NAGARJUNA

COLLEGE OF ENGINEERING & TECHNOLOGY

An Autonomous College under VTU

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

VISION

To transform the students as leaders in Electronics & Communication Engineering to achieve professional excellence in the challenging future

MISSION

M1: To create an environment for the students to have strong academic fundamentals and enable them to be life-long learners.

M2: To provide modern tools to the students in the field of electronics and communication to meet the real-world challenges.

M3: To develop Communication skill, leadership qualities, team work and skills for continuing education among the students.

M4:   To inculcate Ethics, Human values and skills for solving societal problems and environmental protection.

M5: Validate engineering knowledge through innovative research projects to enhance their employability and entrepreneurship skills.

III to VIII Semesters

Outcome Based Education(OBE)/ Choice Based Credit System(CBCS) Curricula

With effect from Academic Year 2020-21

Program Educational Objectives (PEOs)

PEO-1: Graduates of Electronics and Communication engineering will be using the basic academic knowledge of design and analysis required in the industry for sustainable societal growth.

PEO-2: Graduates of Electronics and Communication engineering will be able to design project based learning and team based learning.

PEO-3: Graduates in Electronics and Communication engineering will demonstrate good communication skills, dynamic leadership qualities with concern for environmental protection.

PEO-4: Electronics and Communication engineering graduates will be capable of pursuing higher studies, take up research and development work blended with ethics and human values.

PEO-5: Electronics and Communication engineering graduates will have the ability to get employed and become entrepreneurs thereby switching over from responsive engineering to creative engineering.

Program Outcomes and Program Specific Outcomes as defined by the Program

Program Outcome:

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and electronics and communication engineering principles to the solution of complex problems in electronics and communication engineering.

PO2: Problem Analysis: Identify, formulate, research literature, and analyze complex electronics and communication engineering problems reaching substantiated conclusions using first principles of mathematics, and engineering sciences.

PO3: Design/Development of Solutions: Design solutions for complex electronics and communication engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct Investigations of Complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions related to electronics and communication engineering problems.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex electronics and communication engineering activities with an understanding of the limitations.

PO6: The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities

relevant to the professional electronics and communication engineering practice.

PO7: Environment and Sustainability: Understand the impact of the professional electronics and communication engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the electronics and communication engineering practice.

PO9: Individual and Teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex electronics and communication engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life Long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcome (PSO):

PSO1. Graduate will be able to identify, analyze& solve the problems related to Electronics and Communication Engineering by applying the fundamental knowledge of Electronics and Communication.

PSO2. Graduate will demonstrate an ability to investigate, design and develop both software and hardware using significant knowledge of modern tools in Electronics and Communication Engineering.

PSO3. Graduate will be able to apply their knowledge to assess societal, environmental, health, safety issues with professional ethics and can also pursue higher studies, involve in research activities, be employable or entrepreneur.

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Outcome Based Education(OBE)/ Choice Based Credit System(CBCS)

Third Semester B.E.-Scheme

Sl. No	Course Code	Course	Teaching Dept	L-T-P (Hrs/week)	Total Credits	Marks
1	19MAT31	Fourier series, Transforms and Numerical Techniques	Mathematics	3-2-0	4	100
2	19ECT32	Analog Electronic Circuits	EC	3-0-0	3	100
3	19ECI33	Digital Electronic Circuits(IC)	EC	3-0-2	4	100
4	19ECT34	Network Analysis	EC	2-2-0	3	100
5	19ECT35	Data Structure using C	CS/IS	3-0-0	3	100
6	19ECT36	Electronic Instrumentation	EC	3-0-0	3	100
7	19ECL37	Analog Electronics Circuits Lab	EC	1-0-2	2	100
8	19CPH38	Constitution of India and Professional Ethics and Human Rights	S&H	1-0-0	1	100
9	19ECH39	Elements of Communication	PT	0-0-4	2	100
TOTAL				**19-4-8**	**25**	**900**

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Fourth Semester B.E.-Scheme

Sl. No	Course Code	Course	Teaching Dept	L-T-P (Hrs/week)	Total Credits	Marks
1	19MAT41	Applied Calculus and Probability Distribution	Mathematics	3-2-0	4	100
2	19ECT42	Microprocessors and Microcontrollers	EC	3-0-0	3	100
3	19ECI43	Fundamentals of HDL (IC)	EC	3-0-2	4	100
4	19ECT44	Signals and Systems	EC	2-2-0	3	100
5	19ECT45	Engineering Electromagnetics	EC	2-2-0	3	100
6	19ECL46	Microprocessors and Microcontrollers LAB	EC	1-0-2	2	100
7	**19UHV47**	Universal Human Values	S&H	3-0-0	3	100
8	19KVK48/ 19KAK48	Vyavaharika/Adalitha Kannada	S&H	1-0-0	1	100
9	19ECH49	Professional Development of Engineers	PT	0-0-4	2	100
TOTAL				**18-6-8**	**25**	**900**

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Fifth Semester B.E.-Scheme

Sl. No	Course Code	Course	Teaching Dept	L-T-P (Hrs/week)	Total Credits	Marks
1	18ECT51	Analog Communication	EC	3-2-0	4	100
2	18ECI52	Fundamentals of CMOS VLSI (IC)	EC	3-0-2	4	100
3	18ECT53	Information Theory and Coding	EC	2-2-0	3	100
4	18ECT54	Accountancy and Taxation	ECH	3-0-0	3	100
5	18ECT55X	Professional Elective-I	EC	3-0-0	3	100
6	18ECT56X	Professional Elective-II	CS/IS	3-0-0	3	100
7	18ECL57	Analog Communication LAB	EC	1-0-2	2	100
8	18ECH58	Environmental Studies	S&H	1-0-0	1	100
9	18ECH59	Employability Skills and Aptitude Development	PD	0-0-4	2	100
TOTAL				**19-4-8**	**25**	**900**

Professional Elective-I

Sl.No	Course Code	Course
1	18ECT551	Digital Switching Systems
2	18ECT552	Linear Integrated Circuits
3	18ECT553	Control Systems

Professional Elective-II

Sl.No	Course Code	Course
1	18ECT561	Object Oriented Programming using C++
2	18ECT562	Web Technology
3	18ECT563	JAVA Programming

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Sixth Semester B.E.-Scheme

Sl. No	Course Code	Course	Teaching Dept	L-T-P (Hrs/week)	Total Credits	Marks
1	18ECT61	Digital Communication	EC	3-0-0	3	100
2	18ECT62	Digital Signal Processing	EC	2-2-0	3	100
3	18ECT63	Antennas and Wave Propagation	EC	3-0-0	3	100
4	18ECT64X	Professional Elective-III	EC	3-0-0	3	100
5	18ECT65X	Professional Elective-IV	EC	3-0-0	3	100
6	18HOE66X	Industrial Elective-I	EC	3-0-0	3	100
7	18ECL67	Digital Communication LAB	EC	1-0-2	2	100
8	18ECL68	Digital Signal Processing LAB	EC	1-0-2	2	100
9	18ECH69	Employability Skills and Aptitude Development	PD	1-0-4	3	100
TOTAL				20-2-8	25	900

Professional Elective-III

Sl.No	Course Code	Course
1	18ECT641	ARM Processors
2	18ECT642	Internet Of Things Technology
3	18ECT643	Nano-electronics

Professional Elective-IV

Sl.No	Course Code	Course
1	18ECT651	Artificial Neural Networks
2	18ECT652	Image Processing
3	18ECT653	Pattern Recognition

Industrial Elective-I

Sl.No	Course Code	Course
1	18HOE661	LabVIEW – Level 1
2	18HOE662	Robotic Process Automation
3	18HOE663	Wireless and Mobile Communication

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Seventh Semester B.E. – Scheme

Sl. No.	Course Code	Course	Teaching Dept.	L-T-P-S (Hrs/week)	Total Credits	Marks
1	17ECT71	Power Electronics	EC	3-0-0-0	3	100
2	17ECT72	Data Communication	EC	3-0-0-0	3	100
3	17ECI73X	Foundation Elective-X (IC)	EC	3-0-2-0	4	100
4	17ECT74X	Engineering Elective-XI	EC/ME/CS	3-0-0-0	3	100
5	17HOE75X	Open Elective-XII	EC/BS&H	2-0-0-4	3	100
6	17HOE76X	Open Elective-XIII	EC/BS&H	2-0-0-4	3	100
7	17ECL77	Power Electronics Lab	EC	1-0-2-0	2	100
8	17ECL78	Data Communication Lab	EC	1-0-2-0	2	100
9	17ECP79	Project Phase-I andSeminar	EC	0-0-6-0	3	100
		Total		**18-0-12-8**	**26**	**900**

Foundation Elective-X (IC)

Sl. No.	Course Code	Course
1	17ECI731	Optical Fiber Communication
2	17ECI732	Web Technology
3	17ECI733	Online Certification courses from IITs / IISc / SWAYAM / EDX

Engineering Elective-XI / PBL

Sl. No.	Course Code	Course
1	17ECT741	Wireless Communication
2	17ECT742	Artificial Intelligence
3	17ECT743	MEMS
4	17ECT744	Advanced C Programming and Data Structures
5	17ECT745	Introduction to Embedded System and C Programming
6	17ECT746	Advanced JAVA with Fullstack

Open Elective-XII

SI. No.	Course Code	Course
1	17HOE751	Tax Management
2	17HOE752	Assessment of Building Energy Performance (Of-fered by ASHRAE)
3	17HOE753	Crisis Management
4	17HOE754	Online certification courses from IITs / IISC /SWAYAM / EDX
5	17HOE755	Automotive Embedded System Design
6	17HOE756	Advanced Embedded Systems
7	17HOE757	Advanced JAVA

Open Elective-XIII

SI. No.	Course Code	Course
1	17HOE761	Small & Medium Enterprise Management
2	17HOE762	Occupational Safety & Health Administration
3	17HOE763	Animation & Multimedia Engineering
4	17HOE764	Online certification courses from IITs / IISC /SWAYAM / EDX
5	17HOE765	Model Based Design using MATLAB
6	17HOE766	Introduction to ARMs processor and its Applications
7	17HOE767	Advanced python

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Eighth Semester B.E. – Scheme

Sl. No.	Course Code	Course	Teaching Dept.	Total Credits	Marks
1	17ECP81	Project Phase-II and Seminar	EC	4	100
2	17ECP82	Project Phase-III and Seminar	EC	4	100
3	17ECP83	Evaluation and Viva voce (External)	EC	10	100
Total				**18**	**300**

IC – Integrated Course   **L – Lecture**   **T-Tutorials**

P-Practical   **S – Self Study**

Fourier Series, Transforms and Numerical Techniques					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
19MAT31	3:2:0	4	CIE:50 SEE:50	3 Hours	BS

Course Objectives:

This course will enable students to:

- Have the efficiency in expressing a periodic function in terms of infinite trigonometric series.

- Obtain the knowledge of Laplace Transforms.

- Acquire the skill in solving the engineering applications problem using Laplace Transforms.

- Get the ability to solve the engineering problem using Fourier Transforms.

- Develop the proficiency in solving algebraic and transcendental equations and interpolation using numerical methods.

Syllabus

Module – I

Fourier Series: Periodic functions, Dirichlet's conditions, Euler's Formulae (without proof), Fourier series of periodic functions of period 2l and 2π, Half range Fourier series, Practical harmonic analysis- problems.
08 Hours

Module – II

Laplace Transform: Definition, Laplace Transform of elementary functions. Properties, transform of derivatives, multiplication by t^n and division by t - Problems. Laplace transforms of periodic functions, unit step functions and unit impulse function – Problems. **08 Hours**

Module – III

Inverse Laplace Transforms: Inverse Laplace Transforms of standard functions. (Formulae only). Inverse Laplace transform by using completing the squares, partial fractions, shifting property and differentiation - problems. Convolution theorem - problems. Applications - solution of linear differential equations with initial conditions- problems. **08 Hours**

Module – IV

Fourier Transforms and Z - Transforms:
Complex Fourier transforms, Fourier Sine and Cosine transforms and their inverse transforms problems.
Z - Transforms of some standard functions, Damping and shifting rules - problems. Inverse Z-Transforms by partial fraction method. **08 Hours**

Module – V

Numerical Methods:
Numerical solutions of algebraic and transcendental equations- Regula Falsi Method and Newton Raphson Method (Formulae only) –Problems. Finite Differences-Forward and Backward differences, Newton's Forward and Newton's Backward interpolation formulae. Lagrange's Interpolation formula (without proof)–Problems. Numerical Differentiation using Newton's Forward and Backward interpolation formulae. –Problems. **08 Hours**

Course Outcomes:
On completion of this course, the students are able to:
- Demonstrate Fourier series to study the behavior of periodic functions and their applications in engineering problem.
- Find the Laplace transform of different types of functions.
- Use the Laplace transform and inverse Laplace Transform in solving various types engineering application problems.
- Make use of Fourier transform and Z-transform to illustrate discrete/continuous function arising in engineering applications.

- Determine the roots of Algebraic and Transcendental equations and Interpolation arising in engineering applications, using numerical methods.

Text Books:
1. Dr. B.S. Grewal: "Higher Engineering Mathematics", (Chapters 10, 21, 22, 28, 29, 30), Khanna Publishers, New Delhi, 42nd Edition, 2012, ISBN:9788174 091955.
2. N.P. Bali and Dr. Manish Goyal: "A Text Book of Engineering Mathematics", (Chapters 10, 18, 20, 22, 24), Laxmi Publications (P) Ltd., New Delhi, 9thEdition, 2014, ISBN: 9788131808320.

Reference Books:
1. Erwin Kreyszig: "Advanced Engineering Mathematics", Wiley Pvt. Ltd. India, New Delhi, 9th Edition, 2011, ISBN 13: 9788126531356.

2. B.V. Ramana: "Higher Engineering Mathematics", Tata Mc Graw – Hill Publishing Company Limited, New Delhi, 2nd Reprint, 2007, ISBN 13: 978-0-07063417-0.

E-Resources:
1. http://bookboon.com/en/essential-engineering-mathematics-ebook
2. https://www.free-ebooks.net/ebook/essential-engineering-mathematics
3. https://archive.org/details/AdvancedEngineeringMathematics10thEdition

Analog Electronic Circuits					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
19ECT32	3:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to:

- Understand the working principle of diodes and its applications.
- Illustrate the significance of transistor equivalent circuit models, equations for various configurations.
- Gain the knowledge about construction and working principle of Field Effect Transistors.
- Perform AC and DC analysis of small signal amplifiers and power amplifiers.
- Relate and design feedback amplifiers and various oscillator circuits.

Syllabus

Module – I

Diode Circuits: Diode equivalent circuits, Diode applications: Clippers and Clampers.

Transistor Biasing: Operating point, Fixed bias circuits, Emitter stabilized biased circuits, and Voltage divider biased circuits, DC bias with voltage feedback, Bias stabilization- General expression, Fixed Bias, Emitter bias and Voltage divider type bias.   **08 Hours**

Module – II

Transistor at Low Frequencies: BJT transistor modeling, CE Fixed bias configuration, Voltage divider bias, Emitter follower, CB configuration, Collector feedback configuration, Analysis of circuits re model. Darlington Emitter Follower.

Transistor Frequency Response: General Frequency considerations, Low frequency response.   **08 Hours**

Module – III

Field Effect Transistors: Introduction, JFET: Construction and working, Transfer characteristics,

Depletion type MOSFET: Construction, operation and characteristics, Enhancement type MOSFET:

Construction, operation and characteristics, MOSFET Handling.   **08 Hours**

Module – IV

Power Amplifiers: Definitions and amplifier types, Series fed class A amplifier, Transformer coupled Class A amplifiers, Class B amplifier operations, Class B amplifier circuits: Transformer-Coupled Push-Pull Circuits, Complementary–Symmetry Circuits, Class C and Class D amplifiers.

08 Hours

Module – V

Feedback and Oscillator Circuits: Feedback concept, Feedback connections types. Oscillator operation, Phase shift oscillator, Wien bridge oscillator, Tuned oscillator circuits, Crystal oscillator (BJT version only).

08 Hours

Course Outcomes:

On completion of this course, students should be able to:

- List the diode/FET characteristics and model the Clipping and Clamping circuits using diode.
- Explain the various BJT configurations, biasing and stability methods.
- Analyze the transistor behavior at low frequencies and its effects.
- Categorize and design small signal and power amplifier circuits.
- Evaluate the feedback concepts and construct different types of oscillator circuits for the specified frequency.

Text Books:

1. Robert L. Boylestad and Louis Nashelsky: "Electronic Devices and Circuit Theory, 10th Edition, HI/Pearson Education, 2012, ISBN: 978-81-317-6459-6.

Reference Books:

1. Jacob Millman and Christos C. Halkias: "Integrated Electronics", 2nd Edition, Tata - McGraw Hill, 2010,

ISBN-978-007-015142-0.

2. David A. Bell: "Electronic Devices and Circuits", 5th Edition, PHI, 2008, ISBN: 978-0-19-569340-9.
3. U. B. Mahadevaswamy: "Analog Electronics Circuits: A Simplified Approach", 1st Edition, Pearson/Saguine, 2010, ISBN: 978-81-317-3234-2.

E-Resources:
1. http://www.allaboutcircuits.com/textbook/semiconductors/chpt-3/introduc-tion-to-diodes-and-rectifiers/
2. http://fourier.eng.hmc.edu/e84/lectures/ch2/node4.html
3. http://www.allaboutcircuits.com/video-lectures/transistor-biasing/
4. https://www.youtube.com/watch?v=g30xTHas3aU
5. https://nptel.ac.in/courses/108/102/108102095/

Digital Electronic Circuits (IC)					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**CourseType**
19ECI33	3:0:2	4	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to:

- Understand the concepts of Boolean algebra and Boolean expression minimization techniques.
- Gain the knowledge of combinational logic circuits.
- Study the operation of different types of Flip-Flops.
- Analyze and design the functioning of different types of counters and Shift registers.
- Construct the state diagrams, state table and state equations for Mealy and Moore state models.

Syllabus

Module – I

Simplification of Boolean functions: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables, Karnaugh maps-three, four, Incompletely specified functions (Don't Care terms), Simplifying Max term equations, QuineMc-Clusky minimization technique, Map entered variable. **08 Hours**

Module – II

Combinational Logic Circuits: General approach to Combinational Logic Design, Parallel adder and subtractor, carry look ahead adder, Magnitude Comparator, Decoders, Encoders and Multiplexers. **08 Hours**

Module – III

Flip-Flops and Simple Flip –Flops Applications: Basic Bistable Element, Latches, SR Latch, Application of SR Latch, A Switch Debouncer, The SR Latch, The gated SR Latch, The gated D Latch, The Master Slave Flip-Flops (Pulse-Triggered Flip-Flops): The Master-Slave SR Flip-Flops, The Master-Slave JK Flip-Flop, Edge Triggered Flip-Flop: The Positive Edge-Triggered D Flip-Flop, Negative-Edge Triggered D Flip-Flop. **08 Hours**

Module – IV

Sequential Circuits: Characteristic Equations, Registers, Counters - Binary Ripple Counters, Synchronous Binary counters, Counters based on Shift Registers, Design of Asynchronous counters, Design of a Synchronous Mod-N Counter using clocked JK, D and T Flip-Flops. **08 Hours**

Module – V

Sequential Design: Introduction, Mealy and Moore Models, State Machine Notation, Synchronous Sequential Circuit Analysis, construction of state diagram. **08 Hours**

List of Experiments

1. 3-bit Binary-to-Gray and Gray-to-Binary Converter using gates.
2. a) Full Adder and Full Subtractor using gates.
   b) 4-bit parallel adder/subtractor using IC 7483.
3. MUX/DE-MUX and Comparators using ICs (74153, 74138, 74139, 7485).
4. Truth Table verification of FFs using NAND gates: SR and JK-type.
5. Study of FFs using ICs: JK, T, and D-types (7476).
6. Mod N counters using ICs (7493, 7490)
7. Ring Counter and Johnson Counter using IC 7495
8. PN Sequence generator using Linear Feedback Shift Register. **26 Hours**

Course Outcomes :

On completion of this course, students should be able to:

- Determine an optimal solution for a given digital problem using K – Maps, QuineMc-Clusky minimization technique and Map entered variable method.
- Explain combinational digital circuits like adder, subtractor, Multiplexers, Decoders, Encoders and

Comparator.

- Analyze the functioning of different types of Latches, Pulse-Triggered and Edge Triggered Flip-Flops.
- Design the Registers, Asynchronous and Synchronous counters.
- Develop the appropriate Mealy and Moore Finite State Machine.

Text Books:
1. John M Yarbrough: "Digital Logic Applications and Design", 3rd Edition, Cengage Learning, New Delhi, Reprint, 2012, ISBN-13: 978-81-315-0058-3, ISBN-10: 81315-0058-6.
2. Donald D Givone: "Digital Principles and Design", 1st Edition, Tata McGraw Hill, New Delhi, Reprint, 2005, ISBN: 0-07-052906-X.

Reference Books:
1. Charles H Roth: "Fundamentals of logic design", 5th Edition, Thomson, New Delhi, Reprint, 2007, ISBN: 81-315-0043-8.
2. M. Morris Mano and Charles R. Kime: "Logic and computer design Fundamen- tals", 2nd Edition, Pearson, Reprint, 2005, ISBN: 81-7808-334-5.

E-Resources:
1. http://nptel.ac.in/courses/117106086/
2. http://www.asic-world.com/digital/tutorial.html
3. https://www.wiziq.com/tutorials/digital-electronics

Network Analysis					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
19ECT34	2:2:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to:

- Understand the basic DC , AC circuits & loops using all the simplification techniques.
- Gain the knowledge of graph theory to solve network equations.
- Apply network theorems in analyzing circuits.
- Identify and analyze the series, parallel Resonance circuits.
- Evaluate the use of Laplace transform in various engineering fields.

Syllabus

Module – I

Basic Concepts: Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis with linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh. **08 Hours**

Module – II

Network Topology: Graph of a network, Concept of tree and co-tree, incidence matrix, tie-set, tie-set and cut-set schedules.
Network Theorems I : Superposition, Reciprocity and Millman's theorems. **08 Hours**

Module – III

Network Theorems II : Thevinin's and Norton's theorems and Maximum Power transfer theorem.
08 Hours

Module – IV

Resonant Circuits: Series and parallel resonance, frequency- response of series and parallel circuits, Q-factor, Bandwidth.
Two port network parameters: Definition of z, y, h and transmission **08 Hours**

Module – V

Laplace Transformation: Definition of Laplace transform, Singularity functions, Functional Transforms, Properties of Laplace Transforms, Inverse Laplace Transform, and Waveform Synthesis. **08 Hours**

Course Outcomes :

On completion of this course, students should be able to:

- Learn the interconnection of simple networks to form complex ones.
- Illustrate the circuit using network topology.
- Apply the circuit theorems in analyzing the circuits.
- Analyze concept of resonance circuits and their behavior.
- Evaluate electric circuits using Laplace transforms for system modelling in various engineering domains.

Text Books:

1. M. E. Van Valkenburg: "Network Analysis", (Chapters 1-5), 3rd Edition, Pearson Prentice Hall, New Delhi, 1974. ISBN: 978-81-203-0156-6.
2. W. H. Hyatt Jr., and J. E. Kemmerly, S. M. Durbin: "Engineering Circuit Analysis", 7th Edition, Tata McGraw Hill, New Delhi, 2011, ISBN: 978-0-07-015385-1.

Reference Books:

1. M. Nahvi, J. A. Edminister: "Electric Circuits", 10th Edition, Tata-McGraw Hill, New Delhi, 2007, ISBN 0-07-463591-3.
2. C.K. Alexander, M. N O Sadiku: "Fundamentals of Electric Circuits", 3rd Edition, Tata McGraw Hill, New Delhi, 2007, ISBN: 978-0-07-064803-6.

E-Resources:
1. http://www.allaboutcircuits.com/textbook
2. http://fourier.eng.hmc.edu/e84/lectures/ch2/node3.html
3. http://tutorial.math.lamar.edu/Classes/DE/LaplaceIntro.aspx
4. http://fourier.eng.hmc.edu/e84/lectures/ch2/node4.html

Data Structures using C					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
19ECT35	3:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to:
- Understand the basics of structures and pointers.
- Learn the data structure for a specified application.
- Identify the various data structure concepts, such as stacks, queues, linear lists, trees.
- Understand the impact of data structures on the performance of programs.
- Illustrate the concept of various binary search algorithms.

Syllabus

Module – I

Pointers: Introduction, Accessing the variable and its address through the pointer, Declaring & initialization of pointer variables, Array of pointers, Pointer as function arguments, Functions returning pointers, Dynamic memory allocation - Introduction, malloc(), calloc(), realloc().

08 Hours

Module – II

Structures: Introduction, Defining a structure, Declaring structure variables, Accessing structure members, Structure initialization, Size of structures, Copying & comparing structure variables, Array of structures, Arrays within structures, Structures within structures.

08 Hours

Module – III

Linked Lists: Introduction, Inserting and removing nodes from a list, Lists in C - Array implementation of lists, Circular lists, Doubly linked lists: Inserting and removing nodes from a list.

08 Hours

Module – IV

Stack and Queue: Definition, Stack operations: PUSH, POP, DISPLAY, Array implementation of stacks in C, Linked list implementation of stacks. Queue and its sequential representation, Queue operations: INSERTION, DELETION, DISPLAY, Array implementation of queues in C, Linked list implementation of queues.

08 Hours

Module – V

Trees: Introduction, Binary search trees: Insertion and deletion of a node, searching a key element in Binary search tree, Binary tree traversals: preorder, in order and post order.

08 Hours

Course Outcomes :

On completion of this course, students should be able to:
- Explain the concepts of structures and pointers.
- Interpret the various data structures like stack and queue.
- Analyze prefix, infix, postfix expressions using stack data structure.
- Design the programs using linked lists.
- Develop binary trees in Problem Solving.

Text Books:
1. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed : "Fundamentals of Data Structures in C", (Chapters 1-6,9,10), Universities Press-India, 2nd Edition, 2008, ISBN-13: 978-8173716058.

Reference Books:
1. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein: "Introduction to Algorithms",

PHI Learning Private Limited-India, 3rd Edition, 2010, ISBN-13: 978-8120340077.

