MTL 1012				**Engineering Mathematics-I**			Pre Requisites			
Version R-01							Co-requisites			
L	T	P	C	Minor Duration	Major Duration	Assignment	Minor-I Marks	Minor-II Marks	Major Marks	Total Marks
3	0	0	3	2 Hours	3 Hours	10	20	20	50	100

COURSE OUTCOMES

After successful completion of this course, students shall be able to;

1. Introduce the basic concept of differential calculus to understand the different subjects of engineering as well as basic sciences.
2. Enable the students to develop the concept of partial differentiation to understand their applications in engineering
3. Understand the fundamentals of Integral calculus to understand their applications to length, area, volume, surface of revolution, moments and centre of gravity
4. Understand the improper integrals and Beta and Gamma functions and their applications.
5. Understand the idea of Linear Algebra which are useful to all branches of engineering.

COURSE CONTENTS

Unit-I **(12 Contact periods)**

Differential Calculus: Partial differentiation, asymptotes, concavity, convexity, point of inflexion, curvature, radius of curvature, curve tracing, envelopes and evolutes, change of variables, Jacobian, expansion of functions of several variables, chain rule, mean value theorem, Taylor series with remainder term, maxima & minima, saddle point.

Unit-II **(12 Contact periods)**

Integral Calculus: Fundamental theorem of Integral calculus, reduction formulae, properties of definite integral, applications to length, area, volume, surface of revolution. Moments, centre of gravity, improper integrals, β-γ functions.

Unit-III **(12 Contact periods)**

Matrices: Elementary row and column transformation, linear dependence, rank of a matrix, consistency of system of linear equations, solution of linear system of equations, characteristic equations, Cayley Hamilton theorem, eigen values and eigen vectors, diagonalization, complex matrices.

Recommended Books:

1. E. Kreysig, Advanced Engineering Mathematics, Wiley 1oth edition, 2011.
2. A . K. Gupta, Engineering Mathematics, Macmillan 7th edition 2013.
3. McQuarri Macmillan, Mathematical Methods by Scientists & Engineers, 1st edition 2003.
4. Shanti Narayan, Differential Calculus, S Chand; 30thRevised edition, 2005.

NOTE:	End Term Evaluation (Major Exam) shall be carried out in three stages. Minor I (20 marks), Minor II (20 marks), and Major (50 marks) exams.
	Assignment Marks shall be awarded on students' work in the form of Case Study / Design problem / Presentation / Quiz, which shall be evaluated by the concerned faculty.

Engineering Mathematics-I (1012)

MTL1012	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Engineering Mathematics -I (1012)	**CO1**	2	2	1	2	2	2	2	1	2	2	1	2	3	3
	CO2	2	2	2	2	2	2	2	1	2	2	1	2	2	3
	CO3	2	2	2	2	2	2	2	1	2	2	1	2	3	2
	CO4	2	2	2	2	1	2	2	2	2	2	1	2	3	2
	CO5	2	2	2	2	1	2	2	2	2	2	1	2	3	3

ECL 1020				**Basic Electrical Engineering**			Pre Requisites			
Version R-01							Co-requisites			
L	T	P	C	Minor Duration	Major Duration	Assignment	Minor-I Marks	Minor-II Marks	Major Marks	Total Marks
3	0	2	4	2 Hours	3 Hours	10	20	20	50	100

COURSE OUTCOMES

1. To learn basic concepts of electrical engineering and be able to understand their applications.
2. To apply basic circuit analysis concept to solve basic electrical circuits.
3. To apply the network theorems to practical problems.
4. To study resonance behaviour of electrical circuits.
5. To learn basic operating principle of transformer.

COURSE CONTENTS

Unit I: Introduction (3 contact hours)

Semiconductor Classification ,Semiconductor bonds, Energy band description ,Semiconductor types, Hall effect.

Unit II: Diodes (4 contact hours)

P-N junction-I/V characteristics, diode equivalent circuits, semiconductor diodes, rectifiers-(efficiency, ripple factor),filters,clipers,clampers.

Unit III: Transistors (4 contact hours)

BJT construction, characteristics (cb,ce,cc), load line. BJT biasing. FET, JFET, MOSFET (Depletion and enhancement), FET biasing.

Unit IV: Transistor Modeling (5 contact hours)

BJT small signal model, hybrid equivalent model,FET small signal model.

Unit V: Amplifiers (5 contact hours)

Single stage amplifiers, voltage gain, effect of frequency on Gain, multistage amplifier.

Unit VI: Other Semi-conductor devices (9 contact hours)

SCR'S , Diacs, triacs, and other thyristors, basic theory of operation, characteristics, Theory and operation of UJT,

Unit VII: Oscillators (10 contact hours)

Feedback BH criteria, oscillator types, sinusoidal oscillator, Hartley oscillator,Collpitts Oscillator, Phase shift,Wein bridge oscillator, crystal oscillator.

NOTE:	End Term Evaluation (Major Exam) shall be carried out in three stages. Minor I (20 marks), Minor II (20 marks), and Major (50 marks) exams.
	Assignment Marks shall be awarded on students' work in the form of Case Study / Design problem / Presentation / Quiz, which shall be evaluated by the concerned faculty.

