total Contact Hours:	60

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

- 141EI0507 - Transducer and Signal Conditioning Laboratory
- 141EI0508 - System Simulation Laboratory

Course Objectives

The course is intended to:

1. Derive the mathematical model of first order and higher order systems
2. Explain the procedure for PID controller design.
3. Demonstrate the characteristics of control valves.
4. Demonstrate the principle of level, flow and viscosity measurement techniques.
5. Provide the knowledge on calibration of pressure gauges.

List of Experiments:

Process Control Experiments:

1. Mathematical modelling of interacting & non-interacting systems
2. Response of PID Controller tuning with performance criteria using MATLAB
3. Modelling and response of flow/level control loop
4. Modelling and response of temperature control loop
5. Modelling and response of pressure control loop
6. Characteristics of control valve with and without positioner
7. Design of PID controller for higher order systems
8. Response of complex control systems (Ratio control/Cascade)
9. Study of Nonlinear systems (Distillation column/Conical/Spherical tank)

Instrumentation Experiments:

1. A)Measurement of liquid level using displacer torque tube

   B)Measurement of flow using wheel flow meter.
2. Determination of Discharge Coefficient for venture and orifice meter
3. A) Calibration of pressure using dead weight tester

   B) Measurement of viscosity using Saybolt Viscometer

Course Outcomes

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

CO1: Conduct experiment to obtain the mathematical model of first order and higher order systems

CO2: Design of PID controller using modern tool

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CO3: Determine the characteristics of control valve and obtain the response of complex control system

CO4: Conduct experiment to measure the parameters like level, flow and viscosity

CO5: Conduct experiment to calibrate the pressure gauge

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Course Code: 141EI0606	Course Title: EMBEDDED SYSTEM DESIGN LABORATORY	
Core	L: T: P: C	0 : 0 : 4: 2
Type: Practical	Total Contact Hours:	45

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

- 141EI0404 - Digital Principles and Applications

Course Objectives

The course is intended to:

1.Demonstrate the understanding of the engineering principles in multidisciplinary environment.

2. Communicate effectively with proper aids and documents.

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

4.Comply with code of conduct and professional ethics in developing and completing the

5. Develop project that give sustainable solutions within societal and environmental contexts for

List of Experiments:
Embedded Systems

1. Activation of LED and Generating delay for buzzer using timer.
2. Interfacing of Matrix keyboard and display the data on LCD using microcontroller.
3. Interfacing of temperature sensor and programming of ADC using microcontroller.
4. Transmit and receive sensor data using RF communication.
5. Round robin / Cooperative Scheduling using RTOS.
6. Multitasking using RTOS.

[Note: The student should be made to do the following experiments of Embedded System Design using any of the Microcontroller family said in the corresponding Embedded IDE. *Preferred Choices of Microcontrollers: 8051 Series / PIC series/ ARM family/ Atmega]*

VLSI Design

7. Design and Simulation of Adders (Half adder, full adder, Ripple carry adder)
8. Design and Simulation of Encoder and Decoder.
9. Design and Simulation of Counters (Synchronous and Asynchronous).
10. Design and Simulation of various logic gates using CMOS Design.
11. Design and implementation of a Combinational Circuit using FPGA
12. Design and implementation of a Sequential Circuit using FPGA

[Note: The student should be made to do the following experiments of VLSI design using any modern EDA tools like Cadence, Xilinx, etc...]

Course Outcomes

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

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CO1: Demonstrate the understanding of the engineering principles in multidisciplinary

CO2: Communicate effectively with proper aids and documents.

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

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

CO5: Develop project that give sustainable solutions within societal and environmental contexts

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Course Code: 141EI0608	Course Title: CAMPUS TO CORPORATE	
General	L: T: P: C	0 : 0 : 2: 1
Type: Practical	Total Contact Hours:	30

Pre-requisites: 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 this 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

Assessments and Evaluation:

Assessment	Details	Weig htage	Administrati on	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 held	30%	Individual	Trained	Once in a

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student journal	journal for the whole semester		journals reviewed by the faculty	faculty members	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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Course Code : 141EI0701	Course Title : PRINCIPLES OF MANAGEMENT (Common to ECE,EEE, VII sem-EIE,MECH & AUTO)	
General	L : T : P: C	3 : 0 : 0 : 3
Type:Theory	Total Contact hours:	45

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

- 141EI0101 - Communication Skills I
- 141EI0201 - 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 – OVERVIEWOFMANAGEMENT 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

UNIT V – CONTROLLING 9

Process of controlling – Types of control – Budgetary and non-budgetary control

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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 : 141EI0702	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):

- 141EI0106 - Fundamentals of Electrical Engineering
- 141EI0404 - Digital Principles and Applications

Course Objectives

The course is intended to:

1. Describe the architecture of PLC and I/O devices
2. Develop PLC programming for simple tasks.
3. Explain the development of operator panel for PLC
4. Summarize the concepts of SCADA
5. Illustrate the operation of DCS

UNIT I – PROGRAMMABLE LOGIC CONTROLLER BASICS 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.

UNIT V – DISTRIBUTED CONTROL SYSTEM 9

Evolution – Different architectures – local control unit – Operator Interface –Displays –

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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: Describe the architecture of PLC and I/O devices

CO2: Solve simple tasks using ladder programming

CO3: Explain the development of operator panel for PLC

CO4: Summarize the concepts of SCADA

CO5: Illustrate 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 control and data Acquisition", Second edition, ISA.
3. Romily Bowden, "HART application guide and the OSI communication foundation", 1999.