2. Aaron M. Tenenbaum: "Data Structures using C", Pearson Education-India , 2nd edition, 2003, ISBN-13: 978-8131702291.

E-Resources:
1. https://www.cs.princeton.edu/
2. https://www.opendatastructures.org/ods-cpp
3. https://www.lib.mdp.ac.in/ebook/DSa
4. https://ww.cs-fundamentals.com/data-structures/introduction-to-data-structures.php
5. https://www.cprogramming.com/algorithms-and-data-structures.html

Electronic Instrumentation					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
19ECT36	3:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to:

- Understand the concepts of errors and characteristics of the measurement systems.
- Gain the knowledge of basic working principle of DVM, DMM, CRO, DFM.
- Learn the fundamental concepts and working of CRT.
- Analyze the functioning of different Signal Generators and Bridge Circuits.
- Construct and analyze the principle of different types of Transducers

Syllabus

Module – I

Measurement Errors: Introduction, Gross errors and systematic errors, Absolute and relative errors, accuracy, Precision, Resolution and Significant figures

Voltmeters and Mustimeters: Introduction, Multirange voltmeter, Extending voltmeter ranges, Loading, respond and True RMS voltmeters. **08 Hours**

Module – II

Digital Instruments: Digital Voltmeters – Introduction, DVM's based on V–T, V–F and Successive approximation principles, Resolution and sensitivity, General specifications, Digital Multi-meters, Digital frequency meters, Digital measurement of time. **08 Hours**

Module – III

Oscilloscopes: Introduction, Basic principles, CRT features, Block diagram and working of each block, Typical CRT connections, Dual beam and dual trace CROs, Electronic switch**. 08 Hours**

Module – IV

Signal Generators: Introduction, Fixed and variable AF oscillator, Standard signal generator, Laboratory type signal generator, AF sine and Square wave generator, Function generator, Square and Pulse generator, Sweep frequency generator, Frequency synthesizer.

Measurement of Resistance, Inductance and Capacitance: AC bridges, Capacitance Comparison Bridge, Maxwell's bridge, Wein's bridge, Wagner's earth connection **08 Hours**

Module – V

Transducers : Introduction, Electrical transducers, Selecting a transducer, Resistive transducer, Resistive position transducer, Strain gauges, Resistance thermometer, Thermistor, Inductive transducer, Differential output transducers and LVDT. Piezoelectric transducer, photoelectric transducer, Photovoltaic transducer, Sensor/transducer based on Hall Effect, Semiconductor photo devices, Temperature transducers-RTD, Thermocouple. **08 Hours**

Course Outcomes :

On completion of this course, students should be able to:

- Explain the characteristics of various measuring instruments and different types of errors.
- Illustrate the working principles of different types of Transducers.
- Apply the various technologies available to measure R, L, C using current and voltage meters.
- Analyze the working principle of CRO and able to measure different parameters.
- Evaluate the functionality of different types of Signal generators and function generators.

Text Books:

1. H. S. Kalsi: "Electronic Instrumentation", 3rd Edition, TMH, New Delhi, 2010, ISBN: 978-0-07-070206-6.
2. David A Bell: "Electronic Instrumentation and Measurements", 3rd Edition, PHI, New Delhi, 2006,

ISBN: 9788120323605
.

Reference Books:

1. Cooper D and A D Helfrick: "Modern electronic instrumentation and measuring techniques", PHI, New Delhi, 1990, ISBN: 978-81-203-0752-0.

E-Resources:

1. http://www.testandmeasurementtips.com/oscilloscopes/different-types-ofoscil-loscopes
2. http://www.myklassroom.com/Engineering-branches/21/Electronics-andInstru-mentation-Engg.- (EIE)
3. http://www.radio-electronics.com/info/t_and_m/generators/signal-generatortypes.php
4. http://www.delabs-circuits.com/cirdir/analog/analog2.html

Analog Electronics Circuits Laboratory					
Course Code	**L:T:P**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
19ECL37	1:0:2	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to:
- Gain the knowledge about basic operations of analog devices.
- Understand the applications of different semiconductor devices.
- Experiment with different types of diode circuits.
- Construct different types of transistor circuits.
- Learn the usage of appropriate test equipment to analyze circuit operations.

Syllabus

List of Experiments

1. Design of Clamping circuits: positive clamping / negative clamping.
2. Design and testing of Diode clipping (Single/Double ended) circuits for peak clip-ping, peak detection.
3. Design and testing of Half wave Rectifier with and without Capacitor filter. Determination of ripple factor and efficiency.
4. Design and testing of Full wave Rectifier with and without Capacitor filter. Determination of ripple factor and efficiency.
5. Design and testing of Bridge Rectifier with and without Capacitor filter. Determination of ripple factor and efficiency.
6. Design of RC coupled Single stage BJT amplifier and determination of the gain frequency response.
7. Design of BJT Darlington Emitter follower and determination of the gain frequency response. (Single circuit) (One Experiment).
8. Plot the transfer and drain characteristics of a JFET and calculate its drain resistance, mutual conductance
9. Design and testing for the performance of BJT-RC Phase shift Oscillator for $f_0 \leq 10$ KHz.
10. Design and testing for the performance of BJT – Hartley and Colpitts Oscillators for RF range $f_0 \geq 50$ KHz.
11. Design and testing for the performance of BJT -Crystal Oscillator for $f_0 > 100$ KHz.
12. Design and Testing of a transformer less Class – B push pull power amplifier and determination of its conversion efficiency.

Course Outcomes:

On completion of this course, students will able to:
- Recognize and design various types of clipping and clamping circuits.
- Interpret and design different rectifiers.
- Use appropriate formulas and design various types of BJT amplifier circuits.
- Demonstrate the characteristics of JFET.
- Develop and derive the performance of various types of oscillators.

E-Resources:

1. http://www.allaboutcircuits.com/textbook/semiconductors/chpt-3/introduction-to-diodes-and-rectifiers/
2. http://fourier.eng.hmc.edu/e84/lectures/ch2/node4.html
3. http://www.allaboutcircuits.com/video-lectures/transistor-biasing/
4. http://nptel.vtu.ac.in/econtent/courses/ECE/Analog_Electronics_Lab/index.php

Constitution of India, Professional Ethics and Human Rights					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
19CPH38	1:0:0	1	CIE:50 SEE:50	2 Hours	HSS

Course Objectives:

This course will enable the students to
- The basic information about Indian constitution.
- The fundamental rights and duties of a citizen.
- Special privileges of socially and economically weaker sections of the society.
- Individual role and ethical responsibility towards society.
- Understand the categories in Indian Government

Syllabus

Module – I

Introduction to the Constitution of India, The Making of the Constitution and Salient features of the Constitution. Preamble to the Indian Constitution, Fundamental Rights & its limitations.   **03 Hours**

Module – II

Directive Principles of State Policy & Relevance of Directive Principles of State Policy, Fundamental Duties. Union Executives – President, Prime Minister, Parliament, Supreme Court of India.   **03 Hours**

Module – III

State Executives – Governor, Chief Minister, State Legislature High Court of State. Electoral Process in India, Amendment Procedures, 42nd, 44th , 74th , 76th , 86th & 91st Amendments.   **02 Hours**

Module – IV

Special Provision for SC & ST, Special Provision for Women, Children & Backward Classes, Emergency Provisions. Human Rights- Working of National Human Rights Commission in India, Powers and functions of Municipalities, Panchayats and Co - Operative Societies.   **03 Hours**

Module – V

Scope & Aims of Engineering Ethics, Responsibility of Engineers, Impediments to Responsibility. Risks, Safety and liability of Engineers, Honesty, Integrity & Reliability in Engineering.   **02 Hours**

Course Outcomes:

On completion of this course the students are able to
- Familiarize with fundamental rights and duties.
- Recognize the Electoral Process.
- Get exposed to legislature and judiciary.
- Realize special provisions given for women, children and weaker section of society.
- Exhibit Engineering ethics and responsibilities of Engineers .

Text Books:

1. Durga Das Basu, "Introduction to the Constitution of India", Lexis Nexis Publications; 22nd Edition, 2015, ISBN-13: 978-9351434467.
2. Charles E. Haries, Michael S Pritchard and Michael J. Robins, "Engineering Ethics", Thomson Wadsworth, 2nd Edition, 2003, ISBN-13: 978-9812436764.

Reference Books:

1. M.V. Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002, 1st Edition, ISBN-13: 978-8125918325.
2. M. Govindarajan, S. Natarajan, V.S. Senthilkumar, "Engineering Ethics", PHI Learning Private Limited, New Delhi, 2nd Edition, 2013, ISBN-13: 978-8120348165.
3. Brij Kishore Sharma, "Introduction to the Constitution of India", PHI Learning Private Limited, New

Delhi, 7th Edition, 2015, ISBN-13: 978-8120350892..

E-Resources:

1. http://www.cgsird.gov.in/constitution.pdf
2. http://indiacode.nic.in/coiweb/welcome.html

Elements of Communication					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
19ECH39	0:0:4	2	CIE:50 SEE:50	3 Hours	HSS

Course Objectives:

This course will enable students to:

- Implement English vocabulary at command and ensure language proficiency.
- Pronunciation skills to enhance with English vocabulary and language proficiency Language Lab.
- Augment LSRW and GV skills (Listening, Speaking, Reading, Writing and Grammar, Vocabulary) through tests, activities, exercises etc., comprehensive web-based learning and assessment systems can be referred
- Achieve better Technical writing and Presentation skills Identify the common errors in speaking and writing English and acquire Employment and Workplace communication skills.
- Define non-verbal communication

Syllabus

Module – I

Introduction to Communication Skills : What is communication? The importance of communication skills in Engineering, Key concepts in communication, Kinds of communication, The communication process, Barriers & filters in communication, Feedback in communication, Traits of a good and poor communicator, The communication pie. **03 Hours**

Module – II

Listening Skills– Its importance, Difference between hearing & listening, Active Listening, Traits of good listeners, The Listening Cycle, Listening for Pronunciation Practice.

Reading Skills: Importance of Reading Skills in Communication, Building confidence in reading, Countering common errors in reading, Reading rate & reading comprehension, Jigsaw reading. **06 Hours**

Module – III

Speaking skills: Importance of Speaking, Purpose of Speaking, Secrets to Speaking, Importance of Pronunciation in speaking, Improving pronunciation through cluster ,Sounds, Pronunciation clarity & Cluster sounds, JAM Sessions, Pick and Speak. **06 Hours**

Module – IV

Writing skills: Importance of Written Communication, The importance of good sentence and paragraph construction, Hallmarks of good writing, Accuracy, Ambiguity & Brevity in written communication, One word for many, 7 C's of written communication, Proofing your document, Activities on Written Communication.

Body Language: Importance of Body Language, Body Language Do's & Don'ts, Body Language speaks volumes – the fine print, Body Language behavior & their Interpretation. **06 Hours**

Module – V

Presentation Skills: How to be an effective presenter, Establishing specific purpose and desired outcomes of a presentation, Organizing, writing and editing content in a presentation, Preparation of effective visuals to guide and support a presentation, Effective use of verbal and non-verbal presentation techniques.

Group presentations : Group presentations by the participants, Presentations would be followed by question & answer sessions, Extensive feedback would be given by the trainer on the strengths & areas of improvement, Action plan for improvement for each individual student. **05 Hours**

Course Outcomes :

On completion of this course, students should be able to:

- Identify common errors in spoken and written communication and get familiarized with English

vocabulary and language proficiency. Improve nature and style of sensible writing and acquire employment and workplace communication skills.

- Improve their Technical Communication Skills through Technical Reading and Writing practices.
- Use grammatical English and essentials of language skills and identify the nuances of phonetics, intonation and flawless pronunciation and Implement English vocabulary at command and language proficiency..
- Understand and improve the non verbal communication and kinesics. Perform well in campus recruitment, engineering and all other general competitive examinations.
- able to communicate effectively orally and in writing.

Text Books:
1. S.L.N. Sharma, K. Shankaranarayana: "Basic Grammar", Navakarnataka Vinyasa Pvt. Limited.
2. Technical Communication by Gajendra Singh Chauhan and Et al, Cengage learning India Pvt Limited [Latest Revised Edition] - 2018.
3. Communication Skills by Sanjay Kumar and Pushp Lata, Oxford University Press - 2018. Refer it's workbook for activities and exercises — "Communication Skills — If (A Workbook)" published by Oxford University Press—2018.

Reference Books:
4. Technical Communication - Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.
5. English Language Communication Skills (Lab Manual cum Workbook), Cengage learning India Pvt Limited [Latest Revised Edition]—2018. Reference Books.
6. English for Technical Communication by N.P.Sudharshana and C.Savitha, Cambridge University Press—2016.
7. Intermediate Grammar, Usage and Composition by M.L.Tichoo, A.L.Subramanian, P.R.Subramanian, Orient Black Swan-2016.

E-Resources:
1. https://www.habitsforwellbeing.com/9-effective-communication-skills/
2. https://www.selfgrowth.com/events/5-elements-of-effective-communication-2

Applied Calculus and Probability Distribution					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
19MAT41	3:2:0	4	CIE:50 SEE:50	3 Hours	BS

Course Objectives:

This course will enable students to:

- Acquire the knowledge of calculus of complex functions.
- Develop the proficiency in solving Numerical integral and Initial value problems.
- Obtain the knowledge of probability distributions.
- Learn concept of the Joint distributions and Markov's chains.
- Known the importance of statistical inference in engineering.

Syllabus

Module – I

Complex Variables: Complex variables: Functions of a complex variable, derivative of complex functions. Analytic functions, (No problems by using limits). Cauchy's-Riemann equations in Cartesian and polar forms, Harmonic functions – problems (No problems by using limits). Construction of analytic functions by using Milne-Thomson method -problems.

Complex integration: Line integrals -problems. Cauchy Theorem (no problems on verification of the theorem) and Cauchy's integral formula -problems.

08 Hours

Module – II

Numerical Methods: Numerical Integration-Trapezoidal rule, Simpson's 1/3rd and 3/8th rule. Numerical solutions of ordinary differential equations of first order and first degree- Picard's method, Taylor's Series method, Modified Euler's Method, Runge-Kutta Method of 4th order and Milne's Predictor Corrector Method (without proof) –Problems

08 Hours

Module – III

Random Variables and Probability Distribution: Discrete and continuous Random Variables, Probability density function and distributions. Binomial, Poisson, Exponential and Normal distributions.

08 Hours

Module – IV

Joint Probability and Markov's Chain: Joint Probability distribution of two discrete random variables. Expectations, correlation and covariation. Probability vectors, stochastic matrices, fixed point matrices, regular stochastic matrices, Markov's Chains, higher transition probabilities, stationery distribution of regular Markov's Chains. **08 Hours**

Module – V

Sampling and inference: Sampling Distribution, Testing of hypothesis, level of significance, confidence limits, test of significance of large samples, sampling of variables, central limit theorem, confidence limits for unknown means, Students t-distribution and Chi-square test. **07 Hours**

Course Outcomes:

On completion of this course, the students are able to:

- Use the concepts of analytic functions and complex integration in engineering application problems.
- Solve the Numerical integral and Initial value problems arising in engineering applications, using numerical methods.
- Apply probability distributions in analyzing the probability models arising in engineering field.
- Apply Joint probability distributions and Markov's chains in analyzing the probability models

arising in engineering field.

- Use the concept of sampling analysis in analyzing the statistical models arising in engineering field.

Text Books:
1. Dr. B.S. Grewal: "Higher Engineering Mathematics", (Chapters 20,26,27,30,32), Khanna Publishers, New Delhi, 42nd Edition, 2012, ISBN: 9788174091955.
2. N.P. Bali and Dr. Manish Goyal: "A Text Book of Engineering Mathematics", (Chapters: 19,21), Laxmi Publications (P) Ltd., New Delhi, 9th Edition, 2014, ISBN: 9788131808320.

3. Seymour Lipschutz and Marc Lars Lipson: "Probability", (Chapters: 5 and 8), McGraw Hill Education (India) Private Limited, Chennai, Special Indian Edition, 2010, ISBN: 978-0-07-014622-8.

Reference Books:
1. Erwin Kreyszig: "Advanced Engineering Mathematics", Wiley Pvt. Ltd., India, New Delhi, 9th Edition, 2011, ISBN 13: 9788126531356.

2. B.V. Ramana: "Higher Engineering Mathematics", Tata McGraw – Hill Publishing Company Limited, New Delhi, 2nd Reprint, 2007, ISBN 13: 978-0-07063417-0.

E-Resources:
1. http://bookboon.com/en/essential-engineering-mathematics-ebook
2. https://www.free-ebooks.net/ebook/essential-engineering-mathematics
3. https://archive.org/details/AdvancedEngineeringMathematics10thEdition
4. http://www.zums.ac.ir/ebooks/mathematics/essential-engineering-mathematic.

Microprocessors and Microcontrollers					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
19ECT42	3:0:0	3	CIE:50 SEE:50	3 Hours	**FC**

Course Objectives:

This course will enable students to:

- Understand the architecture of 8086 microprocessor, 8051 microcontrollers.
- Learn software development tools to assemble, test and debug the programs.
- Interpret the concepts of assembler directives in programming.
- Gain the knowledge about basic concepts of microcontrollers and its peripherals
- Develop Microprocessor/ Microcontroller based systems for a given application.

Syllabus

Module – I

Introduction to 8086 Microprocessor: Microprocessor Evolution and types, 8086 Internal Architecture: The BIU and the Execution Unit, Segmentation, Pin Diagram of 8086, Introduction to Programming the 8086.

08 Hours

Module – II

8086 Assembly Language Programming-1: Addressing Modes of 8086, Assembler Directives, Instruction Set of 8086. Data Transfer Instructions, Arithmetic Instructions, Bit Manipulation Instructions, Branching Instructions, Processor Control Instructions and String Instructions.

08 Hours

Module – III

8086 Assembly Language Programming-2: Macros, Procedures, Assembly Language Programming Examples.
Introduction to 8051 Microcontrollers: Comparison of Microprocessors and Microcontrollers, Architecture and Pin Functions of 8051 Microcontroller, Program Counter and Data Pointer, Flags and the Program Status Word, Internal Memory Organization, Special Function Register, Stack Operation.

08 Hours

Module – IV

Programming in 8051: Addressing modes and instruction set of 8051, simple program**s.** 8051 Microcontroller Based System Design-1: Input/output Port Programming, Programming timers, Asynchronous Serial Data Communication, Interrupt Service Routines.

08 Hours

Module – V

8051 Microcontroller Based System Design-2: Programming in C, Interfacing Matrix Keyboard and Seven Segment Displays, Interfacing ADC and DAC, Interfacing of LCD Display.

08 Hours

Course Outcomes:

On completion of this course, students should be able to:

- Explain the architecture, instruction sets and design principles of processor/controller-based systems.
- Identify the different attributes to be satisfied while designing processor/controller-based applications.
- Analyze the given problem statement and to write program for that particular application.
- Evaluate the communication and bus interfacing concepts.
- Design I/O and Memory interfacing circuits.

Text Books:

1. Douglas V. Hall, "Microprocessors and Interfacing: Programming and Hardware", Revised 2nd Edition, TMH, 2006, ISBN: 978-0-07-060167-3
2. Muhammad Ali Mazidi, Jancice Gillispie Mazidi and Rolin D McKinlay" The 8051 Microcontroller

and Embedded Systems: using Assembly and C", Pearson Education, 2nd Edition, 2009, ISBN: 978-81-317-1026-5
3. Kenneth J. Ayala; "The 8051 Microcontroller Architecture, Programming and Applications", 2ndEdition, Thomson Learning; ISBN: 978-1401861582

Reference Books:
1. Barry B. Brey, "The Intel Micro-processors, Architecture, Programming and Interfacing", 6th Edition, Pearson Education, 2008, ISBN: 978-81-317-2622-8.
2. Yu-cheng Liu and Glenn Gibson" microcomputers systems the 8086/8088 family, architecture, programming & design", 4th Edition, PHI, 2008, ISBN: 978-81-203-0409.
3. Raj Kamal, "Microcontrollers Architecture, Programming, Interfacing and System Design", 2nd Edition, Pearson Education, 2011, ISBN: 978-81-317-5990-5.

E-Resources:
1. https://www.sciencedirect.com/topics/computer-science/von-neumann-architecture
2. https://nptel.ac.in/content/storage2/courses/106108100/pdf/Teacher_Slides/mod1/M1L3.pdf
3. https://swayam.gov.in/nd1_noc20_ee11/preview
4. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/108105102/lec23.pdf

Fundamentals Of HDL(IC)					
Course Code	**L:T:P**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
19ECI43	3:0:2	4	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :
- Understand the basic concept of HDL and to compare between Verilog and VHDL.
- Learn the fundamentals of data flow and behavioral designs.
- Gain the concept of structural and mixed language descriptions.
- Illustrate the concept of task, functions and file processing in HDL.
- Develop the concept of map Register Transfer Logic code to hardware domain.

Syllabus

Module – I

Introduction: A Brief History of HDL, Structure of HDL Module, Operators, Data types, Types of Descriptions, simulation and synthesis, brief comparison of VHDL and Verilog. **08 Hours**

Module – II

Data-Flow Descriptions: Highlights of Data-Flow Descriptions, Structure of Data flow Description, Data Type – Vectors.
Behavioral Descriptions: Behavioral Description highlights, Structure of HDL behavioral Description, The VHDL variable: Assignment Statement, Sequential statements. **08 Hours**

Module – III

Structural Description: Highlights of structural description, organization of structural description.
Mixed-Language Descriptions: Highlights of Mixed-Language Description, How to invoke one language from the other, Mixed Language Description examples, and Limitations of Mixed-Language Description.
08 Hours

Module – IV

Procedures, Task and Functions: Highlights of Procedures, tasks, and Functions, Procedures and tasks, Functions. Advanced HDL Descriptions: File Processing, Examples of File Processing. **08 Hours**

Module – V

Synthesis Basics: Highlights of Synthesis, Synthesis information from Entity and Module, Mapping Process and always in the Hardware Domain. **08 Hours**

List of Experiments

 1. Write HDL code to realize all the logic gates.
 2. Write a HDL program for the following combinational designs,
   i. Decoder.
   ii. Encoder.
   iii. Multiplexer and de-multiplexer.
   iv. Comparator.
 3. Write a HDL code to describe the functions of a Full Adder Using three modeling styles.
 4. Develop the HDL code for the following Flip-Flops, SR, D, JK, T.
 5. Design 4 bit binary, BCD counters (Synchronous reset and Asynchronous reset).

Interfacing:
 1. Write HDL code to control speed and direction of Stepper motor.
 2. Write HDL code to generate different waveforms (Square, Triangle, Ramp etc.,) using DAC Change the Frequency and amplitude.
 3. Write HDL code to control speed of DC motor. **26 Hours**

Course Outcomes:

On completion of this course, the students are able to :
- Explain the various data type, operators and different descriptions in VHDL and Verilog.
- Describe the program in data flow and behavioural descriptions in VHDL and Verilog.

- Analyze the program using structural and mixed language description in VHDL and Verilog.
- Develop the program using procedure, task, and functions in VHDL and Verilog.
- Construct and synthesis the VHDL and VERILOG codes for digital circuits.

Text Books:
1. Nazeih M. Botros: "HDL Programming (VHDL and Verilog)", (Chapters 1-5), Dreamtech Press Publishers, New Delhi, 2008, ISBN-13: 9788177226973.

Reference Books:
1. J. Bhaskar: "A Verilog HDL Primer", 2nd Edition, BS Publications, Hyderabad, 2001, ISBN:8178000121.
2. Volnei A. Pedroni: 'Circuit Design with VHDL", 1st Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2004, ISBN: 8120326830.

E-Resources:
1. http://www.xilinx.com/video/hardware/basic-hdl-coding-techniques.html
2. http://www.academia.edu/1492361/VHDL_BASICS_WITH_EXAMPLES
3. http://ece-research.unm.edu/jimp/vlsi/slides/vhdl.html
4. http://www.asic-world.com/systemverilog/basic1.html
5. http://www.referencedesigner.com/tutorials/verilog/verilog_01.php

Signals and Systems					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
19ECT44	2:2:0	3	CIE:50 SEE:50	3 Hours	**FC**

Course Objectives:

This course will enable the students to

- Understand the basic types of continuous-time and discrete-time signals and operations on signals.
- Study the convolution operation on discrete LTI system.
- Apply the concept of difference equations of LTI systems and express the system in block diagram representations
- Analyze the various properties of continuous and discrete Fourier transform for the given signals
- Design the ROC for evaluating causality, stability of the given signal using z-transforms.

Syllabus

Module – I

Introduction and Classification of signals: Definition of signal and systems, communication and control system as examples and Classification of signals. Basic Operations on signals:- Amplitude scaling, addition, multiplication, differentiation, integration, time scaling, time shift and time reversal. Elementary signals/Functions:- Exponential, sinusoidal, step, impulse and ramp functions. Expression of triangular, rectangular and other waveforms in terms of elementary signals. **08 Hours**

Module – II

System Classification and properties: Linear-nonlinear, Time variant-invariant, causal-non causal, static-dynamic, stable-unstable, invertible.

Time domain representation of LTI System:- Impulse response, convolution sum. Computation of convolution sum. LTI system Properties in terms of impulse response: Memoryless, Causal, Stable, Invertible and step response. **08 Hours**

Module – III

Difference equation representation of an LTI System: Solutions for Difference equation, Block diagram representation-direct form-I and direct form- II difference equations.

Fourier Representation of Periodic Signals: Introduction to CTFS and DTFS, definition, properties (No derivation) and basic problems. **08 Hours**

Module – IV

Fourier Representation of aperiodic Signals and its properties: Introduction to Fourier Transform and DTFT, Definition and basic problems. Properties of Fourier Transform: Linearity, Time shift, Frequency shift, Scaling, Differentiation and Integration, Convolution and Modulation, Parseval's theorem **08 Hours**.

Module – V

The Z-Transforms: Z transform, properties of the region of convergence, properties of the Z-transform, Inverse Z-transform, Causality and stability, Transform analysis of LTI systems. **08 Hours**

Course Outcomes:

On completion of this course the students are able to

- Explain the classification of signals and basic operations on signals.
- Determine the linearity, causality, time-invariance and stability properties of continuous and discrete time systems.

- Analyze the response of the LTI system using convolution sum, difference equation and block diagram representation of discrete time system.
- Design the time domain and frequency domain signals using different transforms.
- Evaluate the Region of Convergence of a given signal and inverse z-transform.

Text Books:
1. Simon Haykin: "Signals and Systems", 4th Edition, John Wiley India Pvt. Ltd, Re-print, 2004, ISBN: 978-81-265-1265-2.
2. Michael J Roberts: "Fundamentals of Signals and Systems", 2nd Edition, Tata Mc Graw-Hill, 2010, ISBN: 978-0-07-070221-9.

Reference Books:
1. Alan V Oppenheim, Alan S, Willsky and Hamid Nawab: "Signals and Systems", 2nd Edition, Pearson Education Asia / PHI, Indian Reprint, 2002, ISBN: 81-203-1246-5.
2. H.P Hsu, R. Ranjan, "Signals and Systems", Scham's Outlines, TMH, 1995, ISBN-13: 978-0-07-060171-0.