Recommended Books::

1. Electrical & Electronic Technology, Hughes, Pearson Education
2. Basic Electrical Engineering, Cathey, Nasar, TMH
3. Basic Electrical Engineering, Mittal, TMH
4. Basic Electrical Engineering, B. L. Theraja
5. Electrical Engineering Fundamentals, Vincent Deltoro, PHI

6. Network & Systems, D Roy Choudhary
7. Circuit Analysis, A.K. Chakrabarti

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Basic Electrical Engineering (ECL1020)

Subject Name	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Basic Electronics (ECL1010)	**CO1**	3	2	1	2	2	2	2	1	2	2	1	3	3	3
	CO2	3	2	3	2	2	2	2	1	2	2	1	3	2	3
	CO3	3	2	3	3	2	2	2	1	2	2	1	3	3	2
	CO4	3	2	3	3	1	3	3	2	3	2	1	3	3	2
	CO5	3	2	3	3	1	2	2	2	3	2	1	3	3	3

ECL 1010				**Basic Electronics**			Pre Requisites		ECL 2040	
Version R-01							Co-requisites			
L	T	P	C	Minor Duration	Major Duration	Assignment	Minor-I Marks	Minor-II Marks	Major Marks	Total Marks
3	1	2	5	2 Hours	3 Hours	10	20	20	50	100

Course Outcomes

1.To learn basic concepts of Semiconductor Devices
2. Able to understand and use BJT and MOS Devices.
3.Learn and able to apply small signal BJT and FET analysis.
4.To analyze and design rectifiers and amplifiers.
5.Able to understand advanced semiconductor devices and oscillators.

COURSE CONTENTS

Unit I: Introduction: Semiconductor Classification ,Semiconductor bonds, Energy band description ,Semiconductor types, Hall effect.

Unit II: Diodes: P-N junction-I/V characteristics, diode equivalent circuits, semiconductor diodes, rectifiers-(efficiency, ripple factor),filters,clipers,clampers.

Unit III: Transistors: BJT construction, characteristics (cb,ce,cc), load line. BJT biasing. FET, JFET, MOSFET (Depletion and enhancement), FET biasing.

Unit IV: Transistor Modeling: BJT small signal model, hybrid equivalent model,FET small signal model.

Unit V: Amplifiers: Single stage amplifiers, voltage gain, effect of frequency on Gain, multistage amplifier.

Unit VI: Other Semi-conductor devices: SCR'S , Diacs, triacs, and other thyristors, basic theory of operation, characteristics, Theory and operation of UJT,

Unit VII: Oscillators: Feedback BH criteria, oscillator types, sinusoidal oscillator, Hartley oscillator, Collpitts Oscillator, Phase shift,Wein bridge oscillator, crystal oscillator.

NOTE:	End Term Evaluation (Major Exam) shall be carried out in three stages. Minor I (20 marks), Minor II (20 marks), and Major (50 marks) exams.
	Assignment Marks shall be awarded on students' work in the form of Case Study / Design problem / Presentation / Quiz, which shall be evaluated by the concerned faculty.

Recommended Books::

1. Basic Electronics: Devices, Circuits & IT Fundamentals, Kal, PHI
2. Basic Electronics for Scientists
3. Electronic Devices & Circuits: An Introduction, Mottershead,
4. Electronic Devices & Circuits, Boylestad, Nashelky, PHI
5. Semiconductor Devices , Nandita Dass, PHI
6. Electronic Devices & Circuits, Milman & Halkias
7. Electronic Devices & Circuits, Theodore Bogart, Jr

.

Basic E1ectronics (ECL 1010)

Subject Name	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
Basic E1ectronics (ECL1010)	**CO1**	3	2	1	2	2	2	2	1	2	2	1	3	3	3
	CO2	3	2	3	2	2	2	2	1	2	2	1	3	2	3
	CO3	3	2	3	3	2	2	2	1	2	2	1	3	3	2
	CO4	3	2	3	3	1	3	3	2	3	2	1	3	3	2
	CO5	3	2	3	3	1	2	2	2	3	2	1	3	3	3

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ECL 2040				**Electromagnetic Field Theory**			Pre Requisites			
Version R-01							Co-requisites			
L	T	P	C	Minor Duration	Major Duration	Assignment	Minor-I Marks	Minor-II Marks	Major Marks	Total Marks
3	1	0	4	2 Hours	3 Hours	10	20	20	50	100

COURSE OUTCOMES

1. Able to understand vector analysis and coordinate systems.
2. Able to learn time varying electromagnetic field.
3. To understand solution of wave equations.
4. Able to understand radiation & reflection in time varying EM field.
5. To understand the basics of transmission line.

COURSE CONTENTS

Unit I:Introduction (8 contact hours)

Vector Analysis, Coordinate System, Gradient, Divergence, Curl, Laplaceian in rectilinear, Cyllindrical, Spherical Coordinate System, Line, surface and volume integrals, Divergence Theorem, Stoke's theorem

Unit II: Time varying fields and Maxwell's equations (8 contact hours)

Introduction, The Equation of Continuity For Time-Varying Fields, Inconsistency Of Ampere's Law, Maxwell's Equation in Integral and differential form, Physical Significance of Maxwell Equation, Boundary conditions.

Unit III: ELECTROMAGNETIC WAVES (8 contact hours)

Solution For Free-Space Conditions, Uniform Plane Waves & Propagation, The Wave Equations For A Conducting Medium, Sinusoidal Time Variations, Conductors And Dielectrics, Polarization, Reflection By A Perfect Conductor Normal Incidence & Oblique Incidence, Reflection By A Perfect Dielectric — Normal Incidence & Oblique Incidence, Reflection At The Surface Of A Conductive Medium.

Unit IV: RADIATION (8 contact hours)

Potential Functions And Electromagnetic Field, Potential Functions For Sinusoidal Oscillations, Alternating Current Element, Power Radiated By Current Element, Application To Short Antennas, Radiation From A Monopole Or Dipole.