Web References

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

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CourseCode:141EI0703	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):

- 141EI0404 - Digital Principles and Applications

Course Objectives

The course is intended to:

1. Identify the Pneumatic components required for Industrial Automation
2. Develop PLC programs for automation application
3. Develop HMI and for PLC based automated system
4. Develop SCADA based automation for real time process
5. Design LabVIEW based Control system for real time process

List of Experiments

1. Simple experiments on pneumatic type direction control valves
2. Creating Relay Ladder logic for latch and interlock.
3. Interfacing pneumatic actuators with PLC
4. Ladder programming using Bit logic instructions for Automatic stamp machine
5. Ladder programming using timer, counter for Bottle filling system
6. PLC programming for Parking system
7. Interfacing HMI with PLC (simple applications)
8. Interfacing PLC and HMI with real time process (Flow and Pressure)
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: Identify the Pneumatic components required for Industrial Automation

CO2: Develop PLC programs for automation application

CO3: Develop HMI and for PLC based automated system

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 : 141EI0704	Course Title : ADVANCED 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):

- 141EI0407 - Integrated Circuits Laboratory
- 141EI0507 - System Simulation Laboratory
- 141EI0607 - Embedded System Design Laboratory

Course Objectives

The course is intended to:

1. Fabricate power supply circuit
2. Design the application circuits using Op-amp
3. Analyze the characteristics of Wireless HART based device.
4. Analyze the absorbance level in a sample
5. Develop a signal conditioning unit using microprocessor/microcontroller and VI

List of Experiments

1. Design of fixed and adjustable regulated power supply.
2. Design of V/I and I/V converters.
3. Design of active filters – LPF, HPF and BPF
4. Design of RTD signal condition circuit using Instrumentation amplifier.
5. Design of PID controller using amplifier
6. Wireless temperature and level measurement
7. Wireless pressure and flow measurement
8. Absorbance analysis using UV - Visible spectrophotometer.
9. Design and implementation of DAQ system using VI (Thermocouple, LDR, Thermistor).
10. Design and implementation of microprocessor based humidity and moisture measurement
11. Power supply design Dotted PCB
12. Electronic circuit implementation using PCB

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,V/I, Filters, Instrumentation amplifier and controller circuit using op-amp

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CO3: Analyze the characteristics of Wireless HART based device.

CO4: Analyze the absorbance of a sample using UV-Visible spectrophotometer

CO5: Develop a signal conditioning unit using microprocessor/microcontroller and VI

END OF SEMESTER - VII

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PROFESSIONAL ELECTIVE

Course Code: 141EI9111	Course Title: ASIC DESIGN (Common to ECE,EEE & EIE)	
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):

- 141EI0404 Digital Principles and Applications
- 141EI0601 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 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 FLOOR PLANNING, PLACEMENT AND ROUTING 9

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Floor planning, Placement, Routing- Global routing, detailed routing, special routing, Parasitic extraction, LVS and DRC.

Course outcomes:

At the end of the course the student 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.

CO3: Explain the 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 2006.

2.Norman G. Einspruch, "Application Specific Integrated Circuit (ASIC) Technology", Academic Press, 2012.

References:

1. Morris Mano.M, "Digital Design", Prentice hall of India Pvt.Ltd, Pearson Education Pvt.Ltd, Third Edition , 2003.

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:141EC9112	Course Title: DIGITAL IMAGE PROCESSING (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):

- 141EI0406 - Discrete Time Systems and Signal Processing

Course Objectives:

The course is intended to

1. Analyze the digital images in frequency domain.
2. Analyze the given Digital Image by applying various filtering techniques.
3. Analyze the given digital images using restoration model.
4. Select the techniques for segmenting digital images.
5. Apply the various compression schemes.

Unit I - DIGITAL IMAGE FUNDAMENTALS 9

Elements of digital image processing systems, Digital Camera, Elements of visual perception, brightness, contrast, hue, saturation, Mach band effect, Color image fundamentals - RGB,HSI models, Image sampling, Quantization, 2D transforms - DFT, DCT, KLT and SVD

Unit II - IMAGE ENHANCEMENT 9

Spatial Domain techniques: Intensity transformations, contrast stretching, Histogram equalization and specification techniques, Smoothing filters, sharpening filters, gradient and laplacian. Frequency domain techniques: Smoothening filters, sharpening filters and Homomorphic filtering

Unit III - IMAGE RESTORATION 9

Model of Image restoration process - Noise models- Restoration in the presence of noise (both spatial and frequency domain) Linear Image restoration techniques: Inverse filtering- Wiener filtering. Restoration from projections: Projections and the Radon transform

Unit IV - IMAGE SEGMENTATION 9

Edge detection, Edge linking-Region based segmentation – Region growing – Region splitting and Merging. Clustering techniques: K-means clustering. Basic Morphological operations for Image Processing.

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UNIT V - IMAGE COMPRESSION 9

Need for data compression - Classification of Image compression schemes - Run length coding Huffman coding - Arithmetic coding - LZW coding, Transform based compression – Image compression standards.

Course Outcomes:

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

CO1. Analyze the digital images in frequency domain by applying 2D transforms.

CO2. Analyze the given Digital Image by applying various filtering techniques in both spatial and frequency domains.

CO3. Analyze the given digital images using an appropriate restoration model.

CO4. Select the appropriate techniques for segmenting digital images.

CO5. Apply the various compression schemes for the given image.

Text Books:

1. Rafael C.Gonzalez and Richard E. Woods, "Digital Image Processing", 2nd Edition, Pearson Education, 2002.
2. Anil K. Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 2009

Reference Books:

1. Dr. Jayaraman, S., Essakirajan, S., and Veerakumar, T.,"Digital Image Processing", Tata McGraw Hill, New Delhi, 2012.
2. David Salomon, "Data Compression – The Complete Reference", 3rd edition, Springer Verlag New york, 2004.
3. William K-Pratt, "Digital Image Processing", 4th edition, John Wiley and Sons, 2007.
4. Kenneth R.Castleman, "Digital Image Processing", Pearson Education, 1996.