E-Resources:
1. http://link.springer.com/chapter/10.1007/978-1-4020-6272-8_4#page-1
2. http://www.thefouriertransform.com/
3. http://lpsa.swarthmore.edu/LaplaceZTable/LaplaceZFuncTable.html

Engineering Electromagnetics					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
19ECT45	2:2:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to:

- Understand the fundamental concepts and various laws in Electric Fields.
- Gain the knowledge of Energy, Potential and Boundary conditions.
- Illustrate the concepts of current and current density in Electric fields.
- Interpret the Poisson's and Laplace theorems and their applications.
- Design the basic principles of Maxwell's equations and Uniform Plane waves.

Syllabus

Module – I

Electrostatics: Introduction, Coulomb's Law and field intensity, Electric flux density, Gauss's Law, Applications of Gauss's Law, Divergence theorem.   **08 Hours**

Module – II

Electric Fields: Electric potential, Gradient of a scalar quantity, Relationship between Electric field and potential. Energy and potential in a moving point charge in an Electric Field, the Line Integral, definition of potential difference and potential, Potential gradient.   **08 Hours**

Module – III

Poisson's and Laplace's Equations: Current and current density, Continuity of current, Conductor properties and boundary conditions, Capacitance, several capacitance examples, Derivations of Poisson's and Laplace's Equations.   **08 Hours**

Module – IV

Magnetic Fields: Biot-Savart Law, Ampere's Circuital Law, Curl, Stokes Theorem, Magnetic Flux and Magnetic Flux density, Faraday's law, displacement current.   **08 Hours**

Module – V

Maxwell's equations and Uniform plane waves: Maxwell's equation in point and Integral form. Wave propagation in free space and dielectrics, The Pointing vector and power considerations.   **08 Hours**

Course Outcomes :

On completion of this course, students should be able to:

- Explain the basics of Vectors, Coordinate systems and Electrostatics.
- Apply the concepts of Energy and Potential on a moving point charges.
- Analyze the concepts of Current, Current density and parallel capacitance for the various boundary conditions.
- Evaluate the steady magnetic fields and Time varying magnetic fields using various laws.
- Derive the relationship between Maxwell's equations and Uniform Plane wave.

Text Books:

1. William H Hayt Jr. and John A Buck: "Engineering Electromagnetic", 8th Edition, Tata McGraw-Hill, 2006, ISBN-13: 978-0071244497, ISBN-10: 0071244492.

Reference Books:

1. John Kraus: "Electromagnetics with Applications", 5th Edition, Tata Mc-Graw Hill, 1999, ISBN-13: 978-0072899696, ISBN-10: 0072899697.
2. Edward C. Jordan and Keith G Balmain: "Electromagnetic Waves and Radiating Systems", 2nd Edition, PHI, New Delhi, 1968, ISBN: 9780132499958.

E-Resources:

1. http://hyperphysics.phy-astr.gsu.edu/hbase/electric/maxeq.html

2. http://www.maxwells-equations.com/
3. http://mathworld.wolfram.com/CoordinateSystem.html
4. http://edndoc.esri.com/arcsde/9.1/general_topics/what_coord_sys.htm

Microprocessors and Microcontrollers Laboratory					
Course Code	**L:T:P**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
19ECL46	1:0:2	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to:

- Learn Assembly level programming concepts and features.
- Gain the knowledge about using instruction set of 8086/8051.
- Understand how to interface different input/output devices with a processor.
- Learn how the combination of hardware and software can be used to address the given problem.
- Experiment with serial ports and counters.

Syllabus

List of Experiments

ALP using MASM/ Keil Software:

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.

2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable).

3. Boolean & Logical Instructions (Bit manipulations).

4. Conditional CALL & RETURN.

5. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and   Decimal - HEX.

6. Programs to generate delay, Programs using serial port and Counters.

Write and execute the following programs for 8051 in Embedded C:

1. Interface stepper motor to rotate in clockwise/ anti clockwise directions and to rotate the motor through predefined angle of rotation.

2. Interface DAC to generate sine, ramp, triangular and square wave.

3. Interface 4X4 keypad and display the key pressed on LCD.

4. Speed control of DC motor.

Course Outcomes:

On completion of this course, students will able to:

- Recall and apply fundamentals of assembly level programming concepts.
- Interpret instruction set of 8086/8051 and develop an ALP on a microprocessor.
- Demonstrate interfacing of different input/output devices with a processor.
- Analyze given problems and select the combination of hardware & software to address the problem.
- Generate different waveforms using Digital to Analog Converters.

E-Resources:

1. https://nptel.ac.in/courses/106/106/106106210/
2. https://www.tutorialspoint.com/assembly_programming/index.htm
3. https://www.youtube.com/watch?v=shJAszu34xY
4. https://www.youtube.com/watch?v=KwJmTfzQDf8

Universal Human Values					
Course Code	**L:T:P**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
19UHV47	**3:0:0**	**3**	**CIE:50 SEE:50**	**3 Hours**	**Human values foundation course**

Course Objectives:

- To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
- To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
- To help students understand the meaning of happiness and prosperity for a human being.
- To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
- To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Syllabus

Module – I

Introduction to Value Education

1.   Understanding the need, basic guidelines, content and process for Value Education
2.   Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration
3.   Continuous Happiness and Prosperity- A look at basic Human Aspirations
4.   Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5.   Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6.   Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Module – II

Harmony in the Human Being

 7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Swasthya

Module – III

Harmony in the Family and Society

13. Understanding harmony in the Family- the basic unit of human interaction
14. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*;
Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship
15. Understanding the meaning of *Vishwas*; Difference between intention and competence

16. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship

17. Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva* as comprehensive Human Goals

18. Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*)- from family to world family!

Module – IV

Harmony in the Nature (Existence)

19. Understanding the harmony in the Nature

20. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature

21. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space

22. Holistic perception of harmony at all levels of existence

Module – V

Implications of the Holistic Understanding - a look at Professional Ethics

23. Natural acceptance of human values

24. Definitiveness of Ethical Human Conduct

25. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

26. Competence in Professional Ethics:

a) Ability to utilize the professional competence for augmenting universal human order,

b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models

27. Case studies of typical holistic technologies, management models and production systems

28. Strategy for transition from the present state to Universal Human Order:

a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b) At the level of society: as mutually enriching institutions and organizations

Course Outcomes:

On completion of this course, the students will be able to

- Understand the significance of value inputs in a classroom and start applying them in their life and profession.
- Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual etc.
- Understand the value of harmonious relationship based on trust and respect in their life and profession.
- Understand the role of a human being in ensuring harmony in society and nature.
- Distinguish between ethical and unethical practices and start working out the strategy to actualize a harmonious environment wherever they work.

Text Books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and

Professional Ethics.

Reference Books:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA

2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.

3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991

4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.

5. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.

6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.

7. A N Tripathy, 2003, Human Values, New Age International Publishers.

8. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.

9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press

10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.

12. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co.,   Lucknow. Reprinted 2008.

Vyavaharika Kannada					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
19KVK48	1:0:0	1	CIE:50 SEE:50	1 Hours	S & H

Course Objectives:

This course will enable the students to
- Understand Kannada Language
- Communicate in Kannada Language.

Syllabus

Module – I
Vyavaharika Kannada – Parichaya (Introduction to Vyavaharika Kannada).

Module – II
Kannada Aksharamale haagu uchcharane (Kannada Alphabets and Pronunciation).

Module – III
Sambhashanegaagi Kannada Padagalu (Kannada Vocabulary for Communication).

Module – IV
Kannada Grammar in Conversations (Sambhashaneyalli Kannada Vyakarana).

Module – V
Activities in Kannada

Course Outcomes:

On completion of this course the students are able to understand Kannada and communicate in Kannada language

Aadalitha Kannada					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
19KAK48	1:0:0	1	CIE:50 SEE:50	1 Hours	S & H

ಆಡಳಿತ ಕನ್ನಡ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು

- ಪದವಿ ವಿದ್ಯಾರ್ಥಿಳಾಗಿರುವುದರಿಂದ ಆಡಳಿತ ಕನ್ನಡದ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
- ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯ ವ್ಯಾಕರಣದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡಿಸುವುದು.
- ಕನ್ನಡ ಭಾಷಾ ರಚನೆಯಲ್ಲಿನ ನಿಯಮಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
- ಕನ್ನಡ ಭಾಷಾ ಬರಹದಲ್ಲಿ ಕಂಡುಬರುವ ದೋಷಗಳು ಹಾಗೂ ಅವುಗಳ ನಿವಾರಣೆ ಮತ್ತು ಲೇಖನ ಚಿಹ್ನೆಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
- ಸಾಮಾನ್ಯ ಅರ್ಜಿಗಳು, ಸರ್ಕಾರಿ ಮತ್ತು ಅರೆ ಸರ್ಕಾರಿ ಪತ್ರ ವ್ಯವಹಾರದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡಿಸುವುದು.
- ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆ ಬಗ್ಗೆ ಆಸಕ್ತಿ ಮೂಡಿಸುವುದು.
- ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ ಮತ್ತು ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

Syllabus

ಅಧ್ಯಯ – 1

ಕನ್ನಡಭಾಷೆ – ಸಂಕ್ಷಿಪ್ತ ವಿವರಣೆ.

ಅಧ್ಯಯ – 2

ಭಾಷಾ ಪ್ರಯೋಗದಲ್ಲಾಗುವ ಲೋಪದೋಷಗಳು ಮತ್ತು ಅವುಗಳ ನಿವಾರಣೆ.

ಅಧ್ಯಯ – 3

ಲೇಖನ ಚಿಹ್ನೆಗಳು ಮತ್ತು ಅವುಗಳ ಉಪಯೋಗ.

ಅಧ್ಯಯ – 4

ಪತ್ರ ವ್ಯವಹಾರ.

ಅಧ್ಯಯ – 5

ಆಡಳಿತ ಪತ್ರಗಳು.

ಅಧ್ಯಯ – 6

ಸರ್ಕಾರದ ಆದೇಶ ಪತ್ರಗಳು.

ಅಧ್ಯಯ – 7

ಸಂಕ್ಷಿಪ್ತ ಪ್ರಬಂಧ ರಚನೆ (ಪ್ರಿಸೈಸ್ ರೈಟಿಂಗ್). ಪ್ರಬಂಧ ಮತ್ತು ಭಾಷಾಂತರ.

ಅಧ್ಯಯ – 8

ಕನ್ನಡ ಶಬ್ದಸಂಗ್ರಹ.

ಅಧ್ಯಯ – 9

ಕಂಪ್ಯೂಟರ್ ಹಾಗೂ ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ.

ಅಧ್ಯಯ – 10

ಪಾರಿಭಾಷಿಕ ಆಡಳಿತ ಕನ್ನಡ ಪದಗಳು ಮತ್ತು ತಾಂತ್ರಿಕ / ಕಂಪ್ಯೂಟರ್ ಪಾರಿಭಾಷಿಕ ಪದಗಳು.

ಆಡಳಿತ ಕನ್ನಡ ಕಲಿಕೆಯ ಫಲಿತಾಂಶಗಳು

- ಆಡಳಿತ ಭಾಷೆ ಕನ್ನಡದ ಪರಿಚಯವಾಗುತ್ತದೆ.
- ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯ ವ್ಯಾಕರಣದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡುತ್ತದೆ.
- ಕನ್ನಡ ಭಾಷಾ ರಚನೆಯಲ್ಲಿನ ನಿಯಮಗಳು ಮತ್ತು ಲೇಖನ ಚಿಹ್ನೆಗಳು ಪರಿಚಯಿಸಲ್ಪಡುತ್ತವೆ.
- ಸಾಮಾನ್ಯ ಅರ್ಜಿಗಳು, ಸರ್ಕಾರಿ ಮತ್ತು ಆರೆ ಸರ್ಕಾರಿ ಪತ್ರವ್ಯವಹಾರದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡುತ್ತದೆ.
- ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆ ಬಗ್ಗೆ ಆಸಕ್ತಿ ಮೂಡುತ್ತದೆ.
- ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ ಮತ್ತು ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳು ಪರಿಚಯಿಸಲ್ಪಡುತ್ತವೆ.

PROFESSIONAL DEVELOPMENT OF ENGINEERS					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
19ECH49	0:0:4	2	CIE:50 SEE:50	3 Hours	**HSS**

Course Objectives:

This course will enable students to:

- Explain instances when sending email is necessary and appropriate.
- Create an email subject line that accurately describes the content of the message.
- Clarify and prioritize one's objectives and goals, by creating more planning time.
- Set and accomplish goals by self-reflection and self-monitoring
- Identify, prevent, and manage stress to improve academic success.
- Distinguishing between management and leadership and Sharpening interpersonal and communication Skills

Syllabus

Module – I

Team Building: Defining team and its important elements, Clarifying the advantages and challenges of team work, Understanding bargains in team building, Defining behavior to sync with team work, Team building activities.

Email etiquette: Before you start typing: what to send by Email, "What I'm trying to say": creating an accurate subject line It's still business writing: 12 common errors to avoid, Before clicking 'send': checking, proofing and copying, Damage control: Rx for bad email moments

06 Hours

Module – II

Time Management: Assessing time management strengths and weaknesses, Removing the barriers of productivity Overcoming the procrastination habit Focusing and staying in the zone Learning to be present: the power of now Managing tasks, projects, goals and
Ideas Determining and managing priorities.

03 Hours

Module – III

Stress Management: Achieving work-life balance by becoming better at stress management**,** Approaching stress management in a scientific manner**,** Enhancing personal effectiveness through managing stress**,** Learning stress management techniques**,** Responding resourcefully to stress situations.

  Goal Setting Developing a mission statement**,** Creating goal, Establishing specific, measurable, achievable, realistic and time-targeted (S.M.A.R.T) goals**,** Constructing action Steps**,** Making an action plan presentation**.**

06 Hours

Module – IV

Business Etiquettes: Importance of Business Etiquettes**,** Difference between Social and Business Etiquettes**,** Types of Business Etiquettes – Dining, Telephone, Office, Meeting, Dressing, Cubicle and Networking

Leadership Skills: What is Leadership?**,** Leaders V/s Followers**,** Managers V/s Leaders, Testing your Leadership Potential**,** Your Personality – Conduit of Leadership**,** Team Leadership**,** Leadership & Conflict Resolution**,** Assertiveness and Leadership

06 Hours

Module – V

SWOT: Understanding SWOT**,** SWOT analysis**,** Understand the concept behind SWOT analysis**,** Understand the value of SWOT analysis on an individual, Successfully perform a SWOT analysis

Individual Presentations: Individual presentations by the Participants, Presentations would be followed by question & answer sessions, Extensive feedback would be given by the trainer on the strengths & areas of improvement, Review of performance when compared with previous semesters, Action plan for improvement for each individual student.

05 Hours

Course Outcomes :

On completion of this course, students should be able to:

- Master effective email structures to achieve clarity and successful communication.
- Address the importance of understanding readers.
- Demonstrate self-management by setting reasonable boundaries.
- Implement the steps of the self-regulation cycle using the SMART goals model
- Monitor effectiveness of stress management techniques and revise to meet current needs.
- Students will understand and be able to use a process for decision making
- Improve nature and style of sensible writing and acquire employment and workplace communication skills

Text Books:

4. Technical Communication by Gajendra Singh Chauhan and Et al, Cengage learning India Pvt Limited [Latest Revised Edition] - 2018.
5. Thebaud, Sandra. Stress Management E-Book. Sandra Thebaud, Ph. D., 2019.
6. Kallos, Judith. Because Netiquette Matters!: Your Comprehensive Reference Guide to Email Etiquette and Proper Technology Use. Xlibris Corporation, 2004.
7. Kessler, Eric H. Wise Leadership: A Toolbox for Sustainable Success. Routledge, 2020.

Reference Books:

1. Butt, Joanne, and Robert Weinberg. "GOAL-SETTING." The Routledge International Encyclopedia of Sport and Exercise Psychology: Volume 2: Applied and Practical Measures (2020)
2. Stoilov, T. ed., 2012. Time management. BoD–Books on Demand.
3. Quincy, Ronald, Shuang Lu, and Chien-Chung Huang. "SWOT Analysis." Rutgers University. Luettu (2012).

E-Resources:

1. https://engineeringmanagementinstitute.org/professional-development-engineers/
2. https://eandt.theiet.org/content/articles/2016/10/professional-development-for-engineers-expand-your-mind/

Analog Communication					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECT51	3:2:0	4	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to:

- Understand the concept of AM and DSBSC generation and demodulation.
- Gain the knowledge of generation and demodulation of SSB.
- Apply the various methods for FM generation.
- Illustrate the concept of FM demodulation.
- Analyze and design of noise effect in CW modulation systems.

Syllabus

Module – I

Amplitude Modulation: Introduction to AM, Time-Domain description, Frequency – Domain description. Generation of AM wave, square law modulator, switching modulator. Detection of AM waves, square law detector, envelop detector. Double side band suppressed carrier modulation (DSBSC), Time-Domain description, Frequency-Domain representation, Generation of DSBSC waves, balanced modulator,
Ring modulator.   **11 Hours**

Module – II

Single Side-Band Modulation (SSB) and Hilbert Transform: Properties of Hilbert transform, Pre-envelope. Single side-band modulation (SSB): Frequency-Domain description of SSB wave, Time-Domain description of SSB wave. Phase discrimination method for generating an SSB modulated wave, Demodulation of SSB waves, frequency translation, Application: AM Radio   **11 Hours**

Module – III

Angle Modulation: Basic definitions, Frequency Modulation, Narrow Band FM(NBFM), Wide Band FM(WBFM), transmission bandwidth of FM waves, generation of FM waves: indirect FM and direct FM. frequency stabilization in FM receivers.   **10 Hours**

Module – IV

FM Demodulation: Demodulation of FM waves, Phase-locked loop (PLL), Linear model of the phase – locked loop, Nonlinear model of the phase – locked loop, Nonlinear effects in FM systems. Applications of FM

10 Hours

Module – V

Noise In Continuous Wave Modulation Systems: Receiver model, Noise in DSB-SC receivers, Noise in SSB receivers, Noise in AM receivers, threshold effect, Noise in FM receivers, FM threshold effect, Pre-emphasis and De-emphasis in FM.

10 Hours

Course Outcomes :

On completion of this course the students should be able to:

- Explain the generation and demodulation of AM and DSBSC systems.
- Apply the concept for generating and demodulating of SSB-SC wave.
- Analyze the direct and indirect method of generation of FM.
- Evaluate the generation and demodulation of FM wave.
- Design and analyze the noise performance of receivers.

Text Books:

1. Simon Haykins: "Communication Systems", John Willey India Pvt. Ltd., 5th Edition, 2009, ISBN: 9971-51-170-3.
2. B. P. Lathi: "Modern digital and analog Communication systems", 4th Edition, Oxford University Press, 2010, ISBN: 0-195-68622-5.

Reference Books:
1. Simon Haykins: "An Introduction to Analog and Digital Communication", John Wiley India Pvt. Ltd., 2008, ISBN: 987-81-265-0932-4.
2. Singh, Sapre: "Communication Systems Analog and digital", 2nd Edition, TMH , 2007, ISBN: 100-07-063454-8.

E-Resources :
1. http://www.radio-electronics.com/info/rf-technology-design/am-amplitude-modulation/single-sideband-ssb-modulation.php
2. https://electronicspost.com/explain-the-generation-of-am-waves-using-square-law-modulator-and-switching modulator/
3. http://www.radio-electronics.com/info/rf-technology-design/fm-reception/fmdemodulation-detection-overview.php

Fundamentals of CMOS VLSI (IC)					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECI52	3:0:2	4	CIE:50 SEE:50	3 Hours	**FC**

Course Objectives:

This course will enable the students to

- Understand the concepts of fabrication process of MOS transistor.
- Gain the knowledge about characteristics of CMOS inverter.
- Understand the basic concepts of circuit and sequential MOS transistor Logic.
- Analyze the design of different CMOS Logic Circuits.
- Learn the design of different Digital circuits.

Syllabus

Module – I

Basic MOS technology: Integrated circuit's era. NMOS fabrication. CMOS Fabrication, p well/ n well/ twin well process, Thermal aspects of processing, Bi CMOS technology,

Circuit design processes: MOS layers. Stick diagrams. Design rules and layout –lambda-based design and other rules. Examples. Layout diagrams. **8 Hours**

Module – II

CMOS Inverter: DC Characteristics, Static Load MOS Inverters, the Differential Inverter, the Transmission Gate, Tristate Inverter. **8 Hours**

Module – III

Basic circuit concepts: Sheet resistance. Area capacitances. Capacitance calculations. The delay unit. Inverter delays. Driving capacitive loads. Propagation delays. Wiring capacitances.

Sequential MOS Logic circuits: SR Latch, clocked latch and flip flop circuits, CMOS D Latch & edge triggered flip flop. **8 Hours**

Module – IV

CMOS Logic Structures: Mirror Circuits, Pass Transistor Logic, Pseudo NMOS logic, Tri state Circuits, Dynamic CMOS Logic, Charge sharing problems, remedies, Clocked CMOS Logic, CMOS Domino Logic. **8 Hours**

Module – V

Subsystem Design: Data path Operators, Bit adder, Ripple Carry Adder, Carry Look ahead adder, Carry skip adder, Carry select adder, Carry save adder, Multiplier. **8 Hours**

List of Experiments:

1. Design an Inverter with given specifications, completing the design flow mentioned below:
a. Draw the schematic and verify the following
i) DC Analysis
ii) Transient Analysis
b. Draw the Layout and verify the DRC, ERC

2. Design the Common Source Amplifier circuits with given specifications, draw the schematic and verify the following
i) DC Analysis
ii) AC Analysis
iii) Transient Analysis
3. Design the Common Drain Amplifier circuits with given specifications, Draw the schematic and verify the following
i) DC Analysis
ii) AC Analysis
iii) Transient Analysis

4. Design the A Single Stage differential amplifier circuit with given specifications, draw the schematic and verify the following
i) DC Analysis
ii) AC Analysis
iii) Transient Analysis

5. Develop a Verilog Code for the following circuits and their Test Bench for verification, observe the waveform and synthesize the code with technological library. Do the initial timing verification with gate level simulation.
    i.   inverter
    ii. Basic/universal gates
    iii. Full adder
    iv. Parallel Adder

Course Outcomes:
On completion of this module, students should be able to:
- Analyze the fabrication process of NMOS, CMOS, Stick diagram and Layout of CMOS circuit.
- Illustrate DC characteristics of CMOS inverter, tri state inverter
- Analyse and interpret basic Concepts of MOS transistor, SR Latch, clocked latch and flip flop circuits
- Design BICMOS Logic, Pseudo NMOS LOGIC, Clocked CMOS Logic, dynamic logic CMOS circuits.
- Gain a complete overview of design of different Adder and Subtractor Circuit.

Text Books:
1. Douglas A. Pucknell & Kamran Eshraghian, "Basic VLSI Design" PHI 3rd Edition (original Edition – 1994), 2005. ISBN-13: 978-8120309869
2. Neil H. E. Weste and K. Eshragian," Principles of CMOS VLSI Design", A Systems Perspective," Pearson Education (Asia) Pvt. Ltd, 2nd edition, 2000. ISBN: 9789332542884
3. John P. Uyemura, "Introduction to VLSI Circuits and Systems", John Wiley,First edition, 2003.ISBN: 0471127043

Reference Books:
1. Sung – Mo Kang, Yusuf Leblebici, "CMOS digital integrated circuits – Analysis and   Design", Tata McGraw Hill, 3rd Edition,2003. ISBN10: 0070530777
2. KamranEshraghian, Dougles and A. Pucknell, "Essentials of VLSI circuits and systems", PHI, First Edition, 2005. ISBN: 978-81-203-2772-6

E-Resources:
1. **http://ece-research.unm.edu/jimp/vlsi/slides/chap3_1.html**
2. **http://www.slideshare.net/kalyankumarkalita/dynamic-logic-circuits**
3. **http://www.slideshare.net/jainatush/vlsi-test-principles-and-architectures-design-for-testability**
4. **http://www.eeherald.com/section/design-guide/Low-Power-VLSI-Design.html**

Information Theory and Coding					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECT53	3:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to:

- Understand the concepts of the information content of symbols, mark off model and entropy.
- Gain the knowledge about various coding techniques using different Algorithms.
- Apply the linear block codes for error detection and correction.
- Analyze the cyclic codes for Error control coding.
- Design and develop the different types of Convolutional codes and tree diagram.

Syllabus

Module – I

Information Theory: Introduction, Measure of information, Average information content of symbols in long independent sequences, Mark off statistical model for information source, Entropy and information rate of mark-off source. **08 Hours**

Module – II

Source Coding: Encoding of the source output, Shannon's encoding algorithm. Shannon Fano Encoding Algorithm, Huffman coding, Introduction to Communication Channels. **08 Hours**

Module – III

Error Control Coding: Introduction, Groups, Rings, Fields. Modular Arithmetic, Types of errors, examples, Types of codes, Linear Block Codes: Matrix description, Error detection and correction, Encoder for Linear block codes, Syndrome Calculation Circuit for Linear block codes. **08 Hours**

Module – IV

Binary Cyclic Codes: Introduction, Types of binary cyclic codes, Algebraic Structure of Cyclic codes, Encoding using an (n-k) bit shift register of cyclic codes, Syndrome Calculation circuit of cyclic codes, BCH codes. **08 Hours**

Module – V

Convolutional Codes: Introduction, Types of convolutional codes, Time domain approach, Transform domain approach, Tree diagram, RS Codes **08 Hours**

Course Outcomes :

On completion of this course, students should be able to:

- Explain the average information, entropy and information rate of a source code.
- Illustrate the performance of source encoding techniques.
- Apply the error control coding method in linear block codes for encoder circuit and syndrome calculation circuit.
- Evaluate the cyclic codes for encoder circuit and syndrome calculation circuit.
- Design and develop convolutional codes in Time domain approach and Transform domain approach

Text Books:

1. K. Sam Shanmugam: "Digital and Analog Communication Systems", John Wiley India Pvt. Ltd., 2008, ISBN: 9788126509140.
2. Simon Haykin: "Digital Communication", John Wiley India Pvt. Ltd., 2008. ISBN:9780471647355.

Reference Books:

1. Dr.P.S.Satyanarayana, "Concepts of Information Theory & Coding", Publication, Dynaram,2005, ISBN:1234567150966
2. Bernard Sklar, Digital Communications Fundamentals and Applications, Prentice Hall International,2001, ISBN: 9780130847881
3. Shu Lin and Costello ,"Error Control coding : Fundamentals and Applications," , New Jersey,1983,

ISBN: 978-0130426727

E-Resources:
1. https://www.electronicshub.org/error-correction-and-detection-codes/
2. https://www.sciencedirect.com/topics/engineering/convolutional-coding
3. https://www.tutorialspoint.com/digital_communication/digital_communication_information_theory.htm

Accountancy and Taxation					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECT54	3:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable the students to

- Understand the nature of accounting records relating to Not-for-profit organizations.
- Study the provisions of the Indian Partnership Act 1932 that are relevant for accounting.
- Learn various provisions of Income Tax Act 1961.
- Discuss the basic knowledge of income from salary.
- Understand the principles and provisions of Goods and Services Tax (GST).