Unit V: Transmission Line (8 contact hours)

Circuit theory analysis of Transmission Line, Loss less and Lossy transmission lines, Reflection coefficient, Transmission Coefficient, VSWR, Input Impedance, Matching of Transmission Line, pulse excitation. Group Velocity and Phase velocity.

NOTE:	End Term Evaluation (Major Exam) shall be carried out in three stages. Minor I (20 marks), Minor II (20 marks), and Major (50 marks) exams.
	Assignment Marks shall be awarded on students' work in the form of Case Study / Design problem / Presentation / Quiz, which shall be evaluated by the concerned faculty.

Recommended Books:

1. Fields & Wave Electromagnetics , DK Cheng
2. Electromagnetic Waves and Radiating Systems, Jordan &Balmin
3. Elements of Electromagnetics, Sadiku
4. Engineering Electromagnetics: W H Hayt& J A Buck
5. Advanced Engineering Electromagnetics: C A Balanis

.

E1ectromagnetic Fie1d theory (EC1 2040)

Subject Name	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
E1ectromagnetic Fie1d T3eory (EC1 2040)	**CO1**	3	2	1	2	2	2	2	1	2	2	1	3	3	3
	CO2	3	2	3	2	2	2	2	1	2	2	1	3	2	3
	CO3	3	2	3	3	2	2	2	1	2	2	1	3	3	2
	CO4	3	2	3	3	1	3	3	2	3	2	1	3	3	2
	CO5	3	2	3	3	1	2	2	2	3	2	1	3	3	3

ECL 2151				**Analog Communication Engineering**			Pre Requisites			
Version R-01							Co-requisites			
L	T	P	C	Minor Duration	Major Duration	Assignment	Minor-I Marks	Minor-II Marks	Major Marks	Total Marks
3	1	2	5	2 Hours	3 Hours	10	20	20	50	100

COURSE OUTCOMES

1. Able to understand basic concept of signals and Fourier transform.
2. Able to learn amplitude modulation and angle modulation.
3. Able to learn the basic design concept of communication transmitters and recievers.
4. Acquire knowledge of random signal theory.
5. Able to learn noise analysis in communication systems.

COURSE CONTENTS

Unit I: Introduction (10 contact hours)

Historical Review, Elements of an Electronic Communication System, Communication Channel and their Characteristics, Mathematical Models for Communication Channels.

Unit II: Frequency Domain Analysis of Signals and Systems (10 contact hours)

The Fourier Transform, Properties of the Fourier Transform, Rayleigh`s Energy Theorem, the inverse relationship between time and frequency, Dirac Delta Function, Fourier transform of Periodic signals, transformation of signals through Linear systems, Paley-Wiener Criterion, Hilbert transform, Band Pass signals, Transmission of Band Pass signals, Phase and group delay.

Unit III: Analog Signals Transmission and Reception (10 contact hours)

Introduction, Amplitude Modulation, Double side Band Suppressed carrier Amplitude Modulation, Single side band Amplitude Modulation, Vestigial side band Modulation, Implementation of AM Modulators and De-Modulators, Frequency division Multiplexing, Analog Modulation, representation of FM and PM signals, Spectral Characteristic of Analog Modulated Signals, Implementation of Angle Modulators and De-Modulators, AM Radio Broadcasting, FM Radio Broadcasting

Unit IV: Effect of Noise on Analog communication System (10 contact hours)

White noise, shot noise, thermal noise, noise equivalent bandwidth, Effect of Noise on AM , Effect of Noise on DSB-SCAM, Effect of Noise on SSBAM, Carrier Phase Estimation with Phase Locked loop , Effect of Noise on Angle Modulation, Threshold Effect in Angle Modulation, Pre-emphasis and De-emphasis in FM.

NOTE:	End Term Evaluation (Major Exam) shall be carried out in three stages. Minor I (20 marks), Minor II (20 marks), and Major (50 marks) exams.
	Assignment Marks shall be awarded on students' work in the form of Case Study / Design problem / Presentation / Quiz, which shall be evaluated by the concerned faculty.

Recommended Books:

1. Communication Systems, Simon Haykin, John Willey & Sons
2. Communication Systems Engineering, Proakis&Salehi, Pearson Education
3. Radio Engineering, G.K. Mithal
4. Electronic Communication, Roody&Coolen
5. Electronic Communication, Kennedy

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Ana1og Communication Engineering (EC1 2151)

Subject Na2e	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
Ana1og Communication Engineering (EC1 2151)	**CO1**	3	2	1	2	2	2	2	1	2	2	1	3	3	3
	CO2	3	2	3	2	2	2	2	1	2	2	1	3	2	3
	CO3	3	2	3	3	2	2	2	1	2	2	1	3	3	2
	CO4	3	2	3	3	1	3	3	2	3	2	1	3	3	2
	CO5	3	2	3	3	1	2	2	2	3	2	1	3	3	3

ECL 2070				**Digital Electronics**			Pre Requisites			
Version R-01							Co-requisites			
L	T	P	C	Minor Duration	Major Duration	Assignment	Minor-I Marks	Minor-II Marks	Major Marks	Total Marks
3	1	2	5	2 Hours	3 Hours	10	20	20	50	100

COURSE OUTCOMES

1. To provide the skills to efficiently acquire knowledge on digital electronic circuit analysis and design.
2. To acquire Knowledge of various number systems and codes from historic point of view.
3. To understand the logic families in digital circuits.
4. To obtain the ability to analyze various aspects of sequential circuit design.
5. To learn the design procedure for Sequential Circuits and data converters.

