Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)
Department of Electronics & Communication Engineering
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. IIIrd YEAR (SEMESTER –V)
Choice Based Credit Scheme w.e.f. 2020-21

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	ECE301C	Microwave Theory and Techniques	3	0	0	25	75	-	100	3	3
2	ECE381C	Microwave Theory and Techniques Lab	0	0	2	25	-	75	100	1	3
3	ECE303C	Antennas and Wave Propagation	3	0	0	25	75	-	100	3	3
4	ECE305C	Probability Theory and Stochastic Processes for Communication Engineering	3	0	0	25	75	-	100	3	3
5	ECE307C	Digital Signal Processing	3	0	0	25	75	-	100	3	3
6	ECE387C	Digital Signal Processing Lab	0	0	2	25	-	75	100	1	3
7	ECE309C	Linear Integrated Circuit & Applications	3	0	0	25	75	-	100	3	3
8	ECE391C **or** ECE393C **or** ECE395C **or** ECE397C	Electronic Measurement Lab Digital System Design with VHDL Lab Microcontroller & Interfacing Lab Consumer Electronics Lab	0	0	2	25	-	75	100	1	3
9		Program Elective -1	3	0	0	25	75	-	100	3	3
10	ECE399C	Professional Training (Level-2)	0	0	2	100	-	-	100	2	-
11	HUM301C	Essence of Indian Traditional Knowledge	3	0	0	25	75	-	100	-	3
Total			**21**	**0**	**8**	**350**	**525**	**225**	**1100**	**23**	

Note:

1. Assessment of Professional Training (Level-2)(ECE399C), undergone at the end of semester-IV, will be based on seminar, viva-voce, report and certificate of professional training obtained by the student from the industry / institute / research lab / training centre etc.
2. Students will be permitted to opt for any one elective from the list of **Program Elective-1** as given below. The minimum strength of the students should be 20 to run an elective course. The student opting for program elective ECE321C/ECE323C/ ECE325C/ECE327C has to opt for its respective lab that is, ECE391C/ ECE393C/ ECE395C/ ECE397C.

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	ECE321C	Electronics Measurement	3	0	0	25	75	-	100	3	3
2	ECE323C	Digital System Design with VHDL	3	0	0	25	75	-	100	3	3
3	ECE325C	Microcontroller & Interfacing	3	0	0	25	75	-	100	3	3
4	ECE327C	Consumer Electronics	3	0	0	25	75	-	100	3	3

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)
Department of Electronics & Communication Engineering
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. III[rd] YEAR (SEMESTER –VI)
Choice Based Credit Scheme w.e.f. 2020-21

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	ECE302C	Control Systems	3	0	0	25	75	-	100	3	3
2	ECE304C	VLSI Design	3	0	0	25	75	-	100	3	3
3	ECE384C	VLSI Design Lab	0	0	2	25	-	75	100	1	3
4	ECE306C	Verilog Based Digital System Design	3	0	0	25	75	-	100	3	3
5	ECE386C	Verilog Based Digital System Design Lab	0	0	2	25	-	75	100	1	3
6	ECE308C	Wireless Communication System	3	0	0	25	75	-	100	3	3
7		Program Elective -2	3	0	0	25	75	-	100	3	3
8		Open Elective-I	3	0	0	25	75	-	100	3	3
Total			**18**	**0**	**4**	**200**	**450**	**150**	**800**	**20**	

Note:

1. At the end of semester-VI each student has to undergo Professional Training (level-3) of atleast four weeks from industry, institute, research lab, training centre during summer vacation and its evaluations shall be carried out in the semester-VII.
2. Students will be permitted to opt for any one elective from the list of **Program Elective-2** given below. The minimum strength of the students should be 20 to run an elective course.

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	ECE322C	Speech and Audio Processing	3	0	0	25	75	-	100	3	3
2	ECE324C	Introduction to MEMS	3	0	0	25	75	-	100	3	3
3	ECE326C	Scientific Computing	3	0	0	25	75	-	100	3	3
4	ECE328C	Optimization Techniques	3	0	0	25	75	-	100	3	3

3. Students will be permitted to opt for any one **Open Elective-I** course run by other department, from group of subjects given in table below. However, the department shall offer those elective for which they have expertise. The choice of the students for any elective shall not be binding for the department to offer, if the department does not have expertise. The minimum strength of the students should be 20 to run an elective course.

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	HUM350C	Communication Skills for Professionals (Except BME & BTE)	3	0	0	25	75	-	100	3	3
2	HUM352C	Soft Skills And Interpersonal Communication	3	0	0	25	75	-	100	3	3
3	MGT402C	Human Values, Ethics And IPR	3	0	0	25	75	-	100	3	3
4	MGT404C	Human Resource Management	3	0	0	25	75	-	100	3	3
5	HUM354C	Introduction To French Language	3	0	0	25	75	-	100	3	3
6	HUM356C	Introduction To German Language	3	0	0	25	75	-	100	3	3

B. Tech. 3[rd] Year (V & VI semester) Electronics & Communication Engg.: Approved in 15[th] meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

DEENBANDHU CHHOTU RAM UNIVERSITY OF SCIENCE & TECHNOLOGY, MURTHAL (SONEPAT)