Syllabus

Module – I

Accounting for Not-for-Profit Organization: Meaning and Characteristics of Not-for-Profit Organization, Accounting Records of Not-for-Profit Organizations, Receipt and Payment Account, Income and Expenditure Account, Balance Sheet, Illustrative examples.   **08 Hours**

Module – II

Accounting for Partnership: Basic Concepts, Nature of Partnership, Partnership Deed, Special Aspects of Partnership Accounts, Maintenance of Capital Accounts of Partners, Illustrative examples.

08 Hours

Module – III

Introduction to Income Tax: Brief History of Indian Income Tax, Legal Frame Work, Types of Taxes, Cannons of Taxation, Important Definitions: Assessment, Assessment Year, Previous Year (including Exceptions), Assesses, Person, Income, Casual Income, Gross Total Income**.   08 Hours**

Module – IV

Income from Salaries: Meaning, Definition, Basis of Charge, Advance Salary, Arrears of Salary, Allowances, Perquisites, Provident Fund, Profits in Lieu of Salary, Gratuity, Commutation of Pension, Encashment of Earned leave, Compensation for voluntary retirement, Deductions from Salary U/S 16, Problems on Income from Salary.   **08 Hours**

Module – V

Introduction to Goods and Services Tax (GST): Objectives and basic scheme of GST, Meaning, Salient features of GST, Subsuming of taxes, Benefits of implementing GST, Constitutional amendments, Structure of GST (Dual Model), Central GST, State / Union Territory GST.

08 Hours

Course Outcomes:

On completion of this course the students should be able to:

- Explain the income and expenditure concepts.
- Understand the aspects of partnership with an example.
- Analyze the procedure for direct tax assessment.
- Demonstrate the IT returns on individual income.
- Illustrate the provisions of levy and collection of GST.

Text Books:

1. NCERT: "Accountancy Not-for-Profit Organisation and Partnership Accounts" 12117 – 1 January 2015, ISBN:8174506403
2. Dr. Mehrotra and Dr. Goyal: "Direct Taxes – Law and Practice", Sahitya Bhavan Publication, 60th Edition A.Y 2019-20, ISBN: 9789389111965
3. C A. Rajat Mohan: "Guide to GST" , Bharat Law House Pvt.Ltd., 1 January 2019, ISBN: 978-93-5139-689-5

Reference Books:

1. Dr. Sanjiv Agrawal & CA. Sanjeev Malhotra: "Goods & Services Tax", Bloomsbury India, 1 March 2017, ISBN-10: 9789386432308

E-Resources:

1. https://www.meritnation.com/cbse-class-12-commerce/accountancy/partnership-accounts-ncert-solutions-2019/accounting-for-not-for-profit-organisation/ncert-solutions/59_17_3547_2758_47_16286
2. https://www.britannica.com/topic/taxation/Classes-of-taxes

Digital Switching Systems					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECT551	3:0:0	3	CIE:50 SEE:50	3 Hours	PE

Course Objectives:

This course will enable the students to,

- Understand the network and hierarchical structure for telecommunication transmission.
- Explain the importance of switching over wired and wireless channels.
- Analyze the traffic management and grade of service of the switching systems.
- Evaluating the traffic in different systems and modeling software for the switching systems.
- Design the software and hardware for the maintenance of switching systems.

Syllabus

Module – I

Development of Telecommunications: Network structure, Network services, terminology, Regulation, Standards. Introduction to telecommunications transmission, Power levels, Four wire circuits, Digital transmission, FDM,TDM, PDH and SDH. **08 Hours**

Module – II

Evolution of switching systems: Introduction, Message switching, Circuit switching, Functions of switching systems, Distribution systems, Basics of crossbar systems, Electronic switching.
Digital switching systems: Switching system hierarchy, Evolution of digital switching systems, Stored program control switching systems, Building blocks of a digital switching system, Basic call processing. **08 hours**

Module – III

Telecommunications Standards: Introduction to communication traffic, Unit of traffic, Congestion, Traffic measurement, Mathematical model, lost call systems, Queuing systems.
Switching systems: Introduction, Single stage networks, Gradings, Link Systems, GOS of Linked systems. **08 Hours**

Module – IV

Time Division Switching: Introduction, space and time switching, Time switching networks, Synchronization.
Switching system software: Introduction, Basic software architecture, Digital switching system software classification, Call models, Software linkages during call, Feature flow diagram. **08 Hours**

Module – V

Maintenance of digital switching system: Introduction , Software maintenance, Interface of a typical digital switching system central office, System outage and its impact on digital switching system reliability, Impact of software patches on digital switching system maintainability,
A methodology for proper maintenance of digital switching system.
A generic digital switching system model: Introduction, Hardware architecture, Software architecture, Recovery strategy, Simple call through a digital switching system, common characteristics of digital switching system. **08 Hours**

Course Outcomes:

On completion of this course the students should be able to

- Explain the telecommunication traffic and its measurements.
- Interpret the technologies associated with the data switching operations.
- Analyze the multiplexing technologies for efficient bandwidth operations.
- Applying multiplexing concept in digital switching systems.
- Design and Create required architecture for digital switching systems

Text Books:
1. Digital Telephony - John C Bellamy: Wiley India Pvt. Ltd, 3rd Ed, 2008. ISBN:978-0471345718
2. Telecommunication and Switching, Traffic and Networks - J E Flood: Pearson Education, 2002. ISBN:978-8131705025.

Reference Books:
1. Digital Switching Systems, Syed R. Ali, TMH Ed 2002. ISBN: 9780070483903.

Linear IC's and Applications					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECT552	3:0:0	3	CIE:50 SEE:50	3 Hours	PE

Course Objectives:

This course will enable students to :

- Understand the use of op amp in DC and AC applications.
- Know the concepts of practical OP-AMP specifications, characteristics, Biasing of OP-AMPs.
- Describe the frequency response and bandwidth performance of practical OP-AMP.
- Gain the knowledge of current amplifier, peak detectors, wave form Generators.
- Design the 555 timer, PLL and its applications.

Syllabus

Module – I

Operational Amplifier Fundamentals: basics of BJT, JFET, MOSFET, Basic OP-AMP circuit, OP-AMP parameters: CMRR and PSRR, Offset voltages and currents, Input and Output impedances, Slew rate and Frequency limitations.

OP-AMPs as DC Amplifiers: Biasing OP-AMPs, Direct coupled -Voltage Followers, Non-inverting Amplifiers, Inverting amplifiers, Summing amplifiers, Difference amplifier. **08 Hours**

Module – II

OP-AMPs as AC Amplifiers: Capacitor coupled Voltage Follower, High input impedance-Capacitor coupled Voltage Follower, Capacitor coupled Non-inverting Amplifiers, High input impedance - Capacitor coupled Non-inverting Amplifiers, Capacitor coupled Inverting amplifiers, setting the upper cut-off frequency for inverting amplifier. **08 Hours**

Module – III

OP-Amp Applications: current amplifiers, instrumentation amplifier, precision rectifiers. Clamping circuits, Peak detectors, sample and hold circuits, Log and antilog amplifiers, Phase shift oscillator, Wien bridge oscillator, Triangular/rectangular wave generators. **08 Hours**

Module – IV

More Applications: Active Filters: First order and second order active Low-pass and high pass filters, block diagram of Band pass Filter and Band stop Filter.

Voltage Regulators: Introduction, Series Op-amp regulator, IC voltage regulators. Block diagram of 723 general purpose regulators. **08Hours**

Module – V

Other Linear IC applications:

555 timer: Basic timer circuit, 555 timer used as astable and Mono-stable multivibrator, Schmitt trigger; PLL: Operating principles, Phase detector / Comparator,VCO DAC using R-2R, ADC using Successive approximation. **08 Hours**

Course Outcomes:

On completion of this course the students are able to

- Describe the practical OP-AMP specifications and characteristics.
- Explain OP-AMP as AC amplifiers.
- Analyzing stability condition of OP-AMP.
- Analyzing OP-AMP linear applications like crossing detectors, inverting Schmitt trigger circuits, Mono-stable and A-stable multivibrator, Active Filters.
- Design of 555 timers as astable and Mono-stable multivibrator, Schmitt trigger, PLL and their applications.

Text Books:

1. David A. Bell: "Operational Amplifiers and Linear IC's", 2nd Edition, PHI/Pearson, 2008, ISBN: 9788120323599.

2. D. Roy Choudhury and Shail B. Jain: "Linear Integrated Circuits", 4th Edition, New Age International, 2010, ISBN: 9788122430981

Reference Books:

1. Robert F. Coughlin and Fred F. Driscoll: "Operational Amplifiers and LinearI ntegrated Circuits", 6th Edition, PHI/Pearson, 2001, ISBN: 8120320964.
2. Ramakant A. Gayakwad: "OP-AMPs and Linear Integrated Circuits", 4th Edition, PHI/Pearson, 2000, ISBN: 8120320581.

E-Resources:

1. http://www.linearsystems.com/

2.https://www.tutorialspoint.com/linear_integrated_circuits_applications/basics_of_linear_integrated_circuits_applications.htm

Control Systems					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECT553	3:0:0	3	CIE:50 SEE:50	3 Hours	PE

Course Objectives:

This course will enable the students to

- Understand the mathematical modeling, block diagram reduction techniques and signal flow graph.
- Explain the time response of first and second order systems for different test input signals.
- Analyze of stability of control systems and stability analysis using RH Criterion.
- Evaluate the stability of a given transfer functions using Root-Locus concepts.
- Compute the frequency response assessment for relative stability using Bode plots.

Syllabus

Module – I

Modeling of Systems: The control system, Mathematical models of Physical systems, Introduction, Differential equations of physical systems - Mechanical systems, Translational systems, Rotational systems, Electrical systems, Analogous systems.

Block diagrams and signal flow graphs: Transfer functions, Block diagram algebra and Signal Flow graphs. **08 Hours**

Module – II

Time Response of feedback control systems: Standard test signals, Unit step response of First and second order systems, Time response specifications. Steady state error and error constants.

08 Hours

Module – III

Stability analysis: Concept of stability, Routh-Hurwitz criterion, Relative stability analysis, application of Routh stability criterion, Introduction to Nyquist plot, polar plots.

08 Hours

Module – IV

Root-Locus Techniques: Introduction, the root locus concepts, Construction of root loci, numerical examples. **08 Hours**

Module – V

Frequency response analysis: Introduction, Bode diagrams, assessment of relative stability using Bode plots.

Introduction to State variable analysis**:** Concepts of state, state variable and state models for electrical systems, Solution of state equations. **08 Hours**

Course Outcomes:

On completion of this course the students shoulde be able to

- Explain mathematical modelling techniques to determine the transfer function of a given system.
- Analyze the time response of first and second order systems for different test input signals.
- Apply the concept of RH criterion and Nyquist criterion to determine the stability of a given transfer functions.
- Interpret the concept of root locus to determine the stability of a given transfer function.
- Design frequency domain specification fundamentals and sketch a Bode plot to analyze Stability of a given systems and able to write state model for the given system.

Text Books:

1)J. Nagarath and M.Gopal "Control Systems Engineering", New Age International (P) Limited, New Delhi, Fifth edition – 2007,ISBN-8122420087.

2)K. Ogata "Modern Control Engineering - Pearson PHI, 5th Edition- 2010, ISBN-9788120340107.

Reference Books:

1).Benjamin c. kuo – and FaridGolnaaghi "Automatic Control Systems",Wiley student edition,8th edition-2010,ISBN-9788126513710.
2).A K Jairath "Problems and solutions of control systems with essential theory",CBS, New Delhi, Reprint Fiftth edition-2009,ISBN-978-81-239-1686-6.

E-Resources:
1. https://www.electrical4u.com/signal-flow-graph-of-control-system/
2. http://lpsa.swarthmore.edu/Bode/BodeReviewRules.html
3. http://nptel.ac.in/courses/108103008/25
4. https://www.electrical4u.com/root-locus-technique-in-control-system-root-locus-plot/
5. http://www.facstaff.bucknell.edu/mastascu/econtrolhtml/rootlocus/rlocus1a.html

Object Oriented Programming using C++					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECT561	3:0:0	3	CIE:50 SEE:50	3 Hours	PE

Course Objectives:

This course will enable the students to

- Understand the features of Encapsulation, Inheritance and Polymorphism.
- Study the concept of constructor and destructor using classes and objects
- Apply the different types of inheritance using base class and derived class.
- Analyze the concept of function overloading, operator overloading and virtual functions.
- Develop the formatted and unformatted I/O operation using stream classes.
  .

Syllabus

:**Module – I**

Introduction: Origin of C++, features of OOP, Sample C++ program, Different data types, operators, expressions, implicit conversion, Type cast operator and statements, arrays and strings, pointers and user defined types, reference variable, memory management operator, name space, control structure, Function, default argument, inline functions, function, recursive functions**.**   **08 Hours**

Module – II

Classes and Objects: Classes, structures and classes are related. Friend functions, inline functions, function over loading, Constructors, Different types of constructor, Destructors, Static data members, when constructor and destructors are executed, scope resolution operator. Nested classes, local classes, passing objects to functions, returning objects, this pointer ,   **08 Hours**

Module – III

Inheritance: Base Class, Inheritance, Types of inheritance and protected members, protected base class inheritance, inheriting multiple base classes, Constructors, Destructors and inheritance, Passing parameters to base class constructors, Granting access, Virtual base classes.   **08 Hours**

Module – IV

Virtual functions, Polymorphism and Operator overloading: Operator over loading basics, creating a member operator function, Operator overloading using friend functions such as +, - , pre-increment, post-increment, etc., overloading << and >> Virtual function, calling a Virtual function through a base class reference, Virtual attribute is inherited; Virtual functions are hierarchical, pure virtual functions, Abstract classes,Using virtual functions, Early and late binding.   **08 Hours.**

Module – V

Streams and Working with files: C++ streams and stream classes, formatted and unformatted I/O operations, Output with manipulators, Classes for file stream operations, opening and closing a file, EOF.
                08 Hours

Course Outcomes:

On completion of this course the students will be able to

- Explain the features of Object Oriented Programming.
- Illustrate classes and objects using public and private members of the class.
- Analyze the different types of inheritance to solve complex problems.
- Implement mechanism of virtual function, polymorphism and operator overloading.
- Develop an I/O operations and file streams using opening and closing file.

Text Books:
1. Herbert Schildt: "The Complete Reference C++", 4th Edition, Tata McGraw Hill, 2003,
    ISBN 13: 9780070532465.

2. Object Oriented Programming with C++, E.Balaguruswamy, TMH, 6th Edition, 2013. ISBN-978-1-25-902993-6

Reference Books:

1. Stanley B. Lippmann, Josee Lajore: "C++ Primer", 4th Edition, Pearson Education, 2005,   ISBN-10: 0-321-71411-3.
2. Paul J Deitel, Harvey M Deitel: "C++ for Programmers", Pearson Education, 2009,ISBN-10: 0137059663

E-Resources:

1. http://www.tutorialspoint.com/cplusplus/cpp_tutorial.pdf
2. http://www.ddegjust.ac.in/studymaterial/mca-3/ms-17.pdf

Web Technology					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECT562	3:0:0	3	CIE:50 SEE:50	3 Hours	PE

Course Objectives:

This course will enable students to:
- Understand the concepts of Web Technologies
- Explain the concept of Web Servers and App Servers and their differences.
- Analyze Request and Response models.
- Evaluate how to build e-commerce applications using Servlets and JSP.
- Create EL and EL Tags and their usage in developing dynamic web pages.

Syllabus

Module – I

Introduction to Web Technologies: JEE, PHP, ASP and .Net , App Server, Web Server, 2-Tier and 3 -Tier Architecture.Introduction to Servlet: Introduction to JEE containers, Application directory structure, Servlet Interface / Generic Servlet / HttpServlet, Servlet life cycle, Request and Response objects, Building sample application.   **08 Hours**

Module – II

Inter Servlet Communication: Request Dispatcher, Include / Forward / Redirect, Building sample application. **,**Creating & invalidating session, Different ways to handle session.   **08 Hours**

Module – III

Introduction to JSP: Need for JSP, JSP life cycle.   **08 Hours**

Module – IV

Introduction to EL: Need for EL and its advantages, Fundamentals of EL. Core Tags, Introduction to MVC, Building sample application.   **08 Hours**

Module – V

Project Work: Create an e-commerce application using the client-side languages, such as Bootstrap3, HTML5, CSS3, JavaScript and jQuery, along with the server-side Java language - Servlets and JSP. **08 Hours**

Course Outcomes :

On completion of this course, students should be able to:
- Understand the concepts of Web Technologies.
- Explain Web Servers and App Servers.
- Analyze Request and Response models.
- Implement e-commerce applications using Servlets and JSP.
- Design dynamic web pages using EL Tags.

Text Books:
1. Basham, Bryan, Sierra Kathy, Bates, Bert: "Head First Servlets and JSP", 2nd Edition, Shroff, ISBN-10: 8184044976.
2. Santosh Kumar K: "JDBC 4.2, Servlet 3.1, and JSP 2.3 includes JSF 2.2 and Design Patterns, Black Book", 2nd Edition, Dreamtech Press, ISBN-10: 9351199088.

Reference Books:
1. Budi Kurniawan: "Servlet & JSP: A Tutorial", 2nd Edition, Brainy Software, ISBN-10: 1771970278.

E-Resources:
1. https://www.rishabhsoft.com/blog/asp.net-core-features
2. http://servlet.techdazzler.com/2012/03/inter-servlet-communication.html
3. https://ericbooth.net/the-fundamentals-of-el-sistema/

JAVA Programming					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECT563	3:0:0	3	CIE:50 SEE:50	3 Hours	PE

Course Objectives:

This course will enable students to:

- Understand the basic concepts of object-oriented programming.
- Illustrate the basics of JAVA Programming using classes and objects.
- Gain the knowledge of Inheritance and packages.
- Implement the exceptions using exception handling methods.
- Develop the knowledge of multi-threaded programming in JAVA.

Syllabus

Module – I

Introduction to Object Oriented Concepts and java: Procedure–Oriented Programming system, Object Oriented Programming System, Comparison of Object Oriented Language with C. Java's magic, The Byte code, Java Development Kit (JDK), Java Buzzwords, Object- oriented programming, IO Streams, Data types, variables and arrays, reference variables, Operators, Control Statements. Simple Java programs.

08 Hours

Module – II

Classes: Classes fundamentals, Declaring objects, this keyword, garbage collection. Methods: Method Prototyping, Member functions and data members, Constructors, Objects and methods, Method Overloading, Objects and arrays, Access modifiers, Setters and getters, Nested classes, Console I/O.

08 Hours

Module – III

Packages and Inheritance: Inheritance basics, using super, creating multi-level hierarchy, method overriding, using Abstract classes, using final. Packages: Access Protection, Importing Packages.

08 Hours

Module – IV

Interfaces, **Exceptions, Applets:** Interfaces, Exception handling fundamentals, exception types, uncaught exceptions, using try and catch, using multiple catch clauses, nested try statements, throw, throws, finally, Exception handling in Java, Applets, Types of Applets, Applet basics and class, Applet Architecture.**08 Hours**

Module – V

Multi-Threaded Programming: Threads, Java thread model, creating a thread, Extending thread, creating multiple threads, thread priorities, Synchronization, Interthread communication, Suspending, resuming and stopping threads **08 Hours**

Course Outcomes :

On completion of this course, students should be able to:

- Compare the difference between Procedure and Object Oriented Programming.
- Develop programs by using basics of JAVA.
- Analyze Inheritance properties and packages in solving real world problems.
- Evaluate exception handling methods efficiently.
- Develop specific applications by using multithreaded concepts.

Text Books:
1**.** Herbert Schildt, Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007 ISBN 10: 007063677X

Reference Books:
1. Herbert Schildt, The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2003. ISBN-10: 007053246X

2. E Balagurusamy, Programming with Java-A primer, Tata McGraw Hill companies. ISBN-13: 978-0070617131.

 E-Resources:

1. https://www.programiz.com/java-programming
2. https://www.w3schools.com/java/java_intro.asp
3. https://www.tutorialspoint.com/java/index.htm

Analog Communication Laboratory					
Course Code	**L:T:P**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
18ECL57	1:0:2	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :
- Gain the basic knowledge and Practical insights of Analog communication.
- Understand the application of filters in communication systems.
- Design various types of Analog communication blocks.
- Construct the different types of circuits for communication experiments.
- Demonstrate the analog modulation and demodulation techniques using discrete Components.

List of Experiments

1. Design and construction of second order active low-pass filter and Plot the frequency response and Estimation of roll-off factor.
2. Design and construction of second order active high-pass filter and Plot the frequency response and estimation of roll-off factor
3. Design and construction of active band-pass filter and Plot the frequency response.
4. Design and construction of active band-stop filter and Plot the frequency response.
5. Amplitude modulation-Generation and detection also find the Modulation index.
6. Frequency modulation- Generation.
7. Design and conduct an experiment for Pre-emphasis and de-emphasis.
8. Design and conduct an experiment to generate Pulse amplitude modulation and demodulation.
9. Design and test an R-2R Ladder network and verify truth table.

Course Outcomes:

On completion of this course, students should be able to:
- Design the second order active filters for various frequency bands.
- Analyze the design and implementation concept for modulation and demodulation circuit using amplitude modulation.
- Design and evaluate the concept for modulation circuit using frequency modulation.
- Analyze the circuit by conducting the R-2R- Digital to analog converter experiment.
- Design and evaluate the characteristics of pre-emphasis and de-emphasis circuit.

Text Books:

1. Simon Haykins: "Communication Systems", John Willey India Pvt. Ltd., 5th Edition, 2009, ISBN: 9971-51-170-3.
2. B. P. Lathi: "Modern digital and analog Communication systems", 4th Edition, Oxford University Press, 2010, ISBN: 0-195-68622-5.

E-Resources :

1. http://www.radio-electronics.com/info/rf-technology-design/am-amplitude-modulation/single-sideband-ssb-modulation.php.
2. https://electronicspost.com/explain-the-generation-of-am-waves-using-square-law-modulator-and-Switching-modulator.
3. http://www.radio-electronics.com/info/rf-technology-design/fm-reception/fmdemodulation-Detection- overview.php.

Environmental Studies					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECH58	1:0:0	1	CIE:50 SEE:50	2 Hours	HSS

Course Objectives:

This course will enable the students to

- To identify the major challenges in environmental issues and evaluate possible solutions.
- Develop analytical skills, critical thinking and demonstrate socio-economic skills for sustainable development.
- To analyze an overall impact of specific issues and develop environmental management plan.
- To Understand various factors for Pollution
- To Understand the concepts of GIS and Remote Sensing.

Syllabus

Module – I

Introduction**:** Environment – Components of Environment Ecosystem: Types & Structure of Ecosystem, Balanced ecosystem Human Activities – Food, Shelter, And Economic & Social Security. Impacts of Agriculture & Housing Impacts of Industry, Mining & Transportation Environmental Impact Assessment, Sustainable Development   **03 Hours**

Module – II

Natural Resources, Water resources – Availability & Quality aspects, Water borne diseases & water induced diseases, Fluoride problem in drinking water Mineral resources, Forest Wealth Material Cycles – Carbon Cycle, Nitrogen Cycle & Sulphur Cycle. Energy – Different types of energy, Conventional sources & Non-Conventional sources of energy Solar energy, Hydro electric energy, Wind Energy, Nuclear energy, Biomass & Biogas Fossil Fuels, Hydrogen as an alternative energy..   **03 Hours**

Module – III

Environmental Pollution – Water Pollution, Noise pollution, Land Pollution, Public Health Aspects. Global Environmental Issues: Population Growth, Urbanization, Land Management, Water & Waste Water Management.   **02 Hours**

Module – IV

Air Pollution & Automobile Pollution: Definition, Effects – Global Warming, Acid rain & Ozone layer depletion, controlling measures. Solid Waste Management, E – Waste Management & Biomedical Waste Management – Sources, Characteristics & Disposal methods. .   **03 Hours**

Module – V

Introduction to GIS & Remote sensing, Applications of GIS & Remote Sensing in Environmental Engineering Practices. Environmental Acts & Regulations, Role of government, Legal aspects, Role of Non-governmental Organizations (NGOs) , Environmental Education & Women Education.   **02 Hours**

Course Outcomes:

On completion of this course the students are able to

- Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale,
- Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment,
- Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components
- Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.
- To get a knowledge of Pollution and Remote Sensing Concepts.

Text Books:

1. Benny Joseph (2005), "Environmental Studies", Tata McGraw – Hill Publishing Company Limited.
2. R.J.Ranjit Daniels and Jagadish Krishnaswamy, (2009), "Environmental Studies", Wiley India Private Ltd., New Delhi.
3. R Rajagopalan, "Environmental Studies – From Crisis to Cure", Oxford University Press, 2005,
4. Aloka Debi, "Environmental Science and Engineering", Universities Press (India) Pvt. Ltd. 2012.

Reference Books:

1. Raman Sivakumar, "Principals of Environmental Science and Engineering", Second Edition, Cengage learning Singapore, 2005
2. P. Meenakshi, "Elements of Environmental Science and Engineering", Prentice Hall of India Private Limited, New Delhi, 2006
3. S.M. Prakash, "Environmental Studies", Elite Publishers Mangalore, 2007
4. Erach Bharucha, "Text Book of Environmental Studies", for UGC, University press, 2005
5. G.Tyler Miller Jr., "Environmental Science – working with the Earth", Tenth Edition, Thomson Brooks /Cole, 2004

E-Resources:

1. https://en.wikipedia.org/wiki/Environmental_social_science
2. https://www.environmentalscience.org/

Employability Skills and Aptitude Development-I					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECH59	0:0:4	2	CIE:50 SEE:50	3 Hours	HSS

Course Objectives:

This course will enable students to:

- Understand different types of Numerical / Arithmetical problems.
- Understand the different Data interpretation problems.
- To enhance interpersonal and soft skills for professional development.
- Enables students to develop their ability to reason by introducing them to elements of formal reasoning.
- To develop Problem Solving, confidence building, organizational, team working skills.

Syllabus

Module – I

Quantitative Aptitude I: Number System, Ratio Proportion and Partnership, Average.