COURSE CONTENTS

Unit I: Basic concepts of Boolean Algebra (5 contact hours)

Review of number systems - Binary, Hexadecimal, conversion from one to another, complement arithmatic, Signed and unsigned numbers and their arithmetic operations. BCD, Excess-3, Gray and Alphanumeric codes. Review of Boolean algebra, De-Morgan's Theorems, Standard Forms of Boolean Expressions, Minimization-Techniques: K-MAPS, VEM Technique, Q-M (Tabulation) method.

Unit II: Logic Gates & families (5 contact hours)

Logic Families: TTL, MOS, CMOS, Bi-CMOS; Performance parameters of IC families: input and output loading, fan-in, fan-out, tri-state, current drive, voltage levels, noise margins, power-speed tradeoff; Unused inputs; Interfacing between logic families.

Unit III: Combinational Logic Circuits (5 contact hours)

Problem formulation and design of Basic Combinational Logic Circuits, Combinational Logic Using Universal Gates. Basic Adders, ALU, Parity-Checkers and Generators, Comparators, Decoders, Encoders, Code Converters, Multiplexer (Data Selector), De-multiplexers

Unit IV: Sequential Circuits (5 contact hours)

Latches, Flip-flops (SR, JK, T, D, Master/Slave FF,) Edge-Triggered Flip-Flops, Flip-Flop Operating Characteristics, Basic Flip-Flop Applications, Asynchronous Counter Operation, Synchronous Counter Operation, Up/Down Synchronous Counters.

Unit V: Shift registers & Memories (5 contact hours)

Shift Register Functions, Serial In - Serial Out Shift Registers, Serial In - Parallel Out Shift Registers, Parallel In - Serial Out Shift Registers, Parallel In - Parallel Out Shift Registers, Bidirectional Shift Registers,Basics of Semiconductor Memories, Random-Access Memories (ROM), Read Only Memories (ROMs), Programmable ROM's (PROMs and EPROM's), PAL, PLA.

Unit VI: A/D and D/A convertor (5 contact hours)

Characteristics of ADC, Types of ADC- SAR, Dual Slope, Flash ADC. Characteristics of DAC, R-2R Ladder, Weighted Resistance Type

Unit VII: Circuit and electrical interfacing considerations (10 contact hours)

Transmission line effect, reflection, crosstalk, Noise sources, shielding and decoupling

NOTE:	End Term Evaluation (Major Exam) shall be carried out in three stages. Minor I (20 marks), Minor II (20 marks), and Major (50 marks) exams.
	Assignment Marks shall be awarded on students' work in the form of Case Study / Design problem / Presentation / Quiz, which shall be evaluated by the concerned faculty.

Recommended Books:

1. "Digital Fundamentals" by Thomas L. Floyd, Prentice Hall, Inc
2. "Digital Systems - Principles and Applications" by Tocci, R. J. and Widner, Prentice Hall,
3. Switching and finite automata theory: Z V Kohavi.–TMH
4. Digital Logic Circuit Analysis & Design, by Victor P. Nelson, H. Troy Nagle, Bill D. Carroll and J. David Irwin, Prentice Hall,
5. Digital logic and computer design: M Morris Mano –PHI
6. Modern digital electronics: R.P. Jain. TMH
7. *Digital Design: Principles and Practices, by* Wakerly J F, Prentice-Hall,
8. "Digital Experiments Emphasizing Systems and Design," by David Buchla, Prentice Hall, Inc,

Digita1 E1ectronics (ECL2070)

Subject Name	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
Digita1 E1ectronics (ECL2070)	**CO1**	3	2	1	2	2	2	2	1	2	2	1	3	3	3
	CO2	3	2	3	2	2	2	2	1	2	2	1	3	2	3
	CO3	3	2	3	3	2	2	2	1	2	2	1	3	3	2
	CO4	3	2	3	3	1	3	3	2	3	2	1	3	3	2
	CO5	3	2	3	3	1	2	2	2	3	2	1	3	3	3

ECP 2201				**Electronics Workshop**			Pre Requisites			
Version R-01							Co-requisites			
L	T	P	C	Minor Duration	Major Duration	Assignment	Minor-I Marks	Minor-II Marks	Major Marks	Total Marks
0	0	2	1	2 Hours	3 Hours	10	20	20	50	100

Course Outcome

1.The students learn about the various electronic components and their packages.
2.This course enables the engineering students to simulate the electronic circuit on the virtual platform.
3.The students learn schematic capture and layout designing of the electronic circuits.
4. Fabrication of the printed circuit board.(PCB)
5. mounting, Soldering and troubleshooting of the electronic circuit made.

NOTE:	End Term Evaluation (Major Exam) shall be carried out in three stages. Minor I (20 marks), Minor II (20 marks), and Major (50 marks) exams.
	Assignment Marks shall be awarded on students' work in the form of Case Study / Design problem / Presentation / Quiz, which shall be evaluated by the concerned faculty.

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Electronics Workshop (ECP 2201)

Subject Name	**CO**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
Electronics Workshop (ECP 2201)	**CO1**	3	2	1	2	2	2	2	1	2	2	1	3	3	3
	CO2	3	2	3	2	2	2	2	1	2	2	1	3	2	3
	CO3	3	2	3	3	2	2	2	1	2	2	1	3	3	2
	CO4	3	2	3	3	1	3	3	2	3	2	1	3	3	2
	CO5	3	2	3	3	1	2	2	2	3	2	1	3	3	3

ECL 3180				**Signal processing & Linear Systems**			Pre Requisites			
Version R-01							Co-requisites			
L	T	P	C	Minor Duration	Major Duration	Assignment	Minor-I Marks	Minor-II Marks	Major Marks	Total Marks
3	1	0	4	2 Hours	3 Hours	10	20	20	50	100

Course Outcomes

1. To learn the basics of signal and systems.
2. Able to learn convolution property of the LTI systems.
3. To learn the Laplace and Z transforms
4. To study the direct form I and II.
5. To learn the DTFT and DFT theories.