Web References:

1. https://en.wikipedia.org/wiki/Digital_image_processing
2. www.tutorialspoint.com/dip/
3. www.imageprocessingplace.com/
4. nptel.ac.in/courses/117105079/

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Course Code: 141EI9113	Course Title: AUTOMOTIVE ELECTRONICS (Common to ECE,EEE & EIE)	
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):

- 141EI0304 - Electrical Machines and Measurements
- 141EI0603 - 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 embedded hardware and software modules
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 INTRODUCTION TO EMBEDDED SYSTEMS 9

Review of Embedded Hardware - Review of Software Module: IDE- Getting Started: Creating new project, creating new files, adding files to project, compile, build, debug and simulation of a project. Embedded system programming: Uploaders, ISP, ROM Emulators, In-Circuit Emulators. Debug Interfaces: BDM and JTAG - Embedded RTOS

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

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electronics – Infotainment systems – Navigation systems – System level tests – 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 EMBEDDED SYSTEM COMMUNICATION PROTOCOLS 9

Introduction to control networking – Communication protocols in embedded systems – SPI, I2C, USB – Vehicle communication protocols – Introduction to CAN, LIN, FLEXRAY, MOST, KWP2000.

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 embedded hardware and software modules

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, Automotive Electrics and Automotive Electronics, Systems and Components, Networking and Hybrid drive, 5th edition, John Wiley& Sons Ltd., 2007
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. Rajkamal, "Embedded Systems Architecture, Programming and Design, Tata McGraw-Hill,First reprint 2003
4. JoergSchaeuffele, Thomas Zurawka – Automotive Software Engineering – Principles, Processes, Methods and Tools, SAE,2016

Web References:

1. www.austincc.edu/autotech
2. https://acconline.austincc.edu/webapps/portal/frameset.jsp

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Head of the Department,
Department of Electronics and Instrumentation Engineering,
Dr. Mahalingam College of Engineering and Technology,
Pollachi - 642 003, Coimbatore District, Tamil Nadu.

Course Code: 141EI9114	Course Title: ADVANCED MICROPROCESSORS	
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):

- 141EI0501 - Microprocessor and 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 programmingand 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.

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Course Outcomes

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

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. Explain the architecture programming and interfacing of advanced microprocessors

Text Books

1. B.B.Brey The Intel Microprocessor 8086/8088 /80186/80188, 80286, 80386, 804 86
2. PENTIUM, PENTIUM Pro, PII, PIII & IV Archietecture, Programming & Interfacin g, Pearson Education ,2004.

Reference Books

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, II Edition 2006
5. Mohamed Rafiquzzaman, "Microprocessors and Microcomputer Based System Design", II 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.htm

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Pollachi - 642 003, Coimbatore District, Tamilnadu

Course Code:141EI9115	Course Title: INSTRUMENTATION SYSTEM DESIGN	
Elective	L: T: P: C	3 : 0 : 0: 3
Type: Theory	Total Contact Hours:	45

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

- 141EI0303 - Transducer Engineering
- 141EI0403 - Industrial Instrumentation – I

Course Objectives

The course is intended to:

CO1: Explain the basic concepts of instrumentation system design.

CO2: Design signal conditioning unit for transducers

CO3: Describe the concepts of control system design

CO4: Design electronic controllers in single and composite mode

CO5: Design microcontroller based instrumentation systems

UNIT I INSTRUMENTATION DESIGN BASIC CONCEPTS 9

Calibrating and testing standards for instruments and transducer-NEMA, DIN, BIS and ANSI standards-P&I symbols – P&I diagram for flow, pressure, level and temperature process

UNIT II SIGNAL CONDITIONING FOR TRANSDUCERS 9

Overview of bridge circuits and amplifiers - Design considerations for transducers such as thermocouple, RTD - Calibration and installation procedure for thermocouple and RTD - Design of Pressure measurement transducers - Selection criteria for flow, temperature, level, and pressure transducers

UNIT III OVERVIEW OF CONTROL SYSTEM DESIGN 9

Steps in Control System Design – Influence of process design on Process control – calculation of Degrees of Freedom for process control – effect of feedback control – Selection of Controlled, manipulated and measured variables – Control system design issues - 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 Sensor, Signal Conditioning – ADC – Interface of Microcontroller – DAC - Driver circuit for heater – PID algorithm- programming for temperature control

Course Outcomes

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

CO1: Explain the basic concepts of instrumentation system design using basic standards and P&I diagram

CO2: Design signal conditioning unit for RTD, Thermocouple and Pressure

CO3: Describe the concepts of control system design and process safety

CO4: Design analog PI, PD and PID controllers using Operational Amplifiers

CO5: Design microcontroller based instrumentation system for temperature process

Text Books:

1. Process Dynamics and Control 2nd ed - Dale E. Seborg, Thomas F. Edgar, Duncan A. Mellichamp (Wiley, 2004)
2. C. D. Johnson, Process Control Instrumentation Technology, Fourth Edition,

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,
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.
6. Industrial Process Control by Jocob

Web References:

1. nptel.ac.in/courses/117108107/17

2. nptel.iitg.ernet.in/Courses(Video).php

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Course Code:141EI9116	Course Title: COMPUTER ARCHITECTURE (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):

- 141EI0501 - Microprocessor and Microcontroller

Course Objectives:

The course is intended to

1. Identify the various computer system modules.
2. Design high speed Arithmetic and logic unit.
3. Analyze the occurrence of hazards.
4. Classify various memories used in computer system.
5. Analyze the data transfer modes.

UNIT I - BASIC STRUCTURE OF COMPUTERS9

Functional units- Basic Operational Concepts, Bus Structures, Software Performance – Memory locations and addresses – Memory operations – Instruction and instruction sequencing – addressing modes – assembly language – Basic I/O operations, Stacks and queues

UNIT II - ARITHMETIC UNIT9

Addition and subtraction of signed numbers – Design of fast adders – multiplication of positive numbers- signed operand multiplication and fast multiplication – Integer division, Floating point numbers and operations.