06 Hours

Module – II

Quantitative Aptitude II: Percentage, Profit and Loss, Time and Work

06 Hours

Module – III

Logical Reasoning I: Number Series**,** Letter Series**,** Blood Relations **,**

04 Hours

Module – IV

Logical Reasoning II: Analogy**,** Seating Arrangement**,** Data Arrangement

04 Hours

Module – V

Verbal Ability: Comprehension**,** Sentence Correction**,** Sentence Completion**.**

05 Hours

Course Outcomes :

On completion of this course, students should be able to:

- Solve and analyze different types of Numerical / Arithmetical problems.
- Identify logical relations among statements; and analyze logically complex statements into their truth-functional or quantificational components.
- Develop enhanced productivity, efficiency and effectiveness.
- Be equipped with a set of transferable team-building skills and general employability skills.
- Gain ease in switching jobs in the same or different sectors.

Text Books:

1. R S Aggarwal: "Quantitative Aptitude for competitive examinations", (Chapters 1-3,6-8,10-18,20-22,26-28,30,31,35-39), S. Chand Publishing, New Delhi, 2014, ISBN-13: 978-81-219-2498-6.

Reference Books:

1. R.S. Aggarwal "A Modern Approach to Verbal & Non-Verbal Reasoning (Old Edition)" 2001.
2. R.S. Aggarwal "A Modern Approach to Logical Reasoning (Old Edition)" 1999.

E-Resources:
1. https://employabilityskills.org/development/
2. https://anivda.com/personal-development-for-employability/

Digital Communication					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECT61	3:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to:

- Understand the concept of Sampling Theorem.
- Interpret the different quantization techniques, DPCM, DM and ADM.
- Illustrate the base band shaping techniques in Digital modulation.
- Gain the concept of digital modulation and demodulation.
- Design and analyze the Spread Spectrum modulation techniques.

Syllabus

Module – I

Signal Sampling: Basic signal processing operations in digital communication, Sampling Principles, Sampling Theorem, Quadrature sampling of band-pass signals, TDM.   **08 Hours**

Module – II

Waveform Coding Techniques: PCM block diagram, Different quantization techniques, SNR in PCM, robust quantization, DPCM, DM, Adaptive DM.   **08 Hours**

Module – III

Base-Band Shaping for Data Transmission: Line Codes and their power spectra, ISI, adaptive equalization, eye pattern.   **08 Hours**

Module – IV

Digital Modulation and Demodulation Techniques: Coherent binary modulation techniques, BPSK, FSK, ASK, DPSK, QPSK systems with signal space diagram, generation, demodulation and error probability concept-ASK-BPSK, Coherent demodulation techniques for ASK, FSK and BPSK, Introduction to Minimum Shift Keying (MSK) and Gaussian Minimum Shift Keying (GMSK)   **08 Hours**

Module – V

Spread Spectrum Modulation: Pseudo noise sequences, direct sequence spread spectrum, coherent binary PSK, frequency hop spread spectrum, applications**.**   **08 Hours**

Course Outcomes :

On completion of this course students should be able to:

- Explain the Sampling concept and reconstruction of signal.
- Apply the concept for generating PCM, DPCM, DM and ADM systems.
- Analyze the Base Band shaping Technique for data transmission.
- Evaluate the generation of digital modulation and demodulation concepts.
- Design and analyze the generation of spread spectrum modulation Techniques.

Text Books:
1. Simon Haykin: "Digital Communications", John Wiley India Pvt. Ltd, 2003, ISBN-13: 978-0471629474
2. J. Proakis: "Digital Communication", 4th Edition, McGraw Hill, 2000. ISBN-13: 978-0071181839

Reference Books:
1. K. Sam Shanmugam: "Digital and Analog Communication Systems", John Wiley India Pvt.Ltd, 2008, ISBN-10: 8126509147.
2. Simon Haykin: "An Introduction to Analog and Digital Communication", John Wiley India Pvt,Ltd, 2003 ISBN-13: 978- 0471432227.
3. Bernard Sklar, " Digital Communications Fundamentals and Applications", Prentice Hall ternational,2001,

ISBN-10: 0130847887.

E-Resources:
1. https://www.tutorialspoint.com/signals_and_systems/signals_sampling_theorem.htm
2. http://www.electronicdesign.com/communications/understanding-modern- digital-modulation-techniques
3. https://www.tutorialspoint.com/digital_communication/digital_communication _quantization.htm
4. https://nptel.ac.in/courses/117101051.

Digital Signal Processing					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECT62	2:2:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable the students to

- Understand the basics of Fourier Transform and its relation with other transforms.
- Explain the Properties of Discrete Fourier Transform.
- Apply the concept of FFT algorithms to compute DFT and linear filtering.
- Analyze the performance of IIR filters.
- Design and develop FIR filter using window technique..

Syllabus

Module – I

Discrete Fourier Transforms: Frequency domain sampling and reconstruction of discrete time signals (DFT/IDFT), DFT as a linear transformation, DFT in relationship with other transforms, Properties of DFT. **08 Hours**

Module – II

Additional Properties of DFT and Linear Filtering: The circular convolution, Use of DFT in linear filtering, Overlap-save and add methods, Direct computation of DFT. **08 Hours**

Module – III

FFT Algorithms: Need for efficient computation of the DFT (FFT algorithms), Radix-2 FFT algorithm for the computation of DFT and IDFT, Decimation-in-time FFT algorithm, Decimation-in-frequency FFT algorithm, Goertzel algorithm and chirp-Z transform. **08 Hours**

Module – IV

Design of IIR Filters: Structure for IIR Systems(Direct form, Cascade form, Parallel form structures), Characteristics of commonly used analog filter – Butterworth and Chebyshev filters, analog to analog frequency transformations, design of IIR Filters from analog filter using Impulse invariance and Bilinear transformation. **08 Hours**

Module – V

Design of FIR Filters: Introduction to FIR filters, Structure for FIR Systems (Direct form, Linear Phase, Frequency sampling structure, Lattice structure). Design of FIR filters using Rectangular, Hamming windows. **08 Hours**

Course Outcomes:

On completion of this course the students are able to

- Understand the use of Discrete Fourier Transform in signal processing.
- Apply DFT techniques in linear filtering and spectral analysis.
- Evaluate convolution using FFT algorithms.
- Analyze digital IIR filters and structure of IIR filters.
- Design and analyze digital FIR filters and structure of FIR filters.

Text Books:

1. J. G. Proakis, D. G. Manolakis: "Digital Signal Processing: Principles, Algorithms and Applications", 4th Edition, Pearson Education Asia/Prentice Hall of India, 2002, ISBN-10: 0131873741, ISBN-13: 978-0131873742.
2. Sanjit K. Mitra: "Digital Signal Processing", 4th Edition, Tata McGraw Hill, 2006, ISBN-10: 0073380490, ISBN-13: 978-0073380490.

Reference Books:

1. Oppenheim, Schafer: "Discrete Time Signal Processing", 3rd Edition, Pearson Education, 2003, ISBN-10: 0131988425, ISBN-13: 978-0131988422.

E-Resources:

1. http://indico.ictp.it/event/a08187/session/81/contribution/50/material/0/2.pdf
2. https://engineering.purdue.edu/~ee538/DFTbasedLinearFiltering.pdf.
3. https://web.eecs.umich.edu/~fessler/course/451/l/pdf/c6.pdf
4. https://www.mathworks.com/help/signal/ug/iir-filter-design.html
5. https://www.vyssotski.ch/BasicsOfInstrumentation/SpikeSorting/Design_of_FIR_Filters.pdf

Antennas and Wave Propagation					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECT63	3:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable the students to

- Understand the fundamental concepts of antenna parameters.
- Learn the basic principles of antenna arrays.
- Illustrate the characteristics of different types of antennas.
- Gain the knowledge on radiation mechanism of special antennas and antenna measurements.
- Interpret the importance of radio wave propagation.

Syllabus

Module – I

Antennas Basics: Introduction, Antenna parameters, Radiation Resistance, Patterns, Beam area, Radiation Intensity, Beam efficiency, Directivity and Gain, Antenna aperture, Effective height, Radio Communication link, Fields from oscillating dipole, Antenna field zones, wave polarization, Antenna Temperature, illustrative examples. **08 Hours**

Module – II

Point source: Introduction, Power theorem, Radiation Intensity, Source with unidirectional Cosine and Cosine squared power pattern, Source with Bidirectional Cosine power pattern, Source with Sine (Doughnut) power pattern, Source with Sine (Doughnut) squared power pattern.

Antenna arrays: Introduction, Array of Two Isotropic Point Sources, Pattern Multiplication**,** Linear array of *n* Isotropic Point Sources of equal amplitude and spacing, Broadside array, End fire array, Phased arrays, Adaptive array and Binomial array. **08 Hours**

Module – III

Loop, Slot, Patch and Horn antennas : Introduction, small loop, comparision of far fields of small loop and short dipole, loop antenna General case far field patterns of circular loop with uniform current, the small loop as special case, radiation resistance, directivity of circular loop with uniform current, slot antenna, Babinet's Principle and complementary antennas, Patch or Microstrip antennas, horn antenna, Rectangular horn antenna, Parabolic reflectors. **08 Hours**

Module – IV

Special antennas and Antenna measurements : Yagi-Uda antenna, Turnstile antenna, Helical antenna, Log periodic antenna, Spiral antenna, Embedded antenna, plasma antenna and smart antenna.

Antenna Measurements: Radiation pattern, Gain & Direct measurement. **08 Hours**

Module – V

Radio wave propagation : Modes of propagation, Structure of atmosphere, Ground wave propagation, Tropospheric propagation, Duct propagation, Troposcatter propagation, Flat earth and curved earth concept, Sky wave propagation – Virtual height, Critical frequency, Maximum usable frequency – Skip distance, Fading, MultiHop propagation. **08 Hours**

Course Outcomes:

On completion of this course the students should be able to

- List and explain various antenna parameters.
- Illustrate the different types of arrays and their radiation pattern.
- Analyze the various antenna designing techniques.
- Design the antenna for a given antenna parameters.
- Explain the concept of radio wave propagation.

Text Books:

1. John.D.Krauss: "Antenna for all Applications", Tata McGraw Hill, 3rd Edition, 2004, ISBN: 0-07-053243-5

2. A. R. Harish, M. Sachidananda: "Antenna and Wave Propagation", Oxford University Press India, 2007, ISBN-13: 978-0-19-568666-1

Reference Books:
1. C.A Balanis: "Antenna Theory-Analysis and Design", Third Edition, John Wiley & Sons,2010, ISBN:0-471-66782-X

E-Resources:
3. https://nptel.ac.in/courses/117107035/
4. https://www.smartzworld.com/notes/antenna-and-wave-propagation-notes-pdf-awp/
5. https://www.virtulearn.in/course/antenna-and-wave-propagation-online-classes

ARM Processors					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECT641	3:0:0	3	CIE:50 SEE:50	3 Hours	PE

Course Objectives:

This course will enable students to:
- Understand the operation of ARM and its importance
- Gain the knowledge of pipeline and bus interface.
- Analyze programming of ARM cortex M3 using assembly and c.
- Evaluate the different ARM instructions for Memory Faults.
- Interpret the memory interface of ARM processor.

Syllabus

Module – I

ARM-32 bit Microcontroller: Thumb-2 technology and applications of ARM, Architecture of ARM Cortex M3, Various Units in the architecture, General Purpose Registers, Special Registers, exceptions, interrupts, stack operation, reset sequence   **08 Hours**

Module – II

Instruction Sets: Assembly basics, Instruction list and description, useful instructions, Memory Systems, Memory maps, Cortex M3 implementation overview, pipeline and bus interface.   **08 Hours**

Module – III

Exceptions: Nested Vector interrupt controller design, Systick Timer, Cortex-M3 Programming using assembly and C language, CMSIS   **08 Hours**

Module – IV

 Branching: Branch and Branch with Link (B, BL) and exchange (BX, BLX), ARM instructions, Software Interrupt (SWI), Unused instruction space, Thumb Instruction Set Support for System Development Memory faults.   **08 Hours**

Module – V

The ARM memory interface : The Advanced Microcontroller Bus Architecture (AMBA), The JTAG boundary scan test architecture, The ARM debug architecture, Signal processing support.   **08 Hours**

Course Outcomes :

On completion of this course, students should be able to:
- Recognize the architecture of ARM cortex M3.
- Describe the working of various instructions.
- Solve the exceptions and its programming
- Evaluate thumb instruction set and determine unused instruction space.
- Implement the ARM memory interface and its debugging capabilities.

Text Books:

1. **Joseph Yiu,** "The Definitive Guide to the ARM Cortex-M3", 2nd edn, Newnes, (Elsevier), 2010. ISBN 978-1-85617-963-8

Reference Books:

8.James K. Peckol, "Embedded systems- A contemporary design tool", John Wiley, 2008. ISBN-13: 978-8126524563

2.Andrew N. Sloss, Donimic Symes, Chris Wright, ARM System Developer's Guide. ISBN 978-1-55860-874-0

E-Resources:

1. https://www.arm.com/resources/education/books

2. http://techspeaker.weebly.com/uploads/8/4/7/6/8476668/armch02.pdf

3. https://community.arm.com/developer/ip-products/processors/b/processors-ip-blog/posts/arm-fundamentals-

introduction-to-understanding-arm-processors

Internet of Things (IoT)					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECT642	3:0:0	3	CIE:50 SEE:50	3 Hours	PE

Course Objectives:

This course will enable the students to:

- Understand the concepts and characteristics of IoT devices.
- Interpret the use of different IoT devices and their prototyping.
- Apply the IoT Architecture, protocols and reference model
- Analyze the diverse methods of deploying smart objects and their networking.
- Develop web based IoT application using Web services.

Syllabus

Module – I

Introduction To Internet Of Things: Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates. Overview of Microprocessor and Microcontroller, Basics of Sensors and actuators.   0**8 Hours**

Module – II

Prototyping IoT Objects Using Microprocessor/Microcontroller: Working principles of sensors and actuators – Setting up the board - Programming for IOT – Reading from Sensors, Communication: Connecting microcontroller with mobile devices – communication through Bluetooth, Wi-Fi, Ethernet, Zigbee, RFID, NFC.   0**8 Hours**

Module – III

IoT Architecture, Protocols and Architecture Reference Model: Introduction, Reference Model and architecture, IoT reference Model. Protocols- 6LowPAN, RPL, CoAP, MQTT.   **08 Hours**

Module – IV

Smart Objects: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria.   0**8 Hours**

Module – V

Cloud Services For IoT: Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework designing a RESTful web API, Amazon Web services for IoT.   **08 Hours**

Course Outcomes:

After studying this course, students will be able to

- Explain the IoT architectural components.
- Illustrate the Sensor and Actuator interface to Arduino Microcontroller.
- Apply the IoT architecture, protocols and reference model.
- Evaluate the smart objects and their technologies to connect IoT to network.
- Design and develop Web based IoT applications.

Text Books:

1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)" by 1st Edition, VPT, 2014. ISBN: 9780996025515
2. Srinivasa K G, "Internet of Things", CENGAGE Leaning India, 2017 ISBN:9789386858955
3. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1st Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978- 9386873743)

Reference Books:

1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1ˢᵗ Edition, VPT, 2014. (ISBN: 9788173719547)
2. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1ˢᵗ Edition, McGraw Hill Education, 2017. (ISBN: 9789352605224)
3. Olivier Hersent, David Boswarthick, Omar Elloumi "TheInternet of Things – Key applications and Protocols" Wiley, 2012. ISBN: 9781119994350

E-resources

1. www.coursera.org/specializations/iot
2. www.futurelearn.com/courses/internet-of-things

Nano Electronics					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECT643	3:0:0	3	CIE:50 SEE:50	3 Hours	PE

Course Objectives:

This course will enable students to:
- Understand the basics of top-down and bottom-up fabrication process, devices and Systems
- Enhance basic engineering science and technical knowledge of nano electronics.
- Describe technologies involved in modern day electronic devices.
- Know various nanostructures of carbon and the nature of the carbon bond itself.
- Learn the photo physical properties of sensor used in generating a signal.

Syllabus

Module – I

Introduction to nanotechnology: Impacts, Limitations of conventional microelectronics, Trends in microelectronics and optoelectronics, mosfet basics and operation characteristic lengths in mesoscopic systems, Classification of Nano structures, Low dimensional structures Quantum wells, wires and dots, Density of states and dimensionality Basic properties of two dimensional semiconductor nanostructures,square quantum wells of finite depth, parabolic and triangular quantum wells Quantum wires and quantum dots, carbon nano tube, graphene **08 Hours**

Module – II

Fabrication of nano-layers: Different approaches, physical vapour deposition, chemical vapour deposition Molecular Beam Epitaxy, Ion Implantation, Formation of Silicon Dioxide- dry and wet oxidation methods Fabrication of nano particle- grinding with iron balls, laser ablation , reduction methods, sol gel, self assembly, precipitation of quantum dots. **08 Hours**

Module – III

Characterization of nanostructures: Tools used for of nano materials characterization, microscope-optical, electron, and electron microscope.Principle of operation of Scanning Tunnelling Microscope, Atomic Force Microscope, Scanning Electron microscope, Specimen interaction. Transmission Electron Microscope X-Ray Diffraction analysis, PL & UV Spectroscopy, Particle size analyzer. **08 Hours**

Module – IV

Carbon Nanostructures: Carbon molecules, Carbon Clusters, Carbon Nanotubes, application of Carbon Nanotubes**. 08 Hours**

Module – V

Nano electronic devices: MODFETS, hetero junction bipolar transistors Resonant tunnel effect, RTD, RTT, Hot electron transistors Coulomb blockade effect and single electron transistor, CNT transistors Hetero structure semiconductor laser Quantum well laser, quantum dot LED, quantum dot laser
Quantum well optical modulator, quantum well sub band photo detectors, principle of NEMS. **08 Hours**

Course Outcomes :

On completion of this course, students should be able to:
- Illustrate the principles behind Nano science engineering and Nano electronics.
- Explain the effect of particles size on mechanical, thermal, optical and electrical properties of nano materials.
- Describe the properties of carbon and carbon nanotubes and its applications..
- Apply the knowledge to prepare and characterize nano materials.
- Analyze the process flow required to fabricate state-of-the-art transistor technology.

Text Books:
1. J.M. Martinez-Duart, R.J. Martin Palma, F. Agulle Rueda Nanotechnology for Microelectronics and optoelectronics, Elsevier, 2006, ISBN 9780080445533.
2. W.R. Fahrner, Nanotechnology and Nanoelctronics, Springer, 2005, ISBN 9783540266211.

Reference Books:

3. Chattopadhyay, Banerjee, Introduction to Nano science & Technology, PHI, 2012, ISBN-13: 978-8120336087.
4. George W. Hanson, Fundamentals of Nano electronics, Pearson Education, 2009, ISBN-13: 9780.1B.
5. K. Goser, P. Glosekotter, J. Dienstuhl, Nano electronics and nano systems, Springer 2004, ISBN 978-3-662-05421-5.
6.

E-Resources:

1. https://www.sciencedirect.com/topics/materials-science/nanoelectronics
2. https://www.circuitstoday.com/nanoelectronics

Artificial Neural Networks					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECT651	3:0:0	3	CIE:50 SEE:50	3 Hours	PE

Course Objectives:

This course will enable the students to:

- Understand the basics of ANN and comparison with Human brain.
- Explain reinforcement learning using neural networks.
- Compare the architecture, learning algorithm and issues of various feed forward and feedback neural networks.
- Build knowledge on generalization and function approximation of various ANN architectures.
- Apply knowledge of unsupervised learning using neural networks.

Syllabus

Module – I

Introduction: Biological Neuron – Artificial Neural Model - Types of activation functions –
Architecture: Feedforward and Feedback, Convex Sets, Convex Hull and Linear Separability, Non-Linear Separable Problem. XOR Problem, Multilayer Networks.
Learning: Learning Algorithms, Error correction and Gradient Descent Rules, Learning objective of TLNs, Perceptron Learning Algorithm, Perceptron Convergence Theorem.   **08 Hours**

Module – II

Supervised Learning: Perceptron learning and Non Separable sets, α-Least Mean Square Learning, MSE Error surface, Steepest Descent Search, μ-LMS approximate to gradient descent, Application of LMS to Noise Cancelling, Multi-layered Network Architecture, Back propagation Learning Algorithm, Practical consideration of BP algorithm.   **08 Hours**

Module – III

Support Vector Machines and Radial Basis Function: Learning from Examples, Statistical Learning Theory, Support Vector Machines, SVM application to Image Classification, Radial Basis Function Regularization theory, Generalized RBF Networks, Learning in RBFNs, RBF application to face recognition.
08 Hours

Module – IV

Attractor Neural Networks: Associative Learning Attractor Associative Memory, Linear Associative memory, Hopfield Network, application of Hopfield Network, Brain State in a Box neural Network, Simulated Annealing, Boltzmann Machine, Bidirectional Associative Memory.   **08 Hours**

Module – V

Self-organization Feature Map: Maximal Eigenvector Filtering, Extracting Principal Components, Generalized Learning Laws, Vector Quantization, Self-organization Feature Maps, Application of SOM, Growing Neural Gas.   **08 Hours**

Course Outcomes:

On completion of this course the students are able to:

- Understand the role of neural networks in engineering, artificial intelligence, and cognitive modeling.
- Explain how simple ANNs can be designed and trained.
- Develop the concepts and techniques of neural networks through the study of the most important neural network models.
- Apply neural networks to particular application, and to know what steps to take to improve performance.

- Evaluate whether neural networks are appropriate to a particular application.

Text Book:
1. Satish Kumar, Neural Networks A Classroom Approach–McGraw Hill Education (India) Pvt. Ltd, 2004, Second Edition. ISBN 0070482926, 9780070482920

Reference Books:
1. Simon Haykin, "Neural Networks- A comprehensive foundation", Pearson Education, 2003.ISBN-13: 978-0132733502 ISBN-10: 0132733501
2. Laurene Fausett, "Fundamentals of Neural Networks" , Pearson Education, 2004.ISBN-13: 978-0133341867 ISBN-10: 0133341860

E-Resources:
1. http://stpk.cs.rtu.lv/sites/all/files/stpk/materiali/MI/Artificial%20Intelligence%20A%20Modern%20 Approach.pdf.
2. http://www.getfreeebooks.com/16-sites-with-free-artificial-intelligence-ebooks

Image Processing					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECT652	3:0:0	3	CIE:50 SEE:50	3 Hours	**PE**

Course Objectives:

This course will enable the students to

- Understand the fundamentals of digital image processing.
- Study the concepts of image enhancement using transformation techniques.
- Illustrate image analysis techniques in the form of image segmentation and to evaluate the methodologies for segmentation
- Analyze the image restoration techniques and methods used in digital image processing.
- Design Morphological operations used in digital image processing.

Syllabus

Module – I

Digital Image Fundamentals: Introduction, Brief history, Image Representation, Components in Image Processing, Fundamental Steps in Image Processing, Applications of Image Processing , Image sampling and quantization, Basic Relationship between pixels,. Linear and Nonlinear Operations. **08 Hours**

Module – II

Spatial Domain: Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters
Frequency Domain: Preliminary Concepts, The Discrete Fourier Transform (DFT) of Two Variables, Properties of the 2-D DFT, Filtering in the Frequency Domain, Image Smoothing and Image Sharpening Using Frequency Domain Filters, Selective Filter . **08 Hours**

Module – III

Image Segmentation: Point, Line, and Edge Detection, Thresholding, Region Based Segmentation, Segmentation using Morphological Watersheds, Representation, Boundary descriptors**.**
08 Hours

Module – IV

Image Restoration: Reasons for image degradation, Model of image degradation/ restoration process, Noise probability density functions, Image restoration using spatial filtering (Mean filters), Inverse Filtering, MMSE (Wiener) Filtering. **08 Hours**

Module – V

Morphological Image Processing: Preliminaries, Dilation and erosion, opening and closing, Basic morphological operations: Boundary extraction, Region filling, extraction of connected components, convex hull, thinning, thickening, Hit-or-Miss transform. **08 Hours**

Course Outcomes:

On completion of this course the students are able to

3. Explain the historical background, concepts of image processing and its application.
4. Apply image processing techniques in both the spatial and frequency (Fourier) domains.
5. Design image analysis techniques in the form of image segmentation and to evaluate the Methodologies for segmentation
6. Analyze the image restoration technique to remove degradation from given image.
7. Design Morphological operation dilation and erosion on a given image.

Text Books:

1. Digital Image Processing, Rafael C. Gonzalez, Richard Eugene Woods, Pearson Education India,

2009, ISBN: 8131726959, 9788131726952

Reference Books:
1. S Jayaraman, S Esakkirajan, T Veerakumar: "Digital Image Processing", Tata McGraw Hill Publication.
2. S Sridhar: "Digital Image Processing", Oxford University Press, ISBN-10: 0199459355, ISBN-13: 9780199459353.
3. Milan Sonka and Roger Boile "Image Processing analysis and Machine vision with Mind Tap ", Cengage Publications, 2018.

E-Resources:
1. https://www.abebooks.com/9789332518469/Digital-Image-Processing-3rd-Edition-9
2. www.synergy.ac.in/intranet/classnotes/introduction.pdf

Pattern Recognition					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECT653	3:0:0	3	CIE:50 SEE:50	3 Hours	PE

Course Objectives:

This course will enable students to:

- Understand the basic principles of pattern recognition.
- Illustrate the significance of data representation in pattern recognition.
- Interpret the different classifiers.
- Gain the knowledge of principles of Decision Tree for pattern recognition application.
- Design and analyze the clustering algorithm.

Syllabus

Module – I

Introduction: Definition of PR, Applications, Datasets for PR, Different paradigms for PR, Introduction to probability, events, random variables, Joint distributions and densities, moments. Estimation minimum risk estimators, problems.   **08 Hours**

Module – II

Representation: Data structures for PR, Representation of clusters, proximity measures, size of patterns, Abstraction of Data set, Feature extraction, Feature selection, Evaluation.

08 Hours

Module – III

Nearest Neighbor based classifiers & Bayes classifier: Nearest neighbor algorithm, variants of NN algorithms, use of NN for transaction databases, efficient algorithms, Data reduction, prototype selection, Bayes theorem, minimum error rate classifier, estimation of probabilities, estimation of probabilities, comparison with NNC, Naive Bayes classifier, Basyessian belief network.

08 Hours

Module – IV

Decision Trees: Introduction, DT for PR, Construction of DT, Splitting at the nodes, Over-fitting & Pruning, Examples.   **08 Hours**

Module – V

Clustering: Hierarchical (Agglomerative, single/complete/average linkage, wards, Partitional (Forgy's, k-means, Isodata), clustering large data sets, examples.

08 Hours

Course Outcomes :

On completion of this course, students should be able to:

- Explain the mathematical preliminaries for pattern recognition.
- Apply the data representation for pattern recognition applications.
- Interpret the Nearest Neighbor based classifier and Bayes classifier.
- Evaluate decision tree algorithms for real time applications.
- Design Hierarchical clustering and various clustering algorithms.
.