Course Contents

Unit I **Probability, Random Variables and Random Signals**

Experiment, sample space, event, probability, conditional probability and statistical independence. Random variables: Continuous and Discrete random variables, cumulative distributive function,Probability density function, properties of CDF and PDF,Central Limit Theorem. Statistical averages, mean, moments andexpectations, standard deviation and variance. Probability models: Uniform, Gaussian, Poisson.

Unit II **Introduction to Signals and Systems (CT & DT)**

Fundamentals of signals, Elementary signals, Continuous-time and discrete-time (CT and DT) signals and systems. Classification of signals. Energy and power signals. Operating on signals to produce new signals. Sinusoids, complex exponentials, step and impulse functions. Classification of systems (linearity, time-invariance, causality, memory, invertibility).

Unit III **Properties of Linear, Time-Invariant Systems**

Convolution, Impulse response and superposition integral or sum for linear, time-invariant (LTI) systems. LTIsystems characterized by differential or difference equations using time & transform methods, frequency response of LTI Systems.

Unit IV **Structures For Discrete-time Systems**

Block diagram representation of linear constant coefficient difference equations - their interconnection schemes; direct form-I, direct form-II, cascade form and parallel form structures. Finite word-length effect-number representation, analysis of effect of coefficient quantization and rounding of noise; zero input limit cycles in fixed-point realizations of IIR digital filters.

Unit V **Fourier Transform (Discrete)**

DTFT & DFT and properties of DFT; circular convolution; linear convolution using DFT.

NOTE:	End Term Evaluation (Major Exam) shall be carried out in three stages. Minor I (20 marks), Minor II (20 marks), and Major (50 marks) exams.
	Assignment Marks shall be awarded on students' work in the form of Case Study / Design problem / Presentation / Quiz, which shall be evaluated by the concerned faculty.

Recommended Books:

- Signals and Systems, S. Haykin and B. Van Veen, New York: John Wiley and Sons,
- Signals and Systems, M. J. Roberts, McGraw-Hill,
- Signals and Systems, A. V. Oppenheim, A. S. Willsky, and S. H. Nawab, Prentice-Hall
- Signals, Systems and Transformations, C. L. Phillips and J. M. Parr, Prentice-Hall
- Fundamentals of Signals and Systems using MATLAB, E. W. Kamen and B. S. Heck, Prentice-Hall
- Signal Processing and Linear Systems, B. P. Lathi, BerkeleyCambridge Press, ISBN 0-941413-35-7, 1998.

Signal processing & Linear Systems (ECL 3180)

Subject Name	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Signal processing & Linear Systems (ECL 3180)	**CO1**	3	2	1	2	2	2	2	1	2	2	1	3	3	3
	CO2	3	2	3	2	2	2	2	1	2	2	1	3	2	3
	CO3	3	2	3	3	2	2	2	1	2	2	1	3	3	2
	CO4	3	2	3	3	1	3	3	2	3	2	1	3	3	2
	CO5	3	2	3	3	1	2	2	2	3	2	1	3	3	3

ECL 3050				**Microwave Engg.**			Pre Requisites			
Version R-01							Co-requisites			
L	T	P	C	Minor Duration	Major Duration	Assignment	Minor-I Marks	Minor-II Marks	Major Marks	Total Marks
3	1	0	4	2 Hours	3 Hours	10	20	20	50	100

COURSE OUTCOMES

1. Gain knowledge of basic concepts of Microwave Engineering and its applications.
2. Gain knowledge about the transmission lines and discuss about rectangular and circular waveguides
3. Understand the basic operation, characteristics, parameters, and apply basic concepts for design and analysis of microwave devices and various components such as amplifier and oscillators, microwave filter and mixer, E&H plane Tee, Magic tee, couplers &phase shifters.
4. Analyze and design basic microwave devices including solid-state devices, particularly klystrons, magnetron, diode models.
5. Become proficient with microwave measurement of power, frequency and VSWR, impedance for the analysis and design of circuits

COURSE CONTENTS

Unit I: Introduction: (4 contact hours)

Microwave Frequency Range, Characteristics features of microwaves, Microwave Systems.

Unit II: Transmission line and Waveguides: (10 contact hours)

General solution for TEM, TE and TM waves, Rectangular waveguides, Circular Wave guides, Evanescent modes, Dominant modes, Power flow and energy storage in a waveguide, Planar transmission lines, Microstrip, Strip line, slot line, Smith Chart and its applications.

Unit III: Microwave Network and Passive Components: (12 contact hours)

S- Parameters, Scattering Matrices for Some Typical Networks, Microwave cavities, Microwave Hybrid circuits, Waveguide Junctions, Magic Tee, Rat Race Circuits, Directional Couplers, Waveguide bends, Matched Loads, Coupling, Attenuators, Phase shifters.

Unit-IV: Microwave Devices and Application: (10 contact hours)

Tunnel Diodes, Gunn Effect Diodes, Read Diodes, IMPATT Diodes, TRAPATT Diodes, PIN Diodes. Klystron, Reflex Klystron, Magnetron, TWT

Unit-V: Microwave Measurements: (4 contact hours)

Slotted line arrangement and VSWR meter, Microwave power measurement, Microwave frequency measurement techniques.