UNIT III - BASIC PROCESSING UNIT9

Fundamental concepts – Execution of a complete Instruction – Multiple bus organization – Hardwired control – micro programmed control, Pipelining – Basic concepts – data hazards – instruction hazards – influence on Instruction sets – Data path and control consideration, Superscalar operation.

UNIT IV -MEMORY SYSTEM9

Basic concepts – semiconductor RAMs, ROMs – Speed, size and cost – cache memories - Performance consideration – Virtual memory- Memory Management requirements, Secondary storage.

UNIT V - I/O ORGANIZATION9

Accessing I/O devices – Interrupts – Direct Memory Access – Buses – Interface circuits – Standard I/O Interfaces (PCI, SCSI, and USB)

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Course Outcomes:

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

CO1. Identify the various modules of the computer system.

CO2. Design high speed Arithmetic and logic unit to perform various arithmetic operations

CO3. Analyze the occurrence of hazards during the execution of machine instructions.

CO4. Classify various memories used in computer system based on their characteristics.

CO5. Analyze the data transfer modes of I/O devices through different buses.

Text Books:

1. Carl Hamacher, SafwatZaky, ZvonkoVranesic, "Computer Organization", Tata McGraw-Hill Education Pvt. Ltd, Fifth Edition 2011.
2. William Stallings, "Computer Organization and Architecture" – Designing for Performance Eighth Edition Pearson Education, 2010.

Reference Books:

1. David A. Patterson and John L. Hennessey, "Computer organization and design", Morgan Kauffman, 2014.
2. Vincent P. Heuring, Harry F. Jordan, "Computer System Architecture", Second Edition, Pearson Education, 2005.
3. Govindarajalu B, "Computer Architecture and Organization, Design Principles and Applications", Second edition, Tata McGraw Hill, New Delhi, 2010.
4. AharonYadin, " Computer Systems Architecture", Chapman and Hall/CRC, 2016

Web References:

1. http://nptel.ac.in/courses/106102062/
2. https://www.cis.upenn.edu/~milom/cis501-Fall11/lectures/00_intro.pdf
3. https://inspirit.net.in/books/academic/Computer%20Organisation%20and%20Architecture%208e%20by%20William%20Stallings.pdf
4. http://www.nptelvideos.in/2012/11/computer-architecture.html
5. http://www.learnerstv.com/Free-Computer-Science-Video-lectures-ltv086-Page1.html

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Course Code: 141EI9117	Course Title:ANALYTICAL INSTRUMENTATION	
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:

- 141EI0205 - 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:

1. Explain the concepts and application of various spectrophotometers.
2. Describe Nuclear magnetic resonance, types of mass spectrometers and electron microscope.
3. Contrast the different types of chromatography based on construction and working principle.
4. Summarize the working and characteristics of different analyzers.
5. 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.

Reference Books:

1. Braun, R.D., Introduction to Instrumental Analysis, McGraw – Hill, Singapore, 2006
2. H.H.Willard, L.L.Merritt, J.A.Dean, F.A.Settle, Instrumental methods of analysis, CBS publishing & distribution, 1995.
3. Liptak, B.G., Process Measurement and Analysis, CRC Press, 2005.

Web References:

1. http://nptel.ac.in/courses/102103044
2. http://nptel.ac.in/courses/103108100/

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Pollachi - 642 003, Coimbatore District, Tamilnadu

Course Code:141EI9118	Course Title:INSTRUMENTATION IN PETROCHEMICAL INDUSTRIES	
Core / Elective: Elective	L: T: P: C	3: 0: 0: 3
Type: Theory	Total Contact Hours:	45

Prerequisites:

- Nil

Course Objectives

1. Explain about the exploration, recovery and separation of crude oil
2. Describe the petroleum refining process
3. Illustrate the methods to obtain the derivatives of methane, acetylene, ethylene
4. Elaborate the various control loops used in Petrochemical Industry.
5. Explain the safety procedures in instrumentation system.

Unit I - OIL EXTRACTION AND PROCESSING 9

Techniques used for oil discovery - seismic survey - methods of oil extraction - oil rig system - Primary and Secondary recovery - Enhanced oil recovery - separation of gas and water from oil - control loops in oil gas separator - scrubber –coalesce.

Unit II - PETROLEUM REFINING 9

Petroleum refining process - unit operations in refinery - thermal cracking - catalytic cracking - catalytic reforming - polymerization - isomerization - alkylation - Production of ethylene, acetylene and propylene from petroleum

Unit III -CHEMICALS FROM PETROLEUM 9

Chemicals from methane, acetylene, ethylene and propylene - production routes of important petrochemicals such as polyethylene, polypropylene, ethylene dioxide, methanol, xylene, benzene, toluene, styrene, VCM and PVC

Unit IV – CONTROL LOOPS IN PETROCHEMICAL INDUSTRY 9

Control of binary and fractional distillation columns - Control of catalytic and thermal crackers - control of catalytic reformer - control of alkylation process - Control of polyethylene production – Control of VCM and PVC production.

Unit V - SAFETY IN INSTRUMENTATION SYSTEMS 9

Area and material classification as per National Electric Code (NEC) - Classification as per International Electro technical Commission (IEC) - Techniques used to reduce explosion hazards - Pressurization techniques - Type X, Type Y and Type Z - Intrinsic safety - Mechanical and Electrical isolation - Lower and Upper explosion limit.

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Course Outcomes

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

CO1: Explain about the exploration, recoveryand separation of crude oil

CO2: Describe the petroleum refining process

CO3: Illustrate the methods to obtain the derivatives of methane, acetylene, ethylene and propylene

CO4: Elaborate the various control loops used in Petrochemical Industry.

CO5: Explain the safety procedures in instrumentation system.