Text Books:

1. V Susheela Devi, M Narsimha Murthy, Pattern Recognition (An Introduction), Universities Press, ISBN 978-81-7371-725-3,2011.
2. Earl Gose, Richard Johnsonburg, Steve Joust, Pattern Recognition & Image Analysis, PHI, ISBN- 81-203-1484-0, 1996.

Reference Book:
1. Duda R. O., P.E. Hart, D.G. Stork., Pattern Classification, John Wiley and sons, 2000.ISBN:786-31-8765-4356

E-Resources:
1. https://www.geeksforgeeks.org/pattern-recognition-introduction/
2. https://www.journals.elsevier.com/pattern-recognition-letters/call-for-papers/advances-in-human-action-activity-and-gesture-recognition

LabVIEW Level - 1					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18HOE661	3:0:0	3	CIE:50 SEE:50	3 Hours	IE

Course Objectives:

This course will enable students to:

- Understand the fundamental of graphical coding system.
- Understand the basic level of LabVIEW coding.
- Apply the different concepts of LabVIEW operating tools.
- Analyze the programming concepts in LabVIEW.
- Create and develop different Structures for a specific problem.

Syllabus

Module – I

Introduction of LabVIEW : Advantages OF LabVIEW, Software Environment- Front panel, Block Diagram, Connector Pane,Palletes –Tool, Block Diagram and Connector, Terminals, Nodes, Functions, SubVIs,Datatypes,Data Flow Program. **08 Hours**

Module – II

LabVIEW programming concepts: Modular Programming in LabVIEW, Building a VI Front Panel, Block Diagram and Connector Pane, Creating, Editing and Displaying SubVIs,
Programming Execution with Structures: For Loop -The While Loop - Placing Objects inside Objects - Counting the Loops - Shift Registers – Case registers – Dialogs – The Sequence Structures – Timing – Timed Structures – Formula Node – Expression Node. **08 Hours**

Module – III

Arrays and Clusters: Arrays in LabVIEW, Creating 1D, 2D and multidimensional Arrays, Array Initialization Matrix Operations with Arrays, Polymorphism.
Clusters Introduction , Creating Cluster Controls and Indicators, Assembling and Dis assembling Clusters, Error Handling and Error Cluster, Numerical and string functions, Designing of Boolean operations, Comparator applications, Exercises in basic programming.

08 Hours

Module – IV

Sub VI design: SubVI creation methods, Connector panes and connection types, Polymorphic subVIs, Options related, Property Nodes, and Invoke Nodes
Structures:. Introduction, Case Structures, Sequence Structures, Timed Structures , Formula Node, Event Structures, Event Structure, LabVIEW Math Script **08 Hours**

Module – V

Design and documentation (style) practices: Refer to the LabVIEW Style Checklist topic of the LabVIEW Help for information on the following items , i. User interface design and block diagram layout, ii. Modular and hierarchical design.iii. SubVI icons and connector pane layout (standard) .iv. Properties, v. Documenting Vis **08 Hours**

Course Outcomes :

On completion of this course, students should be able to:

- Explain the LabVIEW programming and its Advantages.
- Apply the basic aspects of the graphical programming using LabVIEW.
- Analyze the error function and components in the LabVIEW coding.
- Evaluate the LabVIEW coding for a specific problem of datalogging, measurement and presentation.
- Formulate and Design coding for data handling and Analysis on the acquired data.

Text Books:

1. LabVIEW - Getting Started with LabVIEW", M/s National Instruments., 2013 , *ISBN* 10: 0-13-609429-5.

2. Jovitha Jerome: "Virtual instrumentation using labview", PHI Learning Pvt. Ltd., 2010. ISBN 10: 8120340302 / ISBN 13: 9788120340305

3. Hans-Petter Halvorsen: "Introduction to LabVIEW," University College of Southeast, Norway. ISBN :978-82-691106-3-0.

4. S. Sumathi, P. Surekha: "LabVIEW based Advanced Instrumentation Systems", Springer. ISBN - 13:978-3540485001

Reference Books:

1. Jeffrey Travis, Jim Kring: "Introduction to Graphical Programming with LabVIEW", Pearson, 2006. ISBN – 10:0-13-185672-3.

E-Resources:

1. http://cnx.org/content/col10241/1.4.

ROBOTIC PROCESS AUTOMATION					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18HOE662	3:0:0	3	CIE:50 SEE:50	3 Hours	IE

Course Objectives:

This course will enable students to:

- Understand the Process and importance of automation
- Identify the anatomy of moving parts in a robot.
- Interpret robot actuation and feedback process.
- Determine the different sensors used in Robot.
- Develop Robotic intelligence, system integration and networking.

Syllabus

Module – I

Automation: History of Automation, Reasons for automation, Disadvantages of automation, Automation systems, Types of automation – Fixed, Programmable and Flexible automation, Automation strategies Automated Manufacturing Systems: Components, classification and overview of manufacturing Systems, Flexible Manufacturing Systems (FMS), Types of FMS, Applications and benefits of FMS.   **08 Hours**

Module – II

Robotics: Definition of Robot, History of robotics, Robotics market and the future prospects, Robot Anatomy, Robot configurations: Polar, Cartesian, cylindrical and Jointed-arm configuration. Robot motions, Joints, Work volume, Robot drive systems, Precision of movement – Spatial resolution, Accuracy, Repeatability, End effectors – Tools and grippers.   **08 Hours**

Module – III

Controllers and Actuators: Basic Control System concepts and Models, Transfer functions, Block diagrams, characteristic equation, Types of Controllers: on-off, Proportional, Integral, Differential, P-I, P-D, P-I-D controllers. Control system and analysis. Robot actuation and feedback components Position sensors – Potentiometers, resolvers, encoders, velocity sensors. Actuators - Pneumatic and Hydraulic Actuators, Electric Motors, Stepper motors, Servomotors, Power Transmission systems.   **08 Hours**

Module – IV

Robot Sensors and Machine vision system Sensors in Robotics - Tactile sensors, Proximity and Range sensors, use of sensors in robotics. Machine Vision System: Introduction to Machine vision, the sensing and digitizing function in Machine vision, Image processing and analysis, Training and Vision systems.

08 Hours

Module – V

The Robots Technology of the future: Robot Intelligence, Advanced Sensor capabilities, Telepresence and related technologies, Mechanical design features, Mobility, locomotion and navigation, the universal hand, system integration and networking. Artificial Intelligence: Goals of AI research, AI techniques – Knowledge representation, Problem representation and problem solving, LISP programming, AI and Robotics, LISP in the factory.   **08 Hours**

Course Outcomes :

On completion of this course, students should be able to:

- Identify various types of automation &manufacturing systems.
- Explain different robot configurations, motions, drive systems.
- Analyze the basic concepts of different systems used in robots.
- Evaluate the working of transducers, sensors and machine vision systems.
- Create the future capabilities Artificial Intelligence in the field of robotics.

Text Books:

1. Automation, Production Systems and Computer Integrated Manufacturing M.P. Groover, Pearson Education.5th edition, 2009 ISBN-13: 978-9332572492.

2. Industrial Robotics, Technology, Programming and Applications by M.P. Groover, Weiss, Nagel, McGraw

Hill International, 2nd edition, 2012. **ISBN-13:** 978-1259006210.

Reference Books:

1. Robotics, control vision and intelligence-Fu, Lee and Gonzalez. McGraw Hill International, 2nd edition, 2007. ISBN-13: 978-0070226258

2. Robotic Engineering - An Integrated approach, Klafter, Chmielewski and Negin, PHI, 1st edition, 2009. ISBN-13: 978-8120308428

E-Resources:

1. https://www.robots.com/applications/material-handling
2. https://www.britannica.com/technology/automation/Robots-in-manufacturing
3. https://www.sciencedirect.com/science/article/pii/S1474667017665947

Wireless and Mobile communication					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18HOE663	3:0:0	3	CIE:50 SEE:50	3 Hours	IE

Course Objectives:

This course will enable students to:
- Understand the application of multiuser access in a cellular communication scenario.
- Illustrate the propagation mechanisms in an urban mobile communications using statistical and empirical models.
- Apply the different models for mobile radio technique using path loss propagation model..
- Analyze system architecture, call processing protocols and services of GSM, GPRS.
- Design system architecture, call processing protocols and services of CDMA based systems IS95 and CDMA2000.

Syllabus

Module – I

Introduction to wireless communication systems: Evolution of mobile radio commutation, mobile radio telephonic, Mobile radio systems around the world, Examples of wireless communication systems, paging systems, cordless telephone systems, cellular telephone systems, comparisons of common wireless communication systems, trends in cellular radio and personal communication systems.   **08 Hours**

Module – II

The cellular concept –System Design Fundamentals: Introduction, Frequency Reuse, Channel Assignment strategies, Handoff strategies, Interference and system capacity, Trunkingand Grade of service, improving coverage and capacity in cellular systems.   **08 Hours**

Module – III

Mobile radio propagation, Large scale path loss: Introduction to radio wave propagation, free space propagation model, Relating power to electric field, The Three basic propagation mechanism, reflection, ground reflection (Two-Ray) Model, Diffraction, Scattering, Practical link budget design using path loss models, outdoor propagation models, indoor propagation models signals penetration into buildings, ray tracing and site specific modeling.   **08 Hours**

Module – IV

Multiple-Accesses (MA) schemes: Introduction, FDMA, TDMA, SDMA, packet radio, capacity of cellular system.   **08 Hours**

Module – V

Wireless technologies: Introduction to Wi-Fi, WiMAX, ZigBee networks, Software defined radio,UBW Radio,Wireless adhoc Network and mobile portability, GSM.   **08 Hours**

Course Outcomes:

On completion of this course, students should be able to:
- Gain the basics of wireless communication techniques.
- Apply the statistical characterization of urban mobile channels to compute the performance for simple modulation schemes.
- Test and validate voice and data call handling for various scenarios in GSM and CDMA systems.
- Analyze the call process procedure between a calling number and called number for all scenarios in GSM or CDMA based systems.
- Illustrate the limitations of GSM, GPRS and CDMA to meet high data rate requirements and limited improvements that are needed.

Text Books:
1. Theodore S. Rappaport: "Wireless communications - Principles and Practices", 2nd Edition, Prentice Hall, 2001, ISBN-10: 0130422320, ISBN-13: 978-0130422323.
2. Gary J Mullet, Introduction To Wireless Telecommunications Systems and Networks", Cengage Learning, ISBN 1401886590,9781401886592.

Reference Books:
1. Dr. KamiloFeher: "Wireless digital communication", Prentice Hall, Har/Dskt,1995, ISBN-10: 0130986178, ISBN-13: 978-0130986177.
2. William C. Y. Lee: "Mobile Communication Engineering -Theory and applications",Tata McGraw Hill, 1995, ISBN-10: 0070370397, ISBN-13: 978-0070370395.

E-Resources:
1. http://nptel.ac.in/courses/117102062/8
2. http://nptel.ac.in/courses/117102062/21
3. http://www.radio-electronics.com/info/cellulartelecomms/cellular_concepts/ multiple_access_schemes.php
4. https://www.elprocus.com/types-of-wireless-communication-applications/

Digital Communication Lab					
Course Code	**L:T:P**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
18ECL67	1:0:2	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :
- Gain the practical knowledge of different digital modulation techniques.
- Understand the design concept used in digital modulation.
- Design a discrete component level concept for digital communication.
- Construct various modulation and demodulation circuits.
- Implement the digital modulations design concepts with open source software

Syllabus

List of Experiments

Digital Communication Experiments using discrete components.
1. Construct an experiment for TDM of two band limited signals.
2. Design and testing of an ASK generation and detection.
3. Conduct an experiment for FSK generation and detection.
4. Design and testing of PSK generation and detection.
5. Verification of sampling theorem using Flat-top sampling

Digital Communication Experiments using open source software
1. ASK modulation and demodulation.
2. FSK modulation and demodulation.
3. PSK modulation and demodulation.
4. QPSK modulation.

Course Outcomes:

On completion of this course, students should be able to:
- Understand the basic knowledge necessary for transmitting and receiving information.
- Analyze the TDM for two band limited signal.
- Design and Implement the ASK, FSK and PSK generation and detection.
- Analyze the outputs by changing the important parameters at the input.
- Realize the design theory and implementation concept using open source software.

E-Resources:
1. http://vlab.amrita.edu/index.php?sub=59&brch=163
2. https://scilab.in/lab_migration/completed_labs

Digital Signal Processing LAB					
Course Code	**L:T:P**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
18ECL68	1:0:2	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Understand basics of MATLab software Tool boxes and how to use it for the implementation of basic signal processing.
- Understand Practical perspective of convolution and filtering operations using MATLab.
- Understand Practical perspective of convolution and filtering operations using DSP processor.
- Gain knowledge about plotting and analysing power spectrum of a signal.
- Understand how a practical long data sequence can be filtered using FFTs.

Syllabus

List of Experiments

A. MATLab Experiments.

1. Computation of N point DFT of a given sequence using direct method.
2. Circular convolution of two given sequences using Direct and DFT /IDFT methods.
3. Linear convolution of two sequences using Direct and DFT /IDFT methods.
4. Computation of N point DFT of a given sequence using FFT technique.
5. Determination and plotting of magnitude and phase spectrum of a signal using FFT technique.
6. Overlap-save and overlap-add method for linear filtering of long data sequence.
7. Solving a given difference equation.
8. Design and implementation of FIR Filters (LP & HP) using window techniques.
9. Design and implementation of analog and digital IIR filters (Butterworth and Chebyshev).

B. Experiments using DSP Processor

1. Linear and Circular convolution of given two sequences.
2. Computation of N- Point DFT of a given sequence.
3. Realization of an FIR filter (any type) to meet given specifications. The input can be a signal from function generator / speech signal.
4. Realization of an IIR filter to meet given specifications.

Course Outcomes:

On completion of this course, students will able to:

- Implement linear and circular convolution using MATLab and DSP hardware..
- Implement Spectral analysis using MATLab.
- Implement digital FIR filter to meet the given specifications.
- Implement digital IIR filters to meet the given specification.
- Implement efficient filtering of long data sequences.

E-Resources:

1.http://indico.ictp.it/event/a08187/session/81/contribution/50/material/0/2.pdf
2. https://engineering.purdue.edu/~ee538/DFTbasedLinearFiltering.pdf.
3. https://web.eecs.umich.edu/~fessler/course/451/l/pdf/c6.pdf

Employability Skills and Aptitude Development-II					
Course Code	**L:T:P**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
18ECH69	1:0:4	3	CIE:50 SEE:50	3 Hours	HSS

Course Objectives:

This course will enable students to:

- Understand different types of Numerical / Arithmetical problems.
- Improves analytical abilities to think on a particular given topic
- Anticipate interview questions according to job requirement.
- Articulate the importance of self-presentation.
- To learn adaptability and become more approachable in the work environment.

Syllabus

Module – I

Quantitative Aptitude : Time Speed and Distance, Permutation and Combination, Probability, Data Interpretation, Ages, Simple and Compound Interest, Alligation and Mixture.

06 Hours

Module – II

Logical Reasoning : Coding and Decoding, Syllogisms, Direction Sense Test, Clocks, Calendars, Data Sufficiency.

Verbal Ability: Change of Speech, Change of Voice, Ordering of Sentences.

08 Hours

Module – III

Group Discussions: GD introduction and basics, What actually happens in a GD?, Initiation, Body of the GD, Summarization GD etiquettes – Do's &Don'ts, Group Discussions – FAQs, GD Practice Sessions.

04 Hours

Module – IV

Interview skills: Personal Interview – introduction & basics, guidance in all types of interviews – technical, behavioral, resume, stress and telephonic, Dressing for the interview, Typical interview questions, Do's & Don'ts in an interview .

04 Hours

Module – V

Resume Building : Resume design & formatting for paper, email and uploads on job portals, Step-by-step creation of the most powerful sections of the resume, Best practices in resume writing, Developing resumes that are grammatically correct and written in business English**.**

05 Hours

Course Outcomes :

On completion of this course, students should be able to:

- Identify logical relations among statements; and analyze logically complex statements into their truth-functional or quantificational components.
- Enhances the leadership and communication skills.
- Understand the purpose and Identify the different types of professional interviews
- Students demonstrate an ability to target the resume to the presenting purpose.
- Gain expertise in time management and negotiation.

Text Books:

8. R S Aggarwal: "Quantitative Aptitude for competitive examinations", (Chapters 1-3,6-8,10-18,20-22,26-28,30,31,35-39), S. Chand Publishing, New Delhi, 2014, ISBN-13: 978-81-219-2498-6.

Reference Books:

4. R.S. Aggarwal "A Modern Approach to Verbal & Non-Verbal Reasoning (Old Edition)" 2001.
5. R.S. Aggarwal "A Modern Approach to Logical Reasoning (Old Edition)" 1999.

E Resources:
https://resumebuild.com/resume-builder/
https://www.myperfectresume.com/resume/builder

Seventh Semester B.E. – Syllabus

Power Electronics

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17ECT71	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Understand the meaning and importance of power electronics.
- Understand the main switching topologies used in power electronics circuits and how they operate, how they are controlled, driven and protected.
- Understand the principle of operation of a thyristor.
- Understand the different configurations of control rectifiers.
- Understand the categorize different commutation techniques.
- Understand the categorize AC voltage controllers.
- Understand the conceptualize DC-DC converters.
- Understand the principles of inverters.

Syllabus

Module – I

Power Devices: Application of power electronics, Power BJT's, Switching characteristics, Switching units, Base drive control, Power MOSFETs, Switching characteristics, Gate drives, IGBTs, Isolation of gate and base drive, Construction of thyristor, Principle of operation, Different states/Modes of operation, Static anode VI characteristics, Two transistor model, Triggering/Turn-on mechanism, Dynamic (Turn-on and Turn-off), Characteristics, Gate characteristics, Gate triggering, di/dt and dv/dt protection, Thyristor firing circuits. **08 Hours**

Module – II

Control Rectifier: Introduction, Principle of phase controlled converter operation, Single phase half controlled converter, Single phase fully controlled converter, Dual converter, Three phase half controlled converter, Three phase fully controlled converter. **08 Hours**

Module – III

Commutation Techniques: Introduction to commutation, Different types of commutations, Natural commutation and forced commutation, Self-commutation, Complementary commutation, Auxiliary thyristor commutation. **08 Hours**

Module – IV

AC Voltage Controllers and Choppers: Introduction to choppers, Principles of step down and step up choppers, Step down chopper with RL load, Classification of chopper, Analysis of impulse commutated thyristor chopper, Introduction to AC voltage controllers, Principle of ON-OfF control, Principle of phase control, Single-phase AC controllers with R load and RL load. **08 Hours**

Module – V

Inverters: Introduction, Principle of operation, Performance parameters, Single-phase bridge inverter, Voltage control of single-phase inverters, Current source inverters. **08 Hours**

Course Outcomes:

On completion of this module, students will be able to :

- Design drive controls for power semiconductor devices.
- Analyze the operation of single phase and three phase rectifiers with various loads.
- Design commutation circuits.
- Design AC-voltage controllers for different configurations.
- Analyze the operation of choppers and inverters.

Text Books:

1. M. H. Rashid: "Power Electronics Circuits, Devices and Applications", 3rd Edition, Pearson India, New Delhi, 2014, ISBN: 978-9332518445
2. G. K. Dubey, S. R. Doradla, A. Joshi, R. M. K. Sinha: "Thyristorized Power Controllers", 6th Edition, New Age International Pvt. Ltd., 1986, ISBN: 9788122434224.

Reference Book:

1. P. S. Bhimbra: "Power Electronics", Khanna Publication, 1995, ISBN: 9788174092 -793.

E-Resources:

1. https://www.electrical4u.com/power-mosfet/
2. http://www.completepowerelectronics.com/power-mosfet/
3. http://www.electronics-tutorial.net/dc-dc-converter-chopper/step-down-chopper/
4. http://www.electronics-tutorial.net/dc-to-ac-inverter/single-phase-full-bridge-inverter/
5. http://www.electricalidea.com/2016/05/21/single-phase-inverter/

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Data Communication

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17ECT72	3:0:0:0	3	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Understand the fundamental of layered task and OSI model and its functions.
- Understand the concepts of Data link control and its protocols.
- Understand the concepts of Wired LAN and Ethernet standards.
- Understand the concepts of Virtual LANs and connecting devices.
- Understand the application of Network layer.

Syllabus

Module – I

Layered tasks, OSI Model, Layers in OSI model, TCP?IP Suite, Addressing, Telephone and cable networks for data transmission, Telephone networks, Dial up modem, DSL, Cable TV for data transmission.   **08 Hours**

Module – II

Data Link Control: Framing, Flow and error control, Protocols,Noiseless channels and noisy channels, HDLC.   **08 Hours**

Module – III

Wired LAN, Ethernet, IEEE standards, Standard Ethernet, changes in the standards, Fast Ethernet, Gigabit Ethernet.   **08 Hours**

Module – IV

Connecting LANs, Backbone and Virtual LANs, Connecting devices, Back bone Networks, Virtual LANs.   **07 Hours**

Module – V

Network Layer, Logical addressing, Ipv4 addresses, Ipv6 addresses, Ipv4 and Ipv6 Transition from Ipv4 to Ipv6   **08 Hours**

Course Outcomes:

On completion of this module, students will be able to :

- Describe layers of OSI model and its functions.
- Discuss the different protocols of Noiseless and Noisy channels.
- Analyze different types of Ethernet.
- Distinguish below Virtual and Connecting LANs.
- Describe the functions of network layer, Transition from Ipv4 to Ipv6.

Text Book:

1. B Forouzan: "Data Communication and Networking", 4th Edition, TMH, 2006.

Reference Books:

1. , James F. Kurose, Keith W. Ross: "Computer Networks", Pearson education, 2nd Edition, 2003.

2. Wayne Tomasi: "Introduction to Data communication and Networking", Pearson Education, 2007.

E-Resources:

1. http://www.webopedia.com/quick_ref/OSI_Layers.asp

2. https://gradeup.co/flow-and-error-control-techniques-i-28750a29-ba8d-11e5-b537-dcac2f2dd7d1

3. http://www.cse.wustl.edu/~jain/cis788-97/ftp/virtual_lans/

4. http://www.studytonight.com/computer-networks/osi-model-network-layer

5. https://www.tutorialspoint.com/data_communication_computer_network/network_layer_introduction.htm

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Optical Fiber Communication (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17ECI731	3:0:2:0	4	CIE:50 SEE:50	3 Hours	FE

Course Objectives:

ThisThis course will enable students to :

- Understand the fundamental concepts in Optical Fiber Communication.
- Understand the types and function of various sources and detectors used OfC.
- Understand the basic knowledge of Fiber Couplers, Fiber Connectors and Optical Receivers.
- Understand the characteristics of Analog and Digital links.
- Understand the concept of WDM and Optical Networks.

Syllabus

Module – I

Overview of optical fiber communication: Introduction, Historical development, general system, advantages, disadvantages, and applications of optical fiber communication, optical fiber waveguides, Ray theory, cylindrical fiber, single mode fiber, cutoff wave length, mode filed diameter. Optical Fibers: fiber materials, photonic crystal, fiber optic cables specialty fibers.   **08 Hours**

Module – II

Transmission Characteristics of Optical Fibers: Introduction, Attenuation, absorption, scattering losses, bending loss, dispersion, Intra model dispersion, Inter model dispersion.

Optical Sources and Detectors: Introduction, LED's, LASER diodes, Photo detectors, Photo detector noise, Response time, double heterojunction structure, Photo diodes, comparison of photo detectors.   **08 Hours**

Module – III

Fiber couplers and connectors: Introduction, fiber alignment and joint loss, single mode fiber joints, fiber splices, fiber connectors and fiber couplers.

Optical receiver: Introduction, Optical Receiver Operation, receiver sensitivity, quantum limit, eye diagrams, coherent detection, burst mode receiver, operation, Analog receivers.   **08 Hours**

Module – IV

Analog and digital links: Analog links – Introduction, overview of analog links, CNR, multichannel transmission techniques, RF over fiber, key link parameters, Radio over fiber links, microwave photonics.

Digital links – Introduction, point–to–point links, System considerations, link power budget, resistive budget, short wave length band, transmission distance for single mode fibers, Power penalties, nodal noise and chirping. **08 Hours**

Module – V

WDM concepts and components: WDM concepts, overview of WDM operation principles, WDM standards, multiplexer, Isolators and circulators, direct thin film filters, active optical components, MEMS technology, variable optical attenuators, tunable optical fibers, polarization controllers, chromatic dispersion compensators, tunable light sources.

Optical Amplifiers and Networks – optical amplifiers, basic applications and types, semiconductor optical amplifiers, EDFA.

Optical Networks: Introduction, SONET / SDH, Optical Interfaces, SONET/SDH rings, High – speed light – waveguides. **08 Hours**

List of Experiments:

1. Demonstration and study of different types of Optical Fibers and connectors.

2. To establish and Study of a 650nm fiber optic analog link.

3. To establish and Study of a 650nm fiber optic digital link.

4. Study of Intensity Modulation Technique using Analog input signal. To obtain intensity modulation of the analog signal, transmit it over a fiber optic cable and demodulate the same at the receiver and to get back the original signal.

5. Study of Intensity Modulation Technique using digital Input signal. The objective of this experiment is to obtain intensity modulation of digital signal, transmit it over fiber optic cable and demodulate the same at the receiver end to get back the original signal.

6. To measure propagation or attenuation loss in optical fiber.

7. To measure propagation loss in optical fiber using optical power meter.

8. To measurement of the Numerical Aperture (NA) of the fibre.

Course Outcomes:

On completion of this course, students will be able to :

- Know the fundamental concepts of OfC.

- Analyze the characteristics of Optical Fiber and functions of various Sources and Detectors.

- Describe various Fiber couplers, connectors and analyse Optical receivers.

- Distinguish Analog and Digital Links.

- Discuss concept of WDM, Optical Amplifiers and Optical networks.

Text Books:

1. Gerd Keiser: "Optical Fiber Communication", MGH, 4th Edition, 2008.

2. John M. Senior: "Optical Fiber Communications", Pearson Education, 3rd Impres -sion, 2007.

Reference Book:

1. Joseph C Palais: "Fiber Optic Communication", 4th Edition, Pearson Education.

E-Resources:

1. vlab.ambita.edu/index.php

2. http://nptel.ac.in/syllabus/syllabus.php?subjectId=108105053

3. http://nptel.ac.in/syllabus/syllabus.php?subjectId=108108076

4. http://nptel.ac.in/courses/108108076/

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Web Technologies – Servlet, JSP (IC)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17ECI732	3:0:2:0	4	CIE:50 SEE:50	n/a	FE

Course Objectives:

This course will enable students to :

- Understand the concepts of Web Technologies.
- Understand what are Web Servers and App Servers, and their differences.
- Understand Request and Response models.
- Understand how to build e-commerce applications using Servlets and JSP.
- Understand what EL and EL Tags are, and their usage in developing dynamic web pages.