NOTE:	End Term Evaluation (Major Exam) shall be carried out in three stages. Minor I (20 marks), Minor II (20 marks), and Major (50 marks) exams.
	Assignment Marks shall be awarded on students' work in the form of Case Study / Design problem / Presentation / Quiz, which shall be evaluated by the concerned faculty.

Recommended Books:

1. Liao Y.S. ―Microwave Devices, PHI
2. Collins R.E. Microwave Engineering, McGraw Hill.
3. Reich J.H. -Microwave Principles, East West Press
4. Pozar, D M -Microwave Engineering, John Wiley & Sons
5. Gupta, K.C- Microwave Engg: New Age Pub.

Microwave Engg. (ECL 3050)

Subject Name	**CO**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
Microwave Engg. (ECL 3050)	**CO1**	3	2	1	2	2	2	2	1	2	2	1	3	3	3
	CO2	3	2	3	2	2	2	2	1	2	2	1	3	2	3
	CO3	3	2	3	3	2	2	2	1	2	2	1	3	3	2
	CO4	3	2	3	3	1	3	3	2	3	2	1	3	3	2
	CO5	3	2	3	3	1	2	2	2	3	2	1	3	3	3

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ECL 3090				**Control Systems**			Pre Requisites			
Version R-01							Co-requisites			
L	T	P	C	Minor Duration	Major Duration	Assignment	Minor-I Marks	Minor-II Marks	Major Marks	Total Marks
4	0	0	4	2 Hours	3 Hours	10	20	20	50	100

COURSE OUTCOMES

1. To learn the basics of Control systems.
2. Able to perform time domain analysis of control system.
3. Able to know about the stabilty of a system.
4. Able to perform frequency domain analysis of a control system.
5. To learn about basic concepts of digital control systems.

COURSE CONTENTS

1. Introduction to Feedback Control System
Mathematical models of physical system , Open loop and closed loop systems, regenerative feedback, Transfer function, Block diagrams and reduction techniques including signal flow graphics, deriving transfer function of physical system one mechanical system and field controlled and armature controlled DC servo motors.

2. Time Response Analysis
Standard test signals, time response of second order system, steady state errors and errorconstants, design specifications of second order system.

3. Stability Analysis
Concept of stability, condition of stability, characteristic equation, relative stability, Routh-Hurwitz criterion, special cases for determining relative stability, Nyquist stabilitycriterion, Nyquist plots

4. Root Locus Techniques.
Basic concept, rules of root locus, application of root locus technique for control systems.

5. Frequency Response Analysis
Bode plots, gain margin, phase margin, effect of addition of poles and zeros on bode-plots.

6. Compensators.
Preliminary design considerations, need of compensation, lead compensations, lag-compensation, lag-lead compensation.

7. Analysis of Control Systems in State – Space
Basic concepts of state, state variable and state models, transfer matrix, Controllability, absorbability, obtaining state space equations in canonical form.

8. Discrete control system: Z Transform and its properties, Basic structure of Digital Control systems, Description and analysis of Sampled-Data system, Stability analysis of Discrete-time systems

NOTE:	End Term Evaluation (Major Exam) shall be carried out in three stages. Minor I (20 marks), Minor II (20 marks), and Major (50 marks) exams.
	Assignment Marks shall be awarded on students' work in the form of Case Study / Design problem / Presentation / Quiz, which shall be evaluated by the concerned faculty.

Recommended Books:

1. Control System Engineering -- I.J. Nagrath, M.Gopal (Willey Eastern)
2. Feedback Control Systems -- (Schaum's Series book)
3. Modern Control System -- Dorf,Bishop (addison – Wesley Publication)
4. Modern Control Engg.(II edition) – Katsuhiko Ogata
5. Automatic Control Engg.(II edition)-Kuo

Contro1 Systems (EC1 3090)

Subject Na2e	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Contro1 Systems (ECL 3090)	**CO1**	3	2	1	2	2	2	2	1	2	2	1	3	3	3
	CO2	3	2	3	2	2	2	2	1	2	2	1	3	2	3
	CO3	3	2	3	3	2	2	2	1	2	2	1	3	3	2
	CO4	3	2	3	3	1	3	3	2	3	2	1	3	3	2
	CO5	3	2	3	3	1	2	2	2	3	2	1	3	3	3

ECL 3080				**Embedded Electronics & Microcontroller**			Pre Requisites			
Version R-01							Co-requisites			
L	T	P	C	Minor Duration	Major Duration	Assignment	Minor-I Marks	Minor-II Marks	Major Marks	Total Marks
3	0	0	3	2 Hours	3 Hours	10	20	20	50	100

COURSE OUTCOMES

1. To study the Issues and Challenges in Embedded System Design.
2. To study the architectures of RISC and CISC processors.
3. Able to understand the concept of Inter-Integrated Circuit (I2C) Interface, Interrupts, Analog-to-Digital Converter and Controller Area Network (CAN).
4. Able to do programming using Kiel µVision IDE & Simulator.
5. To apply the knowledge for embedded system applications using Keyboards, display, Relays etc.

COURSE CONTENTS

Unit I: Introduction (8 contact hours)

Introduction to Embedded Computing, Issues and Challenges in Embedded System Design, Trends: SoC, custom designed chips, configurable processors and multi-core processors.