Text Books:

1. Balchen J.G and Mumme K.I., Process Control Structures and Applications, Von Nostrand Reinhold Company, New York, 1988.
2. Ram Prasad, Petroleum Refining Technology, Khanna Publishers, New Delhi, 2000.

Reference Books:

1. Liptak, B.G., Process Measurement and Analysis, CRC Press, 2005
2. Waddams A.L., Chemicals from Petroleum, Butter and Janner Ltd., 1968.

Web References:

1. nptel.ac.in

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Head of the Department,
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Pollachi - 642 003, Coimbatore District, Tamilnadu.

Course Code:141EI9119	Course Title: POWER PLANT INSTRUMENTATION	
Core/Elective: Elective	**L : T : P : C**	3 : 0: 0 : 3
Type: Theory	**Total Contact Hours:**	45

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

- 141EI0604 - Process Control
- 141EI0403 - Industrial Instrumentation – I
- 141EI9117 - Analytical Instrumentation
- 141EI0505 - Industrial Instrumentation – II

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: Illustratethe different control schemes in steam 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 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 – Cyclone furnace.

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UNIT -V CONTROL OF TURBINE 9

Types of steam turbines – impulse and reaction turbines – compounding – Turbine governing system – Speed and Load control – Transient speed rise – Free governor mode operation – Automatic Load Frequency Control – Turbine oil system – Oil pressure drop relay – Oil cooling system – Turbine run up 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, Instrument Society of America, 1991.
2. Krishnaswamy.K and Ponnibala.M., Power Plant Instrumentation, PHI Learning Pvt. Ltd., New Delhi, 2011

Reference Books:

1. Liptak B.G., Instrumentation in Process Industries, Chilton Book Company,2005.
2. Jain R.K., Mechanical and Industrial Measurements, Khanna Publishers, New Delhi, 1999.

Web References:

1. nptel.ac.in/courses/108106074

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Course Code:141EI9120	Course Title: SMART AND WIRELESS INSTRUMENTATION	
Core / Elective: Elective	L: T: P: C	3: 0: 0: 3
Type: **Theory**	Total Contact Hours:	**45**

Prerequisites:

- 141EI0303 - Transducer Engineering

Course Objectives

The course is intended to:

1. To get an overview of classification of sensors with its operation.
2. To understand the project development procedure with communicating devices like Zigbee, Bluetooth, ISA100, Wireless HART.
3. To study the power harvesting methodologies and power management techniques in WSN.
4. To learn the steps to configure, receive, test and transmit the data using GUI.
5. To study the hardware and software involved in developing the project for applications like structural health, physiological parameters, smart power and emotion monitoring.

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 - ISA 100, Wireless HART.

Unit III - POWER SUPPLIES FOR SENSORS 9

Power Sources-Energy Harvesting-Solar and Lead Acid Batteries-RF Energy Harvesting-Energy Harvesting from Vibration-Thermal Energy Harvesting-Energy Management Techniques-Calculation for Battery Selection.

Unit IV - SOFTWARE DESIGN FOR DATA RECEPTION AND ANALYSIS 9

Brief Description of API Mode Data Transmission-Testing the Communication between Coordinator and Remote XBee-Design and Development of Graphical User Interface for Receiving Sensor Data Using LabVIEW/C++.

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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

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 "Smart Sensors, Measurement and Instrumentation", Springer Heidelberg New York Dordrecht London,2013
2. HalitEren, "Wireless Sensors and Instruments: Networks, Design, and

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: 141EI9121	Course Title: MODERN ELECTRONIC INSTRUMENTATION	
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:

- 141EI0304 – Electrical Machines and Measurements

Course Objectives:

The course is intended to:

1. Explain the operation of various Analog instruments.
2. Explain the operation of various Digital instruments.
3. Describe the working of different Oscilloscopes and Wave analyzer
4. Compare different Recorders and Display devices.
5. Explain the Data Acquisition Systems.

Unit I - ANALOG INSTRUMENTS 9

Electronic analog meters: DC and AC voltmeters - True R.M.S. voltmeters - DC and ACammeters – multimeter, component measuring instruments: Q-meter - vector impedance meter

Unit II - DIGITAL INSTRUMENTS 9

Digital voltmeters and Digital multimeter –Digital phase meters – Digital tachometers – Digital frequency, period and time measurements – Sources of error –Inherent error in digital meters - hidden errors in conventional ac measurements

Unit III - OSCILLOSCOPE AND WAVE ANALYZER 9

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

Unit IV - RECORDERS AND DISPLAY DEVICES 9

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

Unit V - DATA ACQUISITION SYSTEM 9

Introduction to DAS - Objective – Signal Conditioning – Single Channel DAS – Multi Channel DAS – Computer Based DAS – Applications

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Course Outcomes:

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

1. Explain the operation of various Analog instruments
2. Explain the operation of various Digital instruments
3. Describe the operation of Oscilloscopes and Wave analyzer
4. Compare and contrast different Recorders and Display devices
5. Explain about Data Acquisition Systems

Text Books:

1. Cooper.W.D and Helfrick.A.D, Electronic Instrumentation and Measurement Techniques, Fifth Edition, Prentice-Hall of India, 2002.
2. Kalsi H.S., "Electronic Instrumentation", Third Edition, Tata McGraw Hill Company,
   New Delhi, 2012.
3. Sawhney A.K., "A course in Electrical and Electronic Measurement and Instrumentation", DhanpatRai and Co, New Delhi, Nineteenth Edition, 2011.

Reference Books:

1. Bouwens.A.J, Digital Instrumentation, McGraw Hill, 1997.(2008 reprint)
2. David A. Bell, "Electronic Instrumentation and measurements", Second Edition, PrenticeHall of India, New Delhi, 2003.
3. Gupta J.B., "A course in Electrical and Electronic Measurement and Instrumentation", 12th Edition, Katson Publishing House, 2003.