Syllabus

Module – I

Introduction to Web Technologies: JEE, PHP, ASP and .Net

Introduction Web Dev environment: App Server, Web Server, 2-Tier and 3 -Tier Architecture.

Introduction to Servlet: Introduction to JEE containers, Application directory structure, Servlet Interface / Generic Servlet / HttpServlet, Servlet life cycle, Request and Response objects, Building sample application. **08 Hours**

Module – II

Inter Servlet Communication: RequestDispatcher, Include / Forword / Redirect, Building sample application.

Session Management: Creating & invalidating session, Different ways to handle session, Session time out configuration. **08 Hours**

Module – III

Introduction to JSP: Need for JSP, JSP life cycle. **06 Hours**

Module – IV

Introduction to EL: Need for EL and its advantages, Fundametals of EL.

EL Tags: Core Tags, Introduction to MVC, Building sample application. **08 Hours**

Module – V

Project Work: Create an e-commerce application using the client-side languages, such as Bootstrap3, HTML5, CSS3, JavaScript and jQuery, along with the server-side Java language - Servlets and JSP. **10 Hours**

Laboratory

1. Programs covering Web Technologies, Web Dev environment, Servlet.
2. Programs covering Inter Servlet Communication, Session Management.
3. Programs covering JSP, Introduction to EL, EL Tags.

Course Outcomes:

On completion of this course, the students are able to :

- Analyze the concepts of Web Technologies.
- Compare Web Servers and App Servers.
- Implement Request and Response models.
- Demonstrate how to build e-commerce applications using Servlets and JSP.
- Design dynamic web pages using EL Tags.

Text Books:

1. Basham, Bryan, Sierra Kathy, Bates, Bert: "Head First Servlets and JSP", 2nd Edition, Shroff, ISBN-10: 8184044976.
2. Santosh Kumar K: "JDBC 4.2, Servlet 3.1, and JSP 2.3 includes JSF 2.2 and Design Patterns, Black Book", 2nd Edition, Dreamtech Press, ISBN-10: 9351199088.

Reference Book:

1. Budi Kurniawan: "Servlet & JSP: A Tutorial", 2nd Edition, Brainy Software, ISBN-10: 1771970278.

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Wireless Communication

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17ECT741	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to :

- The basic concepts behind wireless communication system
- The concept of path losses in radio wave propagation
- The different types of modulation techniques used in radio communication

Syllabus

Module – I

Introduction to wireless communication systems: Evolution of mobile radio commutation, mobile radio telephonic, Mobile radio systems around the world, Examples of wireless communication systems, paging systems, cordless telephone systems, cellular telephone systems, comparisons of common wireless communication systems, trends in cellular radio and personal communication systems.   **08 Hours**

Module – II

The cellular concept –System Design Fundamentals: Introduction, Frequency Reuse, Channel Assignment strategies, Handoff strategies, Interference and system capacity, Trunkingand Grade of service, improving coverage and capacity in cellular systems.

08 Hours

Module – III

Mobile radio propagation, Large scale path loss: Introduction to radio wave propagation, free space propagation model, Relating power to electric field, The Three basic propagation mechanism, reflection, ground reflection (Two-Ray) Model, Diffraction, Scattering, Practical link budget design using path loss models, outdoor propagation models, indoor propagation models , signals penetration into building s, ray tracing and site specific modeling.   **08 Hours**

Module – IV

Modulation Techniques for mobile radio: Digital modulation- an overview, line coding pulse shaping techniques, geometric representation of modulation techniques, liner modulation technique, constant envelope modulation, combined linear and constant envelope modulation techniques.   **08 Hours**

Module – V

Multiple-Accesses (MA) schemes: Introduction, FDMA, TDMA, SDMA, packet radio, capacity of cellular system.   **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Describe basics of wireless communication techniques.

- Analyze and describe the fundamentals of cellular concepts.

- Describe mobile radio communication in depth.

- Distinguish between different types of modulation techniques for mobile radio communication.

- Differentiate the types of Multiple Access schemes.

Text Books:

1. Theodore S. Rappaport: "Wireless communications - Principles and Practices", 2nd Edition, Prentice Hall, 2001, ISBN-10: 0130422320, ISBN-13: 978-0130422323.

Reference Books:

1. Dr. Kamilo Feher: "Wireless digital communication", Prentice Hall, Har/Dskt, 1995, ISBN-10: 0130986178, ISBN-13: 978-0130986177.

2. William C. Y. Lee: "Mobile Communication Engineering -Theory and applications", Tata McGraw Hill, 1995, ISBN-10: 0070370397, ISBN-13: 978-0070370395.

E-Resources:

1. http://nptel.ac.in/courses/117102062/8

2. http://nptel.ac.in/courses/117102062/21

3. http://www.radio-electronics.com/info/cellulartelecomms/cellular_concepts/multiple_access_schemes.php

4. https://www.elprocus.com/types-of-wireless-communication-applications/

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Artificial Intelligence

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17ECT742	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to

- Apply a given AI technique to a given concrete problem
- Implement non-trivial AI techniques to handle complex problem
- Understand uncertainty and Problem-solving techniques.
- Understand various symbolic knowledge representation to specify domains and reasoning tasks of a situated software agent.
- Understand different logical systems for inference over formal domain

Syllabus

Module – I

Introduction: What is AI? Intelligent Agents: Agents and environment; Rationality; the nature of environment; the structure of agents. Problem solving: Problem-solving agents; Example problems; Searching for solution; Uninformed search strategies.

09 Hours

Module – II

Informed Search, Exploration, Constraint Satisfaction, Adversial Search: Informed search strategies; Heuristic functions; On-line search agents and unknown environment. Constraint satisfaction problems; Backtracking search for CSPs. Adversial search: Games; Optimal decisions in games; Alpha-Beta pruning.

08 Hours

Module – III

Logical Agents: Knowledge-based agents; The wumpus world as an example world; Logic; propositional logic Reasoning patterns in propositional logic; Effective propositional inference; Agents based on propositional logic. **07 Hours**

Module – IV

First-Order Logic, Inference in First-Order Logic-1: Representation revisited; Syntax and semantics of first-order logic; Using first-order logic; Knowledge engineering in first-order logic. Propositional versus first-order inference; Unification and lifting

08 Hours

Module – V

Inference in First-Order Logic-2: Forward chaining; Backward chaining; Resolution.

08 Hours

Course Outcomes:

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

- Design intelligent agents for solving simple gaming by using artificial intelligence.
- Apply non-trivial AI techniques to handle complex problems.
- Apply various symbolic knowledge representation to specific problems.
- Design Knowledge-based agents.
- Understand syntax and semantics of first-order logic.
- Understand inference in first order logic.

Text Book:

1. Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, 2nd Edition, Pearson Education, 2003. (Chapters 1.1, 2, 3.1 - 3.4, 4.1, 4.2, 4.5, 5.1, 5.2, 6.1-6.3, 7, 8, 9, 10, 11.1, 11.2, 11.4, 11.5, 13.1, 13.4, 13.5, 13.6,) ISBN 0-13-103805-2.

Reference Books:

1. Elaine Rich, Kevin Knight: "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2009, ISBN-10: 007087709.
2. Nils J. Nilsson: "Principles of Artificial Intelligence", Elsevier, 1980, ISBN: 978-3-540-11340-9.

E-Resources:

1. http://stpk.cs.rtu.lv/sites/all/files/stpk/materiali/MI/Artificial%20Intelligence%20A%20Modern%20Approach.pdf.
2. http://www.getfreeebooks.com/16-sites-with-free-artificial-intelligence-ebooks

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Micro-Electro-Mechanical Systems (MEMS)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17ECT743	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to :

- Understand the standard micro fabrication techniques and the issues surrounding them.
- Understand the major classes, components, and applications of MEMS devices/systems.
- Understand the unique requirements, environments, and applications of MEMS.

Syllabus

Module – I

Overview of MEMS and Microsystems: MEMS & Microsystems, Typical MEMS and Micro system products — features of MEMS, The multidisciplinary nature of Microsystems design and manufacture, Applications of Microsystems in automotive industry, health care industry, aerospace industry, industrial products, consumer products and telecommunications. **08 Hours**

Module – II

Scaling Laws in Miniaturization: Introduction to scaling, scaling in geometry, scaling in rigid body dynamics, scaling electrostatic forces, electromagnetic forces, electricity, scaling in fluid mechanics & heat transfer.

Transduction Principles in MEMS and Microsystems: Introduction, Micro sensors — thermal, radiation, mechanical, magnetic and bio-sensors, Micro actuation, MEMS with micro actuators. **08 Hours**

Module – III

Microsystems Fabrication Process: Introduction, Photolithography, Ion-implantation, diffusion, oxidation, CVD, PVD, etching and materials used for MEMS, Some MEMS fabrication processes: surface micro-machining, bulk micromachining, LIGA process, LASER micro machining, MUMPS, FAB-less fabrication **08 Hours**

Module – IV

Micro System Design and Modeling: Introduction, Design considerations: Process design, Mechanical design, Modeling using CAD tools: ANSYS / Multiphysics or Intellisuite or MEMS CAD, Features and Design considerations of RF MEMS, Design considerations of Optical MEMS (MOEMS), Design and Modeling: Case studies: i) Cantilever beam ii) Micro switches iii) MEMS based SMART antenna in

mobile applications for maximum reception of signal in changing communication conditions and iv) MEMS based micro mirror array for control and switching in optical communications. **08 Hours**

Module – V

Micro system packaging: Over view of mechanical packaging of micro electronics micro system packaging, Interfaces in micro system packaging, Packaging technologies. **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Describe new applications and directions of modern engineering.
- Describe the techniques for building microdevices in silicon, polymer, metal and other materials.
- Describe the physical, chemical, biological, and engineering principles involved in the design and operation of current and future microdevices.
- Analyze microsystems technology for technical feasibility as well as practicality.
- Describe the limitations and current challenges in microsystems technology.

Text Books:

1. Tai Ran Hsu: "MEMS and Micro Systems: Design and Manufacture", Tata McGraw Hill, 2002.
2. Boca Raton: "MEMS and NEMS: Systems, Devices and Structures", CRC Press, 2002.

Reference Books:

1. J. W. Gardner, V. K. Vardan: "Micro Sensors MEMS and SMART Devices", John Wiley, 2002.
2. N. Maluf: "Introduction to Micro Mechanical Systems Engineering, Artech House", Norwood, MA, 2000.

E-Resources:

1. http://nptel.ac.in/courses/117105082/
2. http://www.ece.ubc.ca/course/elec-465
3. https://www.mems-exchange.org/MEMS/fabrication.html
4. https://www.elprocus.com/understanding-fabrication-mems/

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Advanced C Programming and Data Structures

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17ECT744	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to:

1. Understand the basic concepts of Functions.
2. Acquire the knowledge of arrays and strings.
3. Understand the concepts of pointer.
4. To gain the knowledge of data structures and its applications.

Syllabus
Module –I

Modular Programming using Functions: Declaration, Definition, Passing arguments to function. **Storage classes**: automatic and static, **Preprocessor**: File Inclusion, Macro Without Arguments, Macro With Arguments and Predefined Macros.

08 Hours

Module – II

Arrays : Declaration of Array, Accessing elements of array, Passing Array to Function
Multidimensional arrays: Matrix, Initialization, accessing elements, passing matrix for functions
Strings - Character Arrays: Declaring and Initializing strings, String I/O : gets, fgets , puts, Character Lib Functions : is digit , is space, is alpha etc., String Library Functions : strlen , strcpy, strcmp , strcat

08 Hours

Module – III

Introduction to Pointers: Pointer Declarations, Passing Arguments by Value ,Passing Arguments by Address, Relation between Pointer and Array Pointer. Arithmetic operations using const with Pointers and Parameters Declarations implementing string functions.

08Hours

Module – IV

Structures: Declaration of Structure and Structure Variable**,** Accessing Structure Members, Memory Allocation of Structure, Passing Structure to Function by value, Passing Structure to Function by address, Accessing Structure Members using pointers.

08 Hours

Module – V

Data structures: Stack, Applications of Stack, Queue, Applications of Queue, Linked List ,Single Linked List, **Single Linked List :** Ins Front, Rear, Order ; Del Front, Rear , Key. Circular Linked List, Double Linked List: Traversal Front-Rear & Rear – Front, Trees ,Trees - BST : Insertion, Traversal, Height, Count Leaf, Expression Tree.

08 Hours

Course Outcomes: On successful completion of this course, students should be able to:

1. Understand the basic principles of C language.
2. Achieve knowledge of design and development of c problem solving skills.
3. Effective utilization of memory using pointers.
4. Develop modular programming using structures.
5. Understand the basic concepts of data structures.

Text book:

1**.** Deepali Srivastava ,S.K.Srivastava **-" C in depth",**3rd Edition, BPB publications.
2**.** Aaron M. Tenenbaum, Moshe J.Augestein,Yedidyah Langsam **–"Data Structures Using C",**1st Edition,Pearson Education

Reference Books:

 1. **Dennis M Richie, Brain W Kernighan**- "The C programming language",
2nd Edition, PHI, 2012**.**
2. Balguruswamy, "Data structure Using C**", McGraw Hill Education.**

E-RESOURCES:

1. http://cds.iisc.ac.in/courses/ds286/
2. https://www.javatpoint.com/data-structure-tutorial

Introduction to Embedded Systems and C Programming

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17ECT745	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to:

1.Analyze and design hardware and software for small digital systems involving microprocessors.
2.Understand the organization of a simple digital computer.
3.Use the 8051 microcontroller and its standard peripherals.
4.Apply assembly and C languages in embedded computer systems.

Syllabus

Module –I

INTRODUCTION TO EMBEDDED SYSTEM: History & need of Embedded System, Basic components of Embedded System, Programming Language Classification of Embedded System, Advantage & Disadvantage

08 Hours

Module – II

MICROPROCESSOR & MICROCONTROLLER CLASSIFICATION: Difference between Microprocessor & Microcontroller, Classification based on architecture, Memory Classification

08 Hours

Module – III

INTRODUCTION OF EMBEDDED C: Introduction to Embedded C, Difference between C & Embedded C, Programming style, Basic structure of C program
CONSTANTS, VARIABLES & DATA TYPES: Keywords & Identifiers, Data type & its memory representation, Arrays and strings.

08 Hours

Module – IV

OPERATORS: Types of Operators, Bitwise Operators explained
FUNCTIONS:Why Functions, Types of Functions, A Multi functional program, Return values & their types

08 Hours

Module – V

INTRODUCTION TO SOFTWARES: Kiel Compiler, Proteus

08 Hours

Course Outcomes: On successful completion of this module, students should be able to:

 1.Analyze and design hardware and software for small digital systems involving microprocessors.
2.Understand the organization of a simple digital computer.
3.Use the 8051 microcontroller and its standard peripherals.
4.Apply assembly and C languages in embedded computer systems

Reference Books:

1. Aaron M. Tenenbaum, Moshe J.Augestein,Yedidyah Langsam –**"Data Structures Using C",**1st Edition,Pearson Education
2. **Dennis M Richie, Brain W Kernighan**- "The C programming language", 2nd Edition, PHI,

2012**.**
3. Muhammed Ali Mazidi, Janice G Mazidi, "The 8051 Microcontroller and Embedded Systems**", 2nd edition.**

E-RESOURCES:
1. https://www.electronicshub.org/basics-of-embedded-c-program/
2. https://www.elprocus.com/basics-and-structure-of-embedded-c-program-with-examples-for-beginners/

Advanced Java with Full-stack

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17ECT746	3:0:0:0	3	CIE:50 SEE:50	3 Hours	EE

Course Objectives:

This course will enable students to:

1. Understand the programming concepts.

2. Design interfacing modules to communicate with external world.

3. Differentiate the addressing modes and instruction set to perform - arithmetic & logic operations, data & control transfer operations, input & output operations.

4. Describing the java full-stack data types and developing java programs & Development software.

5. Describing the java full-stack database Concepts.

Syllabus
Module –I

Procedures-Set Operators-Review Session-HTML / CSS / JavaScript-Servlets-JSP / Ajax-Deployment. Introduction to JSP (JSP Lifecycle) - Basic JSP Elements Scripting Elements

Ajax-Scope / Implicit Objects / EL operators / JSP Tags-Basic JSTL-Tomcat Server / WAR / Deployment.

08 Hours

Module – II

Review of Programming Concepts -(Conditional / Looping / Arrays)-Review of OOPS Concepts – I-(Encapsulation / Relationships / Inheritance / Abstract Class)-Review of OOPS Concepts - II (Interfaces / Polymorphism / JDBC)-Review of SQL Concepts-Identification of Actors & Usecases in Application-Building the Domain Model of an Application / Creating Class Diagram.

08 Hours

Module – III

Building the DB layer / Creating the ER Diagram-Implementing a Login flow in Three tier architecture-Implementing business flow for 3 requirements-Using a Console UI with files to read and process.

08 Hours

Module – IV

Introduction to Junit-Writing Junit for BO layer & DAO layer along with MOCK Objects-Review of Web Technology Concepts - HTML / JS / CSS-Review of Web Technology Concepts - Servlets / JSP-Replace Console UI with Web UI-Introduction to Selenium-Writing Selenium Scripts for UI Components-Introduction to AWS-Deploy an application in cloud.

08 Hours

Module – V

Introduction to Hibernate-Hibernate Mapping and relationships-Framework Overview Spring Core, IOC-Dependency Injection-Autowiring-JDBC Templates / Prepared Statements / RowMapper-Spring With Hibernate-Spring MVC Overview-Implementing business flow for 3 requirements-Spring MVC CRUD application-Introduction to Jquery & JS Frameworks

Jquery & Ajax-Introduction to Bootstrap & LESS-Capstone Project.

08 Hours

Course Outcomes: On successful completion of this module, students should be able to:

1. Understand the programming concepts.

2. Understand the Design interfacing modules to communicate with external world.

3. Understand the Differentiate the addressing modes and instruction set to perform - arithmetic & Understand the logic operations, data & control transfer operations, input & output operations.

4. Understand the Describing the java full-stack data types and developing java programs & Development software.

Reference Books:
1. O'Reilly Offering Programming eBooks for Free (Reddit)
2. GitHub—Thousands of free programming Books on every topic
3. Non-Technical Books to make you a better Programmer (Reddit)

E-RESOURCES:
1. https://en.wikipedia.org/wiki/Java_(programming_language)
2. https://www.w3schools.com/java/

Tax Management

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE751	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Familiarise the students with the significance of taxation system.
- Understand the structure of Indian Taxation system.
- Gain knowledge about the practical aspects of Indian taxation.
- Understand the system of computation of tax from Salaries.
- Sketch the recent trends in Indian taxation system.

Syllabus

Module – I

Introduction to taxation system, Objectives of taxation, Factors to be considered for tax planning Canons of taxation, Types of taxation, Direct tax, Indirect tax (Broad perspective only). **07 Hours**

Module – II

Taxation system in India, Types of taxes levied in India, Various heads of income tax (Broad outline only} Basic concepts in taxation, Assessment year, Financial year, assessee, Residential status, Tax liability **08 Hours**

Module – III

Income tax authorities in India, Constitution, Powers, Functions specimen of Form 16, Filing of returns, tax evasion, Penalties for contravening the provisions of income tax. **08 Hours**

Module – IV

System of computation of tax from salaries, Taxable income, Permissible deductions from 80C to 80U Fringe benefits exempted from tax, exempted income under section 10 of Income tax act. **10 Hours**

Module – V

Trends in Indian taxation system, Self assessment, PAN card, Budgetary provisions of the financial year 2017-18 on taxation, GST, Advantages, Problems in implementing GST, Measures to overcome the limitations of GST. **06 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Gain knowledge about the system of taxation prevailing in the country.
- Compute tax under different heads.
- Gain practical knowledge on filing returns.
- Calculate the payable tax for salaried individuals.
- Gain insight into recent practices on taxation.

Reference Books:

1. Dr. Vinod K. Singhania: "Direct taxes-Law and Practice", Taxmann Publication.

2. Dr. Mehrotra, Dr. Goyal: "Direct taxes- Law and Practice", Sahitya Bhavan Publication.

3. "7 lectures-Income tax-I ", VBH.

4. Swaminathan: "Income Tax", KPH.

5. T.N.Manoharan: "Income tax including VAT".

6. R.G.Saha, Ushadevi: "Taxation", HPH.

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Assessment of Building Energy Performance

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE752	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Provide a foundation for performing a building energy audit
- Perform assessment tasks on building energy performance
- Submit a Building EQ rating
- Understand the methods and processes to be performed in the field
- Know the process of certifying professionals in energy assessment

Syllabus

Module – I

Introduction, global energy consumption characteristics and the role of commercial and residential buildings, building energy end use consumption characteristics, impact of time variations in building energy consumption, Building mechanical, electrical, and lighting systems.   **08 Hours**

Module – II

Anatomy of typical HVAC systems in commercial buildings , typical primary and secondary HVAC equipment and their role in meeting system requirements , basics of electrical distribution systems and their equipment in commercial buildings, basics of lighting system in buildings, including performance terminology, lighting technologies, energy performance, and the role of day lighting.   **08 Hours**

Module – III

Introduction to building energy benchmarking and assessment , differences between benchmarking, labeling programs, and energy and environmental auditing, role of building type and climate zone on energy use, key aspects of ENERGY STAR® Portfolio Manager and other tools for benchmarking, ASHRAE Building EQ As Designed and In Operation ratings, differences between Building EQ and Portfolio Manager, Preliminary Energy Use Analysis (PEA).   **08 Hours**

Module – IV

Measuring and monitoring building performance, instrumentation for measuring indoor environmental quality and building energy flows, Perform measurements of indoor environmental quality and building energy flows, accuracy of building measurements, Identify the components of an ASHRAE Level 1 walk through survey and the differences between Level 1, 2, and 3 surveys, Indoor Environment Quality.

08 Hours

Module – V

Energy Efficiency Measures – Building Envelope and Lighting, role of building envelope characteristics on energy use, energy conservation and energy efficiency measures related to envelope and lighting characteristics, Energy Efficiency Measures – HVAC Systems, energy conservation and energy efficiency measures related to HVAC systems, financial analysis of expected improvements to HVAC systems. **08 Hours**

Course Outcomes:

On completion of the course, the student will be able to:

- Produce an ASHRAE Building EQ In Operation rating for the buildings provided in the class

- Produce a listing of potential Energy Efficiency Measures (EEM) including financial payback analysis

- Perform measurements of indoor environmental quality and HVAC system performance

- Identify different building types and determine the impact of climate on energy use.

- Analyze raw energy consumption data from measured-meter readings

Text Books:

1. ASHRAE Building Energy Quotient Program website.
2. ASHRAE BEAP certification study guide.
3. ASHRAE Standard 105-2014 Standard Methods of Determining, Expressing, and Comparing Building Energy Performance and Greenhouse Gas Emission.

Reference Books:

1. ASHRAE Performance Measurement Protocols for Commercial Buildings: Best Practices Guide.
2. ENERGY STAR® Portfolio Manager website.

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Natural Disaster Mitigation and Management

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE753	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Understand the types of natural and environmental disasters.

- Develop skills in various stages of disaster preparedness, mitigation and management.

- Understand the methodologies for disaster risk assessment.

Syllabus

Module – I

Natural Disasters – Overview: Introduction- Natural Disasters around the world- Natural Disaster Risk Assessment- Earth and its characteristics Human Dimensions of Global environment Change – Disaster mitigation, preparedness, response and recovery comprehensive emergency management Early warning systems and Disaster Preparedness– Rehabilitation, Vulnerable Populations - Logistics and Services, Food, Nutrition and Shelter -Role of UN Red cross and NGOs.   **08 Hours**

Module – II

Natural Hazards: Introduction and Review - Natural Disasters -Principles, Elements, and Systems - Geological-Geomorphological aspects, - Earthquake-Geology, Seismology, Characteristics and dimensions– Landslides- Human impact on the mountainous terrain and its relationship with Rainfall, liquefaction etc- Tsunami - Nature and characteristics.   **08 Hours**

Module – III

Climate system aspects and Processes: Oceanic, Atmospheric and Hydrologic cycles - Severe Weather & Tornadoes , Cyclones, Floods and Droughts - Global Patterns - Mitigation & Preparation – Drought – Famine- nature and dimensions – Drought Assessment and Monitoring.   **08 Hours**

Module – IV

Natural Disaster Communication: Mapping - Modeling, risk analysis and loss estimation – Natural disaster risk analysis - prevention and mitigation - Applications of Space Technology (Satellite Communications, GPS, GIS and Remote Sensing and Information / Communication Technologies (ICT) in Early warning Systems - Disaster Monitoring and Support Centre– Information Dissemination, mobile communication – etc.   **08 Hours**

Module – V

Administrative mechanisms: Community and Social organizations – Education and Training – Establishment of capacity building among various stake holders – Government - Educational institutions – Use of Multi-media knowledge products for self education. **08 Hours**

Course Outcomes:

On completion of the course, the student will be able to :

- Learn about the types of natural and environmental disasters and its causes.
- Learn about organizational and Administrative strategies for managing disasters.
- Learn about the early warning systems, monitoring of disasters effect and necessity of rehabilitation.
- Learn about the engineering and non-engineering controls of mitigating various natural disasters.
- Understand the key roles of capacity building to face disaster among government bodies, institutions, NGO's, etc.
- Learn methodologies for disaster risk assessment with the help of latest tools like GPS, GIS, Remote sensing, information technologies, etc.

Text Books:

1. Kovach, Robert L :"Earth's Fury: An Introduction to Natural Hazards and Disasters", Englewood Cliffs, N.J., Prentice Hall, 1995.
2. Siddhartha Gautam, K Leelakrishna Rao: "Natural disaster Management", 3rd Edition, 2012, ISBN: 9381604320.

Reference Books:

1. Arul Jothi, D L Balaji: "Safety And Disaster Management Education in Schools", 1st Edition, Anmol Publications, 2009, ISBN: 9380252609.

E-Resources:

1. https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/dsstr/bt-dsstr-mtgtn-en.aspx
2. www.nrdms.gov.in/natural_disaster.asp
3. https://www.ncbi.nlm.nih.gov › NCBI › Literature › Bookshelf

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AUTOMOTIVE EMBEDDED SYSTEM DESIGN

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE755	2:0:2:0	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to:

1. Understand the automotive embedded system architecture & its programming concepts.

2. To perceive functional difference between mechanical and electronics based control units.

3. To create and establish an open and standardized software architecture for automotive electronic control units.

4. To learn user friendly testing and development tool for CAN.

Syllabus
Module –I

Introduction to Automotive Embedded Systems: Introduction, Basic building blocks of embedded systems, Automotive Systems Overview, Embedded Technology in Automotive Industry, Automotive Microcontroller MISRA C**:** Embedded C & Coding Standards Acc to Automotive, Introduction to MISRA C Automotive Standard, Understanding the Rules in MISRA C, Static Analysis of selected programs for compliance.