Unit II: Embedded Processor Architecture (Intel 8051 Platform-8 bit) (8 contact hours)

Harvard Architecture, RISC v/s CISC, µProcessor v/s µController, CPU Architecture and instruction sets **:** Hardware architecture- program memory consideration – register file structure and addressing modes – CPU Register – instruction set – Port architecture, Timer/Counter Block Configuration & Interrupts, Serial Port Configuration & Interrupts, External interrupts

UnitIII:Embedded Processor Architecture(Freescale S12X Platform-16 bit) (8 contact hours)

Introduction to the S12 and S12X Microcontroller, Core Architecture, Clock Generation&Resets, Port Architecture, Timer functions, Serial Communication Interface (SCI), Serial Peripheral Interface (SPI), Inter-Integrated Circuit (I^2C) Interface, Interrupts, Analog-to-Digital Converter, Controller Area Network (CAN), Internal Memory Configuration and External Memory Expansion

Unit IV: Development tools and Programming: (8 contact hours)

Hardware and Software Development Tools, C Language Programming, Kiel µVision IDE & Simulator, CodeWarrior tools – Project IDE, Compiler, Assembler and debugger, JTAG and hardware debuggers, Code optimization.

Unit V : Embedded Applications & Interfacing (8 contact hours)

Embedded System Applications using Keyboards, display, Relays, Motors, Sensor Interface, ADC, DAC, SCI, SPI, RTC, I^2C, Interrupts with 8051 & S12X

NOTE:	End Term Evaluation (Major Exam) shall be carried out in three stages. Minor I (20 marks), Minor II (20 marks), and Major (50 marks) exams.
	Assignment Marks shall be awarded on students' work in the form of Case Study / Design problem / Presentation / Quiz, which shall be evaluated by the concerned faculty.

Recommended Books:

1. Mazidi, "8051 Microcontrollers & Embedded systems", Pearson
2. John B Peatman, " Design with PIC Microcontrollers", Pearson Education Asia, Low price edition
3. The HCS12/9S12, An Introduction to Hardware and Software Interfacing By Han-Way Huang
4. A.K. Ray, K.M. Bhurchandi, " Advanced Microprocessors and Peripherals – Architecture, Programming and Interface", Tata McGrawHill
5. MykePredko, "Programming and Customizing the 8051 Microcontroller", Tata McGrawHill

6. Assembly and C Programming for the Freescale HCS12 Microcontroller Second Edition by Fredrick M. Cady
7. Embedded Microcomputer Systems: Real Time Interfacing by Jonathan W. Valvano

Embedded Electronics & Microcontroller (ECL 3080)

Subject Name	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Embedded Electronics & Microcontroller (ECL 3080)	**CO1**	3	2	1	2	2	2	2	1	2	2	1	3	3	3
	CO2	3	2	3	2	2	2	2	1	2	2	1	3	2	3
	CO3	3	2	3	3	2	2	2	1	2	2	1	3	3	2
	CO4	3	2	3	3	1	3	3	2	3	2	1	3	3	2
	CO5	3	2	3	3	1	2	2	2	3	2	1	3	3	3

ECL 3100				**Computer Network and Security**			Pre Requisites			
Version R-01							Co-requisites			
L	T	P	C	Minor Duration	Major Duration	Assignment	Minor-I Marks	Minor-II Marks	Major Marks	Total Marks
3	0	0	3	2 Hours	3 Hours	10	20	20	50	100

COURSE OUTCOMES

1. To understand signal flow on physical layer.
2. Able to understand behavior network layer.
3. Able to understand behavior Data-link layer.
4. Able to understand behavior Transport layer.
5. To apply knowledge in the data communication systems.

COURSE CONTENTS

Unit I: Physical Layer (10 contact hours)

Communication Medium (Copper, OFC, Wireless), Connectors and Cables (RJ11, RJ45, 8P8C, Cat5, Cat6, UTP, Coax, 10baseT etc.) Baseband and Passband Communications, Modulation schemes, Source coding, Channel coding, Line coding

Unit II: Data link Layer (10 contact hours)

Framing and Error Detection, Packet Multiple Access, Packet Switching, Aloha, CSMA (CA, CD), RTS CTS, Hidden/Exposed Terminals, ARQ Protocols, ARP, LAN, Ethernet, 802.11, 802.15.1, 802.15.4

Unit III: Network Layer (10 contact hours)

Network Addressing, Subnets, Packet Routing, Packet Fragmentation, Routing Protocols, WAN, IP, ICMP

Unit IV: Transport Layer (10 contact hours)

Datagrams, Segments, Bit Streams, Connection Oriented and Connectionless Protocols, Reliability, Error Detection and Correction, Flow Control, Congestion Control, TCP, UDP, RTP, Host to Host Communication

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NOTE:	End Term Evaluation (Major Exam) shall be carried out in three stages. Minor I (20 marks), Minor II (20 marks), and Major (50 marks) exams.
	Assignment Marks shall be awarded on students' work in the form of Case Study / Design problem / Presentation / Quiz, which shall be evaluated by the concerned faculty.