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

Course Code: 141EI9122	Course Title: WIRELESS SENSOR NETWORKS	
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):

- 141EI0504 - 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 CommunicationTechnology – 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

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Simulators, State-centric programming.

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

1. www.nptel.ac.in

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Pollachi - 642 003, Coimbatore District, Tamilnadu.

Course Code: 141EI9123	Course Title: BIOMEDICAL ENGINEERING	
Elective	L: T: P: C	3 : 0 : 0: 3
Type: Theory	Total Contact Hours:	45

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

- 141EI0303 - 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 this 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: 141EI9124	Course Title: ADVANCED PROCESS CONTROL	
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):

- 141EI0604 - 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

Model based control – IMC structure – development and design; IMC based PID control, Model Predictive Control.

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:141EI9125	Course Title: INDUSTRIAL DRIVES AND CONTROL	
Core / Elective: Elective	L: T: P: C	3: 0: 0: 3
Type: **Theory**	Total Contact Hours:	**45**

Prerequisites:

- 141EI0304 - Electrical Machines and Measurements
- 141EI0602 - Power Electronics

Course Objectives

1. Identify the needs and choice of various drives.
2. Explain various speed control techniques in DC drives
3. Analyze the different control methods of AC drives
4. Describe the digital control schemes for special drives.
5. Select suitable drive for different industrial applications.

Unit I - INTRODUCTION 9

Concept of drives - Classification of Electric Drives - Speed/Torque characteristics - selection of Motor power rating - Thermal model of motor for heating and cooling - Classes of duty cycle-Determination of motor rating - control of Electric drives-modes of operation.

Unit II - CONTROL OF DC DRIVES 9

DC motor and their performance-Braking - Ward Leonard drives - Controlled rectifier fed DC drives - Chopper controlled DC drives-Time ratio control and current limit control - Single, two and four quadrant operations - Open loop and closed loop control of drives

Unit III -CONTROL OF AC DRIVES 9

Induction Motor Drives-Stator control- v/f control -VSI,CSI fed induction motor drives - open loop and closed VVVF control - Rotor resistance control and slip power recovery Scheme -Vector Control basic concepts.

Unit IV – CONTROL OF SPECIAL DRIVES 9

Stepper motor: Driver circuit – Digital Implementation- BLDC motor: Principle, Construction and operation- Types of BLDC motor- Control of BLDC motor - Microprocessor and DSP based control schemes -Sensor less Control- servomotor: AC and DC control.

Unit V - DRIVES IN INDUSTRIAL APPLICATIONS 9

Selection of drives and control schemes for electrical vehicle application, Steel rolling mills - Paper mills-Textile mills-Sugar mills-Coal mines- lifts and cranes.

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Course Outcomes

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

CO1: Identify the needs and choice of various drives.

CO2: Explain various speed control techniques in DC drives

CO3: Analyze the different control methods of AC drives

CO4: Describe the digital control schemes for special drives.

CO5: Select suitable drive for different industrial applications.

Text Books:

1. R. Krishnan, 'Electric Motor and Drives: Modeling Analysis and Control', Pearson Education, 2001.
2. G.K. Dubey, 'Fundamentals of Electrical Drives', Narosa Publication, 2002.
3. Sen., P.C. "Thyristor DC Drives", Krieger Publishing Company 1991.

Reference Books:

1. E.G.Janardanan, 'Special Electrical Machines', Prentice Hall of India, 2014.
2. Bimal. K. Bose, 'Modern Power Electronics and AC Drives', Prentice Hall of India, 2003.
3. Chesmond, Wilson and Lepla, 'Advanced Control System Technology', Viva low priced Student edition, 1998.

Web References:

1. www.nptel.ac.in
2. http://www.accessengineeringlibrary.com/
3. http://www.electrical4u.com/

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Course Code: 141EI9126	Course Title: DIGITAL CONTROL AND STATE VARIABLE METHODS	
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):

- 141EI0102 -Engineering Mathematics-I
- 141EI0202- Engineering Mathematics – II

Course Objectives

The course is intended to:

1. Explain time domain models for sampled data control systems
2. Develop the discrete time domain model for hold devices and PID controllers
3. Explain the State space representation controllability and Observability of discrete time systems
4. Comment on the stability of discrete time systems
5. Obtain compensator for sampled data control system

UNIT I INTRODUCTION 9

Overview of frequency and time response analysis and specifications of control systems – Digital control systems – basic concepts of sampled data control systems – principle of sampling, quantization and coding – Reconstruction of signals – Sample and Hold circuits – Practical aspects of choice of sampling rate –Basic discrete time signals – Time domain models for discrete time systems.

UNIT II MODELS OF DIGITAL CONTROL DEVICES AND SYSTEMS 9

Z domain description of sampled continuous time plants – models of Zero order hold and first order hold circuits – Z Domain description of systems with dead time – Implementation of digital controllers – Digital PID controllers –Position, velocity algorithms

UNIT III STATE VARIABLE ANALYSIS 9

State space representation of discrete time systems – Solution of discrete time state space equation – State transition matrix – Decomposition techniques – Controllability and Observability – Multi variable discrete systems.

UNIT IV STABILITY ANALYSIS 9

Mapping between S plane and Z plane– Jury's stability test – Bilinear transformation and extended Routh array– Root Locus Method –Liapunov Stability Analysis of discrete time systems.

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UNIT V DESIGN OF DIGITAL CONTROL SYSTEM 9

Z plane specifications of control system design – Digital compensator design – Frequency response method – State feedback – Pole placement design – State Observers

Course Outcomes

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

CO1: Explain time domain models for sampled data control systems

CO2: Develop the discrete time domain model for hold devices and PID controllers

CO3: Explain the State space representation controllability and Observability of discrete time systems

CO4: Comment on the stability of discrete time systems

CO5: Obtain compensator for sampled data control system

Text Books:

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

Reference Books:

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

Web References:

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

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Dr. Sivanthi Aditanar College of Engineering and Technology,
Pethuchi - 642 003, Coimbatore District, Tamilnadu.