08 Hours

Module – II

Introduction to CAN Protocol: Features of CAN, CAN nodes and states, CAN Controller, CAN Transceiver, CAN Bus levels; NRZ Coding; Twisted Pair wiring with termination, CAN Communication Principle, CAN Standard and Extended, Characteristics of CAN Protocol, CAN from OSI Perspective, CAN Frame Formats, Error Detection Mechanisms, BIT Stuffing; Synchronization, CAN Time Quanta; Relation of Baud rate and Length of CAN bus, CRC and Acknowledge

08 Hours

Module – III

CAN Programming: Related Registers, Implementing CAN Messaging system, Communication between two nodes using CAN protocol.

Introduction to Vehicle Networks: Introduction to Bus Network in vehicles, Fundamentals of Serial Data Transmission and communication architectures, CSMA-CD, Comparison of different Vehicle network protocols (CAN, FLEXRAY,LIN,MOST)

08 Hours

Module – IV

Introduction to the BUS MASTER, SBUS CAN: Tx and Rx data through BUS MASTER tool, Errors during the message transmission, Create log files of messages, Convert log files to .xls format, Putting log files for Transmission by Replay the message, Create the Data Base into BUS MASTER and generation of signal, Introduction to OBD for vehicle system.

0**8 Hours**

Module – V

Automotive Embedded System Design & SDLC: Understanding Automotive Product Design Cycle, Introduction to Software Development Life Cycle, Types of Software Development Life Cycle, Introduction to AUTOSAR: Overview, Need for AUTOSAR, AUTOSAR Layer Model,

Methodology, RTE: Run Time Environment.

07 Hours

List of Experiments:
1. C program for self test mode using CAN protocol.
2. C program to check the status of seat belt in a vehicle.
3. C program to test the braking system in a vehicle.
4. C program to check the ignition system of a vehicle.
5. C program to check to battery status of the vehicle for the defined values.

Course Outcomes: On successful completion of this course, students should be able to:
1. Design and develop automotive embedded systems.
2. Analyse various embedded products used in automotive industry.
3. Evaluate the opportunities involving technology a product or a service required for developing a start up idea used for automotive applications.
4. Will be able to interface devices and build the complete system.

Text Books:
1. Shibu K V, **"Introduction to Embedded Systems"**, Tata McGraw Hill Education Private Limited, 2009
2. K. Etschberger. **"Controller Area Network: Basics, Protocols, Chips and Applications"** IXXAT Automation GmbH, Weingarten, Germany, 2001.

Reference books:
1. CAN specification version 2.0. Robert Bosch GmbH, Stuttgart, Germany, 1991

E-RESOURCES:
1. http://www.autosar.org, 2004. Homepage of the development partnership Automotive Open System Architecture (AUTOSAR).
2. http://www.can-cia.de, 2004. Homepage of the organization CAN in Automation (CiA)

Advanced Embedded Systems

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE756	2:0:2:0	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

 This course will enable students to:

1. Understand the embedded systems architecture & its programming concepts.

2. Design Embedded interfacing modules to communicate with external world.

3. Analyse interfacing concepts of embedded systems and to interface switches and key boards

Syllabus
Module –I

Typical Embedded System: Introduction to embedded systems, core of the embedded system, memory, sensors and actuators, communication interface, embedded firmware, other system components. Characteristics and Quality Attributes of Embedded Systems

8Hours

Module – II

Hardware Software Co-Design and Program Modelling: Fundamental issues in hardware software co-design, computational models in embedded design, introduction to unified modelling language, hardware software trade-offs.

8Hours

Module – III

INTERFACING OF LED :Introduction of LED's, Interfacing Circuit Description of LED's ,Programming of LED's Interfacing.

8Hours

Module – IV

 INTERFACING OF SEVEN SEGMENT DISPLAY : Introduction to 7 Segment Display , Types of 7 Segment Display , Interfacing Circuit Description of 7 Segment Display ,Programming of 7 Segment Display Interfacing.

INTERFACING OF LCD :Introduction to 16 x 2 LCD ,Commands of 16 x 2 LCD , Interfacing Circuit Description of 16 x 2 LCD , Programming of 16 x 2 LCD.

8Hours

Module – V

INTERFACING OF SWITCHES & KEYBOARD MATRIX: Introduction to Switches & Keyboard Matrix, Interfacing Circuit of Switches & Keyboard Matrix, Programming of Keyboard Matrix & Switches, Controlling of LED's by using Switches Key board Matrix & LCD Interfacing Program, I2C Bus Standard,UART   **8Hours**

List of experiments:

1. Embedded C program on Eight LED switch

2. Design of Calculator using C programming using Proteus tool

3. Simulation of Curton program (Bit operations) using Proteus tool

4. Simulation of LCD keypad set up using Proteus tool

5. Simulation of serial data transfer using Proteus tool.

6. Keypad interfacing using Proteus tool.

Course Outcomes: On successful completion of this module, students should be able to:

1. Understand the basics of embedded systems like firmware and other system components.
2. Analyse the hardware software co-design
3. Understand interfacing of LED along with programming
4. Understand interfacing of Seven segment Display and LCD
5. Study and analyse interfacing of switches and keyboard to embedded systems.

Reference Books:

1. Shibu K V, "Introduction to Embedded Systems", 2nd Edition, McGraw Hill Education, 2009.

2. K. V. K. K. Prasad, "Embedded Real-Time Systems: Concepts, Design & Programming",Dreamtech Press, 2005.

E-RESOURCES:

1. https://www.elprocus.com/basics-of-embedded-system-and-applications/

2. https://www.coursera.org/lecture/embedded-operating-system/introduction-to-embedded-systems-vOlUy

3. https://www.elprocus.com/led-interfacing-with-8051-microcontroller/

4. https://embetronicx.com/tutorials/tech_devices/matrix_keypad/

Advanced Java

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE757	2:0:2:0	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to:

1. Understand the programming concepts.

2. Design interfacing modules to communicate with external world.

3. Differentiate the addressing modes and instruction set to perform - arithmetic & logic operations, data & control transfer operations, input & output operations.

4. Describing the java data types and developing java programs & Development software.

5. Describing the java database Concepts.

Syllabus

Module –I

Java Basics : Java Languages Fundamentals-Data Types and Variables-Literals and Operators-Control Statements-Arrays.

8Hours

Module – II

Introduction to OOPS-Objects and Classes-Variables, Blocks Constructors-Methods-Method Overriding-Inheritance-Packages-Method Overriding-Abstract Classes-Interfaces-Inner Classes.

8Hours

Module – III

Exploring Object class-JVM Memory Management-String API and String Buffer API-Wrapper Classes-Exception Handling-Multi Threading-Java.Util Package-Collection Framework-IO Streams-Reflection-Enum.

8Hours

Module – IV

Structured Programming-Classes and Objects-Colections 1-OOPS-Threading-Exception Handling & Strings-Collections 2-JDBC-DDL-DML 1-Date, Time, String-DML 2-Views.

8Hours

Module – V

Database Connection : Installation MySql with Java-Creating Database-Preview-Insert data into MySql-Deleting Tables-Sending Email.

8Hours

List of Experiments:
1. Java Program to Calculate average of numbers using Array
2. Java Program to display first n prime numbers
3. Java Program to check Prime Number
4. Java Program to Reverse a String using Recursion
5. Java Program to check if a number is Positive or Negative

Course Outcomes: On successful completion of this module, students should be able to:

1. Understand the programming concepts.

2. Understand the Design interfacing modules to communicate with external world.

3. Understand the Differentiate the addressing modes and instruction set to perform - arithmetic & Understand the logic operations, data & control transfer operations, input & output operations.

4. Understand the Describing the java data types and developing java programs & Development software.

Reference Books:
1. Binstock, Andrew (May 20, 2015). "Java's 20 Years of Innovation". Forbes. Retrieved March 18, 2016.
2. Chaudhary, Harry H. (2014-07-28). "Cracking The Java Programming Interview :: 2000+ Java Interview Que/Ans". Retrieved 2016-05-29.

E-RESOURCES:
1. https://en.wikipedia.org/wiki/Java_(programming_language)
2. https://www.w3schools.com/java/

Small and Medium Enterprise Management

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE761	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to :

- Understand the various concepts of Entrepreneurship and familiarize them with the understanding of contemporary environment of MSMEs.
- Understand the business Environment to MSMEs.
- Understand the process of Enterprise Creation.
- Understand the effective Business Plan and Institutional Support Mechanism.
- Understand the concepts of marketing management in the MSMEs.

Syllabus

Module – I

Basic Aspects: Concept, nature of Entrepreneur and Entrepreneurship, Distinction between Entrepreneur and Manager, Entrepreneurship, Medium, Small and Tiny Business : Definition, Role in the economy and significance, Changing scenario of MSMEs in the era of Liberalization and Globalization, Competitiveness.   **08 Hours**

Module-II

Environment assessment: Political, Legal, Economic, Social, Technological, Global environment, Assessment of business opportunities, Government initiatives and private sector opportunity.   **08 Hours**

Module-III

Enterprise Creation: Starting a small industry, Entrepreneurial function or process of starting a new venture based on personal competencies, requirements to start a business venture, Feasibility of the project, Business incubators .   **08 Hours**

Module-IV

Business Plan: Developing effective business plan-meaning, benefits of business plan, Timing of the business plan, Length of the business plan, composition of the business plan or detailed project report. Institutional Support Mechanism: District Industries Centre, State Directorate of Industries, SIDBI, NSIC, SISI, KSFC, KIADB, TECSOK.   **08 Hours**

Module-V

Small Business Marketing: Concept of Marketing, Scope of Marketing, Marketing Mix, Product Mix, Channels of Distribution, Market Segmentation, Role of Middlemen, Distribution Strategies, Sales Promotion, Advertising and Publicity, Packaging Strategies, Branding Strategies.   **08 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Visualize the various concepts of Entrepreneurship and understand of current environment of MSMEs.
- Know the Business Environment with respect to MSMEs.
- Know the Process of Enterprise Creation.
- Prepare Business Plan and Understand the Institutional Support Mechanism.
- Know the marketing management with reference to MSMEs.

Text Books:

1. Shukla. M.B: "Entrepreneurship and Small Business Management", Kitab Mahal, Allahabad, 2011.
2. Sahay A., V. Sharma: "Entrepreneurship and New Venture Creation", Excel Books, New Delhi, 2008.
3. Lall, Sahai: "Entrepreneurship", Excel Books, New Delhi, 2006.
4. S. Anil Kumar: "Small Business and Entrepreneurship", I.K.International Publishing House Pvt. Ltd., 2008.
5. Kotler, Keller, Koshy, Jha: "Marketing Management", 13th Edition, Pearson Education.

Reference Book:

1. Wickham, Phillip A: "Strategic Entrepreneurship", Pitman, UK, 1998.

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Occupational Safety and Health Administration

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE762	2:0:0:4	3	CIE:50 SEE:50	3hours	OE

Course Objectives:

This course will enable students to :

- Understand the occupational health and safety and sector specific occupational health and safety issues.
- Understand the socio-economic aspects of occupational health and safety.
- Understand the health screening measures.
- Understand the legal Provisions on Occupational Health and Safety.
- Understand the participatory Research and Occupational Health.

Syllabus

Module – I

Introduction to Occupational Health and Safety: Definition and Context of OHS, Objectives and Principles of OHS, Workplace and Health Occupational Health, Hygiene and Ergonomics.

Sector Specific Occupational Health and Safety Issues: Health and Safety Risks in Mining, Health Hazards in Electronic Industry, Health Hazards in Food Processing Industry, Health Hazards in Other Industries. **07 Hours**

Module – II

Socio-Economic aspects of Occupational Health and Safety: Women's occupational and health safety, Child labour issues in occupational health and safety, Health issues in the unorganized sector.

Basics of Preventive Techniques: Definition of Accident, Accident Analysis, Monitoring of Hazards, Reporting and Investigation of Accidents. **08 Hours**

Module – III

Health Screening Measures: Stages of Medical Examination, Occupational History, Pulmonary Function Test (PFT), Noise Induced Hearing Loss (NIHL). **07 Hours**

Module – IV

Legal Provisions on Occupational Health and Safety: Overview of existing OHS Legislations in India, The Factories Act, The Mines Act, The Workmen's Compensation Act, The Employee's State Insurance Act. **07 Hours**

Module-V

Participatory Research and Occupational Health: Philosophy of Participatory Research (PR) Analysis based on PR Methodologies Conducting Participatory Research for OHS.   **07 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Develop the ability to know the occupational health and safety.
- Have the knowledge of the socio-economic aspects of occupational health and safety.
- Demonstrate purpose of health screening measures.
- Know the legal Provisions on Occupational Health and Safety.
- Participate in Research and Occupational Health.

References:

1. International Labour Organinization. Mining: a hazardous work [Internet]. ; 2015 ([cited 2015 Feb 2]. Available from: http://www.ilo.org/safework/areasofwork/ hazardous-work/WCMS_124598/lang--en/index.htm

2. Gyekye, S.A. Workers' perceptions of workplace safety: an African perspective. Int J Occup Saf Ergon. 2006;12:31–42.Crossref | PubMed| Scopus (4)

3. Amponsah-Tawiah, K., Jain, A., Leka, S., Hollis, D., Cox, T. Examining psychosocial and physical hazards in the Ghanaian mining industry and their implications for employees' safety experience. J Safety Res. 2013;45:75–84.Crossref PubMed| Scopus (5)

4. Owiredu D. Annual chamber of mines presidential review. 83rd Annual General Meeting of the Ghana Chamber of Mines [Internet]. 2011 [cited 2014 Mar 1]. Available from:http://www.ghanachamberofmines.org.

5. Helliwell, J.F., Putnam, R.D. The social context of wellbeing. Philos Trans R Soc Lond B Biol Sci. 2004;35:1435–1446.Crossref| Scopus (550)

6. Bhagawati, B. Basics of occupational safety and health. IOSR J Environ Sci Toxicol Food Technol. 2015;9:91–94.

7. Amponsah-Tawiah, K., Dartey-Baah, K. Occupational health and safety: key issues and concerns in Ghana. Int J Bus Soc Sci. 2011;14:120–126.

   National Safety Council. Injury facts. NSC, Itasca (IL); 2004.

Animation and Multimedia Engineering

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE763	2:0:0:4	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to:

- Understand the basics of Animation.
- Understand computer animation using characters.
- Learn how to create quality animation characters.
- Learn about volume construction and action made from face, gestures.
- Understand Acting and Sketching techniques.

Syllabus

Module – I

Introduction to Animation: History of Animation, The Origins of Animation, Types of Animation, Terms used in Animation, Basic Principles of Animation.

Introduction to equipment required for Animation: Animator's Drawing Tools, Rapid Sketching and Drawing, Developing Animation Character.   **07 Hours**

Module – II

Developing the characters with computer animation: Anatomy and Body Language, 2-D virtual drawing for animation.

Motion studies: : Thumbnails, sequential movement drawing, drawing for motion.

08 Hours

Module – III

Essentials and qualities of good animation characters: Three dimensional drawings of characters.

Skills and Basic proportions: Visual and creative development of an artist, how to draw gestures, Heads, Rotation in Arcs, Key Lines, Perspective.   **08 Hours**

Module – IV

Volume Construction: Balance, Muscles, Light and shade.

Shape and Action: Hands and Legs, Foreshortening, Facial expressions.   **08 Hours**

Module – V

Acting and Sketching techniques: Introduction to Acting, Modeling, Sketching from Acting, Sketching from live models, Introduction to Rapid Sketching Techniques, Sketching from Memory, live action. **09 Hours**

Course Outcomes:

On completion of this course, students will be able to :

- Recognize the basics of animation along the tools.
- Develop characters with computer animation.
- Develop 3D drawings of characters and acquire skills regarding basic level of sketching.
- Explain Foreshortening, Facial expressions.
- Develop small animation characters by using acting and sketching techniques.

Text Book:

1. Chris Patmore: "The Complete Animation course: The Principles, Practice and Techniques of Successful Animation", (Chapters 1-10), Barons Educational Series New York, 2003, ISBN-13: 978-0764123993.

Reference Books:

1. Frank Thomas, Ollie Johnston: "The Illusion of Life by Walt Disney", Abbeville Press, 1981.
2. Daniel Carter, Michael Courtney: "Anatomy for the Artist: A Comprehensive Guide to Drawing the Human Body, A Complete Guide", 2011.

E-Resources:

1. http:// www.animationmentor.com/
2. https://www.bloopanimation.com/animation-for-beginners/
3. https://robots.thoughtbot.com/css-animation-for-beginners

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Model Based Design using MATLAB

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE765	2:0:2:0	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to:

- Understand the Matlab Desktop, Command window and the Graph Window
- Carry out numerical computations and analysis.
- Do simple programming and data visualization.
- Competently use the Matlab programming environment
- Understand the concepts of **Raspberry-pi**

Syllabus

Module –I

Introduction: Introduction to MATLAB, MATLAB Environment, Model Based Design, Data types, creating and manipulating matrices.

8 Hours

Module – II

Data Structures :

Indexing techniques, resizing & Reshaping matrices, operations on matrices, solving linear equations, cell arrays and structures, scripts and functions, global variables.

8 Hours

Module – III

Programming in Matlab: Flow control constructs, functions, function handles**.**
Data visualization: MATLAB graphics system, 2D graphics, graphical user interface (guide).

8 **Hours**

Module – VI

Simulink: Introduction , block diagrams and model building, subsystems and masking
Logic driven modeling using state flow: Logic driven modeling, parallel and exclusive states, finite state machines, events in state charts.

8 Hours

Module – V

Introduction to Raspberry-pi: Introduction, general purpose input-output (GPIO) connector, operating system, NOOB setup.

7 Hours

List of Experiments:

1. MATLAB program to show switch operation.
2. MATLAB program to find factorial of a number.
3. MATLAB program to convert RGB image to grayscale image and vice versa.
4. MATLAB program to develop calculator using GUI.
5. MATLAB program to generate sine and cosine wave by considering the defined parameters.

Course outcomes:
1. Able to program scripts and functions using the Matlab development environment.
2. To perform mathematical computations
3. Ability to express programming & simulation for engineering problems.
4. Ability to connect programming files with GUI Simulink
5. Articulate importance of software's in research by simulation work.

Text books:
1.Rudra Pratap**,"Getting started with MATLAB",** South Asia edition, Oxford university press
2.Agam Kumar Tyagi**,"MATLAB and Simulink for engineers"**,Oxford higher education.

Reference books:
1.Oleg A.Yakimenko**,"Engineering computations and modeling in MATLAB/Simulink**",Reston publications
2.Amos Gilat,"MATLAB,An introduction with application", 5th edition , Wiely publications.
3. Adrian B. Biran," MATLAB and Simulink", 1st edition, CRC Press

E-RESOURCES:
1. **https://en.wikibooks.org/wiki/MATLAB_Programming**
2. **https://www.mathworks.com/help/matlab/programming-and-data-types.html**

Introduction to ARMs Processor and its Applications

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE766	2:0:2:0	3	CIE:50 SEE:50	3 Hours	OE

Course Objectives:

This course will enable students to:

1.Collect knowledge of architecture of ARM 7processor and assembly programming of ARM.

2. Design, construct, program, verify, analyze and troubleshoot ARM assembly

and C language programs and supporting hardware.

Syllabus

Module –I

Introduction to Embedded Systems: Embedded system vs General computing system, characteristics of an embedded system, quality attributes of embedded system, core of embedded system, memory, sensors and actuators, communication interfaces, Embedded firmware design approaches, embedded firmware development languages.

8 Hours

Module – II

ARM7 Processor Fundamentals: ARM Architecture, Registers, current program status register, pipeline, exceptions, interrupts and vector table, core extensions. Introduction to ARM, Instruction Set: Data Processing Instructions, Branch Instructions

8 Hours

Module – III

Introduction to ARM7 Instruction Set: Load Store Instructions, Software Interrupt Instruction, Program Status Register Instructions, Loading Constants, and Conditional Execution.

8 Hours

Module – IV

Interrupts & Exception Handling in ARM7: Exception Handling Interrupts, Interrupt handling schemes, Design of system using GPIO"s (LCD interface, 4 x 4 Keypad), Timers.

8 Hours

Module – V

Embedded/Real – Time Operating System Concepts: Architecture of the Kernel, Tasks & Task Scheduler, and Interrupt service Routine.

8 Hours

List of experiments:

1. C programming to interface ADC with ARM processor
2. C programming for LED interface with ARM processor
3. C programming for Key pad interfacing with ARM processor
4. C programming for Serial communication with ARM processor
5.Programming on UART.

Course Outcomes: On successful completion of this module, students should be able to:

1. Identify the requirements of an embedded system
2. Familiarize with the ARM architecture
3. Write programs using ARM instruction set

4. Analyze the various ways of handling exceptions and interrupts in ARM processor
5. Develop embedded C programs to interact with various built in peripherals of ARM7

Reference Books:
1. Andrew N. Sloss, "ARM system Developers Guide", Elsevier, 1st Edition, 2008
2. William Hohl, Christopher Hinds"ARM assembly language Fundamentals and Techniques**",**
2nd edition
E-RESOURCES:
1. https://whatis.techtarget.com/definition/ARM-processor
2.https://web.eecs.umi**ch.edu/~prabal/teaching/eecs373**f10/readings/ARM_Architecture_Overvie
w.pdf
3. http://www.iti.uni-stuttgart.de/~radetzki/Seminar06/08_report.pdf
4. http://ee.cgu.edu.tw/ezfiles/7/1007/img/476/EmbSys99(OM)_Exception.pdf

Advanced Python

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17HOE767	2:0:2:0	3	CIE:50 SEE:50	3 Hours	0E

Course Objectives:

This course will enable students to:

1. Understand the programming concepts.

2. Design interfacing modules to communicate with external world.

3. Differentiate the addressing modes and instruction set to perform - arithmetic & logic operations, data & control transfer operations, input & output operations.

4. Describing the python data types and developing python programs & Development software.

5. Describing the python database Concepts.

Syllabus
Module –I

Python Languages Fundamentals: Data Types and Variables-Literals-and Operators-Control Statements and Functions-Python Data Structures.

8Hours

Module – II

List & Functions : Lists-Tuples-String-Dictionary-Introduction Function-Arguments-Pass by value-Pass by Reference

8Hours

Module – III

Oops : Object Oriented Programing in Python-More On OOPS-Class-Object-Inheritence--Exception Handling-Regular Expressions-rest.

8Hours

Module – IV

File : Basic Of File Operation Methods-Preview-Create File-Reading File-Writing File-Preview-Appending Files.

8Hours

Module – V

Database Connection : Installation MySql with Python-Creating Database-Preview-Insert data into MySql-Deleting Tables-Sending Email.

8Hours

List of Experiments:
1. Python Program to root of Quadratic Equation
2. Python Program to Generate a Random Number
3. Python Program to Convert temperatures to and from celsius, fahrenheit
4. Python Program to Check if a Number is Positive, Negative or 0

5. Python Programming Code to Print Fibonacci Series

Course Outcomes: On successful completion of this module, students should be able to:

1. Understand the programming concepts.

2. Understand the Design interfacing modules to communicate with external world.

3. Understand the Differentiate the addressing modes and instruction set to perform - arithmetic & Understand the logic operations, data & control transfer operations, input & output operations.

4. Understand the Describing the python data types and developing python programs & Development software.

Reference Books:
1. Guttag, John V. (2016-08-12). Introduction to Computation and Programming Using Python: With Application to Understanding Data. MIT Press. ISBN 978-0-262-52962-4. Deily, Ned (28 March 2018). "Python 3.7.0 is now available". Python Insider. The Python Core Developers. Retrieved 29 March 2018.

E-RESOURCES:
1. https://en.wikipedia.org/wiki/Python_(programming_language)
2. https://www.w3schools.com/python/
3. https://www.cs.uky.edu/~keen/115/Haltermanpythonbook.pdf

Power Electronics Lab

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17ECL77	1:0:2:0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Understand the working knowledge of different triggering circuits, DIAC and TRIAC.
- Understand the operation and characteristics of Stepper motor and Inverter.

List of Experiments:

1. SCR Characteristics
2. TRIAC Characteristics
3. MOSFET Characteristics
4. IGBT Characteristics
5. RC Triggering circuit – HWR & FWR
6. UJT Triggering of SCR
7. Oscillation Chopper circuit
8. UJT Triggering circuit – HWR & FWR
9. Digital Firing circuit
10. AC Voltage control by using TRIAC and DIAC
11. Single Phase FWR
12. Impulse Commuted Chopper
13. Speed control of a Stepper motor
14. Series Inverter
15. Parallel Inverter

Course Outcomes:

On completion of this course, students will be able to :

- Understand the fundamental concepts of MOSFET, IGBT and SCR.
- Understand the basics of UJT HWR and FWR.
- Discuss UJT triggering of SCR.
- Understand Stepper motor concepts.
- Describe various types of inverters.

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Data Communication Lab

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17ECL78	1:0:2:0	2	CIE:50 SEE:50	3 Hours	FC

Course Objectives:

This course will enable students to :

- Understand the practical aspects of techniques used in data communication
- Understand the Serial communication techniques for data communication

List of Experiments:

1. Simulate bit stuffing and destuffing
2. Character stuffing
3. Encryption and decryption
4. Cyclic Redundancy check
5. Simulate short path
6. Minimum spanning tree
7. Serial Communication using RS-232 (Synchronous and Asynchonous)
8. Serial Communication using telephone cable
9. Telnet
10. Remote host access

Course Outcomes:

On completion of this course, students will be able to :

- Understand different data stuffing techniques used in communication.
- Analyze basic encryption techniques.
- Discuss spanning tree.
- Understand serial communication techniques.
- Describe telnet basics and remote access.

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Project Phase-I and Seminar

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
17ECP79	0-0-6-0	3	100	3 Hours	FC

Phase	Activity	Credits
I	Batch formation, project identification, literature survey, finalization of problem statement with objectives and outcomes, Synopsis submission, Preliminary seminar for the approval of selected topic and objectives	3

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Eighth Semester B.E. – Syllabus

Phase	Activity	Credits
II	Design, Theoretical/experimental investigation and Mid-term seminar to review the progress of the work and documentation (Mid term report).	4
III	Completion of the project work, participation in the project exhibition, Submission of project report Final Internal seminar and demonstration, Publications.	4
	Evaluation and Viva-voce	5 +5