Recommended Books:

1. D E Comer and M S Narayanan. *Computer Networks and Internets* 4th ed : Pearson Education: ISBN: 9788177589276
2. Peterson and Davie. *Computer Networks (2nd Edition)*. San Francisco, CA: Morgan Kaufmann Publishers, 1999. ISBN: 1558605142 .
3. Tanenbaum, A. S. *Computer Networks*. 4th ed. Upper Saddle River, NJ : Prentice Hall, 2003. ISBN: 0130661023.
4. Stevens. *TCP/IP Illustrated*. Reading, MA: Addison-Wesley Pub. Co., c1994-c1996. ISBN: 0201633469.
5. *Saltzer, J., D. Reed, and D. Clark. "End-to-end Arguments in System Design." ACM Transactions on Computer Systems (TOCS) 2, no. 4 (1984): 195-206.*
6. *Cerf, V., and R. Kahn. "A Protocol for Packet Network Interconnection." IEEE Transactions on Communications COM-22 (1974): 637-648.*
7. *Clark, D. "Design Philosophy of the DARPA Internet Protocol." Proc ACM SIGCOMM (August 1988): 106-114. Stanford, CA.*
8. *Paxson, V. "End-to-End Routing Behavior in the Internet." IEEE/ACM Transactions on Networking 5, no. 5 (October 1997): 601-615.*
9. *Jacobson, V., and M. Karels. "Congestion Avoidance and Control." Proc ACM SIGCOMM (August 1988). Stanford, CA.*

10. *Bharghavan, V., A. Demers, S. Shenker, and L. Zhang. "MACAW: A Media Access Protocol for Wireless*

Communication and Data Network (ECL 3100)

Subject Name	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Communication and Data Network (ECL 3100)	**CO1**	3	2	1	2	2	2	2	1	2	2	1	3	3	3
	CO2	3	2	3	2	2	2	2	1	2	2	1	3	2	3
	CO3	3	2	3	3	2	2	2	1	2	2	1	3	3	2
	CO4	3	2	3	3	1	3	3	2	3	2	1	3	3	2
	CO5	3	2	3	3	1	2	2	2	3	2	1	3	3	3

LANs." ProcACM SIGCOMM (September 1994): 212-225. London, UK.

ECL 4170				**Optical Fiber Communication**			Pre Requisites			
Version R-01							Co-requisites			
L	T	P	C	Minor Duration	Major Duration	Assignment	Minor-I Marks	Minor-II Marks	Major Marks	Total Marks
3	0	0	3	2 Hours	3 Hours	10	20	20	50	100

COURSE OUTCOMES

1. To learn the basic concept of optical fiber
2. To acquire knowledge about various losses in optical fiber
3. To understand basic design concept of optical sources and detectors
4. To learn and analyze the dedign concept of optical fiber networks
5. Able to learn design parameters of Optical Fiber Communication System

COURSE CONTENTS

Unit I: Introduction (8 contact hours)

Introduction to Telecommunications and Fiber Optics, The Evolution of Fiber Optic Systems, Basic Optical Laws and Definitions, Propagation of light inside fiber, Critical-Angle, Numerical-Aperture, Acceptance-Angle ,Cut-off wavelength , V-Number, Mode Field Diameter, Leaky Modes , Single and Multi-Mode Fibers, Fiber Types, Waveguide Equations, Step-Index Fiber Structure, Graded-Index Fiber Structure, Splicing Techniques and Connectors, Elements of an Optical Fiber Transmission Link. Merits and Demerits of Fiber Optics over conventional copper wire systems

Unit II: Losses and Dispersion (8 contact hours)

Attenuation, Absorption Losses, Scattering Losses, Bending Losses, Core and Cladding Losses, Total combined Losses.

Dispersion, Group-Delay, Material Dispersion, Waveguide Dispersion, Intermodal Distortion.

Unit III: Optical Sources and Detectors (8 contact hours)

Light-Emitting Diodes (LEDs), LED Structures, Characteristics of LEDs, Laser Diodes, Laser Diode Modes and Threshold Conditions, Laser Diode Structures, Characteristics of Laser Diodes, Comparison between LED and Laser Diode.Physical Principles of Photodiodes, PIN Photodetector, Avalanche Photodiodes (APD), Photodetector-Noise, Noise-Sources, Signal-to-Noise Ratio, Comparison of Photodetectors.Optical Receiver.

Unit IV: Optical Fiber Network and its Components (8 contact hours)

Point-to-Point Links, System Considerations, Link Power Budget, Rise-Time Budget. Single and Multi-Hop Networks, SOA, EDFA, WDM-MUX/DEMUX, Optical-Switches, Couplers, Splitters, Photonic Switching.

Unit V: Economics and Potential Applications ofOptical Fiber CommunicationSystems (8 contact hours)

Economics with Optical Fiber Communication Systems, Prospects for Optical Fiber Communication, Fiber-Optic Applications, Applications of Integrated Optics.

NOTE:	End Term Evaluation (Major Exam) shall be carried out in three stages. Minor I (20 marks), Minor II (20 marks), and Major (50 marks) exams.
	Assignment Marks shall be awarded on students' work in the form of Case Study / Design problem / Presentation / Quiz, which shall be evaluated by the concerned faculty.

Recommended Books:

1. Keiser, "Optical fiber communication", Tata McGraw Hill
2. John M Senior, "Optical Fiber Communication-Principles and Practice ", Prentice Hall International
3. Joseph C Patios, "FiberOptical Communications", PHI
4. John Gowar, "Optical Communication System", Prentice Hall International
5. Sharma, "Fiber Optics in Telecommunication", Tata Mc Graw Hill
6. M K Liu, "Principles and applications of optical communication ", Tata Mc Graw Hill

Optical Fiber Communication (ECL 4170)

Subject Name	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Optical Fiber Communication (ECL 4170)	**CO1**	3	2	1	2	2	2	2	1	2	2	1	3	3	3
	CO2	3	2	3	2	2	2	2	1	2	2	1	3	2	3
	CO3	3	2	3	3	2	2	2	1	2	2	1	3	3	2
	CO4	3	2	3	3	1	3	3	2	3	2	1	3	3	2
	CO5	3	2	3	3	1	2	2	2	3	2	1	3	3	3