Course Code: 141EI9127	Course Title: NON LINEAR CONTROL SYSTEM	
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):

- 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

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approach to speed control of dc motors.

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: 141EI9128	Course Title: INDUSTRIAL DATA COMMUNICATION NETWORKS	
Elective	L: T: P: C	3 : 0 : 0: 3
Type: Theory	Total Contact Hours:	45

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

- 141EI0504 - Communication Engineering

Course Objectives

The course is intended to:

1. Explain the basic standards used in communication interface
2. Summarize the different types of industrial Ethernet
3. Describe the different standards of industrial protocol
4. Explain different types of field bus
5. Illustrate the wireless communication standards and OPC server.

UNIT I OSI MODEL AND SERIAL COMMUNICATION INTERFACE 9

ISO-OSI model – EIA 232 Interface standard – EIA 488 interface standard – 4 to20mA current loop – Serial interface converters.

UNIT II INDUSTRIAL ETHERNET 9

Introduction – IEEE Standards – Ethernet MAC layer – IEEE 802.2 and Ethernet SNAP – OSI and IEEE 802.3 standard. Ethernet transceivers, Ethernet types, switches and switching hubs, 10 Mbps Ethernet, 100 Mbps Ethernet, Gigabit Ethernet. TCP / IP Overview – Internet Layer Protocols – Host-to-Host layer

UNIT III INDUSTRIAL PROTOCOL 9

Overview – Protocol Structure – Example Function codes. ASCII based protocol - Modbus protocol – Overview. HART Protocol – Overview – Layers

UNIT IVFIELD BUS 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 AND OPC SERVER 9

Wireless LANs – IEEE 802.11 standard – Interconnection of LANs - Wireless WANs – Wireless HART- introduction to OPC server.

Course Outcomes

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

CO1: Explain the basic standards used in communication interface

CO2: Summarize the different types of industrial Ethernet

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CO3: Describe the different standards of industrial protocol

CO4: Explain different types of field bus

CO5: Illustrate the wireless communication standards and OPC server.

Text Books:

1. Behrouz A Forouzan, 'Data Communications and Networking', Tata McGraw-Hill, 2013.
2. Steve Mackay, Edwin Wright and Deon Reynders, 'Practical Industrial data Networks: Design, Installation and Trouble Shooting', Elsevier International Projects Ltd., 2004.
3. 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", 2nd Edition, Prentice Hall of India, 2005

Web References:

1. http://nptel.ac.in/courses/106105082/
2. http://nptel.ac.in/downloads/106105080/

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Course Code: 141EI9129	Course Title: ROBOTICS AND AUTOMATION	
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):

- 141EI0102 - Engineering Mathematics - I
- 141EI0202 - Engineering Mathematics - II
- 141EI0304 - Electrical Machines and Measurements
- 141EI0303- 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 – selection of robot. Applications - material handling, processing operations, assembly and inspection.

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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: 141EI91310	Course Title: HYDRAULICS AND PNEUMATICS	
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):

- 141EI0306Thermodynamics 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 – Installation, Fault

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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:141EI9131	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):

- 141EI0105 - 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 – Sub VI. Structures – FOR, WHILE Loops, Case, Sequence, event structures, Formula node.

UNIT III - LABVIEW BASICS II 9

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

UNIT IV - DATA ACQUISITION SYSTEM 9

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

UNIT V - LABVIEW APPLICATIONS 9

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

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Course Outcomes:

At the end of the course, the 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: 141EI9132	Course Title: DATA BASE MANAGEMENT SYSTEM	
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. Construct the Entity Relationship Model.
2. Convert ER diagram to relational database schema.
3. Relate the normalization technique to obtain the relational database design.
4. Choose a query evaluation and optimization technique.
5. Execute the 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, Estimating statistics of expression results, Transformation of relational expressions.

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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

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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: 141EI9133	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 Hours

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

- Database Management Systems

Course Objectives

The course is intended to:

1. Select the appropriate pre-processing technique.
2. Relate 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 Pre-processing: 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 Hadoop: Hadoop Overview – Hadoop Distributors - Hadoop Distributed File System.

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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: 141EI9134	Course Title: JAVA PROGRAMMING (Common to ECE,EEE & EIE)	
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):

- 141EI0105 - 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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Course Code: 141EI9135	Course Title: SOFTWARE TESTING (Common to ECE,EEE & EIE)	
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. 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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Course Code: 141EI9136	Course Title: PYTHON PROGRAMMING (Common to ECE,EEE & EIE)	
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):

- JAVA Programming

Course Objectives

The course is intended to:

1. Build a console application using variables, expressions & functions.
2. Develop an application using list, tuple and dictionary.
3. Apply object oriented programming concepts to develop console applications.
4. Develop an application using Tkinter and database packages.
5. Create web based application using Model View Controller.

UNIT I - INTRODUCTION TO PYTHON 9

Variables, Expressions and Statements – Functions - Case Study: Interface Design-Conditionals and Recursion - Fruitful Functions- Iteration.

UNIT II- DATA STRUCTURES IN PYTHON 9

Strings - Case Study: Word Play – Lists – Dictionaries - Tuples-Case Study:Data Structure Selection - Files.

UNIT III - OOPS CONCEPTS IN PYTHON 9

Classes and Objects -Classes and Functions - Classes and Methods – Inheritance - Tkinter: GUI - Buttons and Callbacks - Canvas Widgets-Coordinate Sequences - More Widgets - Packing Widgets - Menus and Callable - Binding

UNIT IV- MANAGING DATA IN PYTHON 9

Storing Data Using Python - Analyzing Data with Python - Managing Data using SQL - Migrating LendyDB to an SQL Database - Exploring Other Data Management Options.

UNIT V- WEB APPLICATIONS IN PYTHON 9

Python on the Web - Web Programming with Python - Python and the Web – Using Python Across the Wire - Exploring Python's Frontiers: Drawing Pictures with Python - Doing Science with Python - Playing Games with Python - Integrating with Other Languages

Course Outcomes

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

CO1. Build a console application using variables, expressions & functions.

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CO2. Develop an application using list, tuple and dictionary.

CO3. Apply object oriented programming concepts to develop console applications.

CO4. Develop an application using Tkinter and database packages.

CO5. Create web based application using Model View Controller.

Text Books

1. Allen Downey, "Think Python" ,Second Edition,Green Tea Press,2012
2. Laura Cassell,AlanGauld, "Python Projects",Wrox Publication,2015

Reference Books

1. Jeffrey Elkner, Chris Meyers Allen Downey, "Learning with Python" , Fourth Edition Dream Tech Press Publication,2015
2. Mark Summerfield, "A Complete Introduction to the Python Language", second Edition Addison-Wesley Professional,2014
3. Ryan Mitchell, "Web Scraping with Python: Collecting Data from the Modern Web", O'Reilly Media, Inc,2016.
4. Richard Lawson "Web Scraping with Python", First Edition, Packet Publishing Limited,2016.
5. John M Zelle "Python Programming: An Introduction to Computer Science"Franklin, Beedle& Associates, Inc, 2004.

Web References

1. https://www.coursera.org/learn/python
2. https://www.fullstackpython.com/databases.html
3. http://fivedots.coe.psu.ac.th/~cj/os/slides/slide-ppt.html
4. http://www.w effbot.org/tkinterbook/tkinter-index.html

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Course Code: 141EI9137	Course Title: PROBABILITY AND RANDOM PROCESS	
Core	L : T : P : C :	3 : 0 : 0 : 3
Type: Theory	Total Contact hours :	45 Hours

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

- 141EI0102-Engineering Mathematics I
- 141EI0202-Engineering Mathematics II

Course Objectives

The course is intended to:

1. Characterize probability models
2. Characterize two dimensional probability models
3. Demonstrate knowledge of random process
4. Describe correlation and spectral density function
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, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.

UNIT II – TWO-DIMENSIONAL RANDOM VARIABLES 9

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III – RANDOM PROCESSES 9

Classification – Stationary process – Markov process - Poisson process – Random telegraph 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 - White noise.

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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. Demonstrate knowledge of random process

CO4. Describe a random process in terms of correlation and spectral density functions.

CO5. Apply the random inputs to the linear systems

Text Books

1. Ibe, O.C. "Fundamentals of Applied Probability and Random Processes", Elsevier, U.P., 1st Indian Reprint, 2007.
2. Peebles, P.Z., "Probability, Random Variables and Random Signal Principles", Tata McGrawHill, New Delhi, 4th Edition, 2002.

Reference Books

1. Yates, R.D. and Goodman, D.J., "Probability and Stochastic Processes", JohnWiley and Sons, 2nd Edition, 2005.
2. Miller, S. L. and Childers, D. G., "Probability and Random Processes with Applications to Signal Processing and Communications", Academic Press, 2004.
3. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill, New Delhi, 9th Reprint, 2010.

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Course Code: : 141EI9138	Course Title: OPERATIONS RESEARCH (Common to ECE,EEE & EIE)	
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):

- 141EI0102 - Engineering Mathematics– I
- 141EI0202 - Engineering Mathematics – II
- 141EI0105 - 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. Travelling 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

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machines – Processing n Jobs through m Machines.

Course Outcomes

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

CO1. Find the value of the given objective functions using linearprogramming 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

1. http://nptel.ac.in/courses/112106131/1

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Course Code: 141EI9139	Course Title: DISASTER MANAGEMENT (Common to ECE,EEE & EIE)	
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):

- 141EI0101 Communication Skills–I
- 141EI0201 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 MANAGEMENT9

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
2. AmitaSinhal, "Understanding earthquake disasters" TMH, 2010.

References:

1. PardeepSahni, AlkaDhameja and Uma medury, "Disaster mitigation: Experiences and reflections", PHI
2. Jeff Groman, "The atlas of Natural Disasters", Friedman/Fairfax publishing, 2002
3. Jaikrishna and Chandrasekar, Elements of Earthquake Engineering.

Web References:

1. www.nptel.ac.in

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Course Code: 141EI9141	Course Title: ENGINEERING ECONOMICS AND COST ANALYSIS (V sem MECH, Elective-AUTO,ECE,EEE,EIE)	
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):

- 141EI0102 Engineering Mathematics– I
- 141Ei0202 Engineering Mathematics – II

Course Objectives

The course is intended to:

1. Categorize different cost and calculate the breakeven point for a given business situation
2. Apply different interest formulae and their application in decision making process.
3. Evaluate present value, future value and annual worth analysis on one or more economic alternatives.
4. Determine the economic value of an asset and develop a better replacement policy for given equipment.
5. Evaluate the depreciation of equipment per period.

UNIT I INTRODUCTION TO ECONOMICS 8

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

UNIT II VALUE ENGINEERING 10

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

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UNIT IV REPLACEMENT AND MAINTENANCE ANALYSIS 9

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

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.

References:

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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OPEN ELECTIVES

Course Code: 141OE0915	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 operational amplifier - 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**: Touch sensor, Proximity Sensor, Ambient

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light sensor, Hall sensor and Finger print sensor – **Sensors in Automotive vehicles:** Air flow sensor, Engine speed sensor, Manifold Absolute Pressure Sensor, Spark Knock Sensor, Fuel Temperature Sensor and Voltage Sensor - **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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Course Code: 141OE0916	Course Title : INDUSTRIAL INTERNET OF THINGS	
Open Elective	L : T : P: C	3:0:0:3
Type: Theory/Practical	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 – Crowd sourcing and Social BPM - Process data management in the cloud.

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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/

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