ELECTRONICS & COMMUNICATION ENGINEERING DEPARTMENT

SCHEME OF STUDIES & EXAMINATIONS OF B. TECH. (HONS./MINOR DEGREE) WITH SPECIALIZATION (W.E.F. 2020-21)

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (Hons. Degree for students of ECE & CSE, Minor Degree for other students)

S. No.	Semester	Course Code	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
				L	T	P		Theory	Practical			
1	5	SPEC301C	Statistics and Predictive Analytics	4	0	0	25	75	-	100	4	3
2	6	SPEC302C	Python Programming	4	0	0	25	75	-	100	4	3
3	6	SPEC304C	Machine Learning	4	0	0	25	75	-	100	4	3
4	6	SPEC384C	Machine Learning Lab	0	0	2	25	-	75	100	1	3
5	7	SPEC401C	Artificial Intelligence	4	0	0	25	75	-	100	4	3
6	7	SPEC481C	Artificial Intelligence Lab	0	0	2	25	-	75	100	1	3
Total				**16**	**0**	**4**	**150**	**300**	**150**	**600**	**18**	

INTERNET OF THINGS (Hons. Degree for students of ECE & CSE, Minor Degree for other students)

S. No.	Semester	Course Code	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
				L	T	P		Theory	Practical			
1	5	SPEC303C	IoT and Applications	4	0	0	25	75	-	100	4	3
2	5	SPEC383C	IoT Lab	0	0	2	25	-	75	100	1	3
3	6	SPEC302C	Python Programming	4	0	0	25	75	-	100	4	3
4	6	SPEC306C	Embedded IoT	4	0	0	25	75	-	100	4	3
5	6	SPEC386C	Embedded IoT Lab	0	0	2	25	-	75	100	1	3
6	7	SPEC403C	Cloud Computing	4	0	0	25	75	-	100	4	3
Total				**16**	**0**	**4**	**150**	**300**	**150**	**600**	**18**	

ROBOTICS (Jointly offered with ME Department. Hons. Degree for students of ECE & ME, Minor Degree for other students)

S. No.	Semester	Course Code	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
				L	T	P		Theory	Practical			
1	5	SPME301C	Robotics and Applications	4	0	0	25	75	-	100	4	3
2	5	SPEC381C	Robotics Lab	0	0	2	25	-	75	100	1	3
3	6	SPEC302C	Python Programming	4	0	0	25	75	-	100	4	3
4	6	SPEC308C	Embedded Robotics	4	0	0	25	75	-	100	4	3
5	6	SPEC388C	Embedded Robotics Lab	0	0	2	25	-	75	100	1	3
6	7	SPME401C	Mechanics and Control in Robotics	4	0	0	25	75	-	100	4	3
Total				**16**	**0**	**4**	**150**	**300**	**150**	**600**	**18**	

Note:

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

1. **The ordinance of B. Tech. Programme of the University shall be applicable to this scheme as well.**
2. **Student can undertake 20% of the courses of this scheme (Hons./Minor Degree with Specialization in the above listed emerging areas) through online platforms SWAYAM/MOOCS/NPTEL etc. with due permission of the chairperson.**
3. **Any students of the B. Tech. of the University can opt for this scheme (Hons./Minor Degree with Specialization in the above listed emerging areas), however, minimum 10 students are required for running a particular specialization.**
4. **The choice of the students shall be sought through the respective chairpersons at the end of the 4th Semester.**
5. **If any of the course in the any of the above scheme opted by a student exist in the list of the electives of the normal B. Tech. Scheme of the stream of that student as well then the student has to opt for some other elective.**

ECE301C Microwave Theory and Techniques

B.Tech. 3rd YEAR (SEMESTER –V)

Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (10 Lectures)

Introduction to Microwaves: History of Microwaves, Microwave Frequency bands; Applications of Microwaves: Civil and Military, Medical etc. Microwave Systems- Radar, Terrestrial and Satellite Communication, RFID, GPS. Planar Transmission Lines, basics of waveguides, Concept of transmission modes in waveguides, Features of TEM, TE and TM Modes in Rectangular waveguide & Circular waveguide.

Unit 2 (12 Lectures)

Microwave Network Analysis: Scattering Parameters and S-matrix. Passive Microwave Devices- Directional Coupler, Power Divider, Magic Tee, Attenuator, Resonator, Hybrid Ring, Directional Couplers, Phase shifter, Cavity resonators, Isolators, Circulators.

Unit 3 (12 Lectures)

Microwave active components: Microwave Tubes: Klystron amplifiers, reflex klystron, TWT, BWO, Magnetron, CFA. Microwave Semiconductor Devices: Varactor diode, Tunnel diode, Schottky Barrier diodes, PIN diodes, Gunn Diodes, IMPATT, TRAPATT, BARITT diodes, parametric amplifiers, MASER.

Unit 4 (9 Lectures)

Microwave Measurements: VSWR, Power, Frequency and impedance measurement at microwave Frequency. Network Analyzer, Spectrum Analyzer. Modern Trends in Microwaves Engineering- Effect of Microwaves on human body, Monolithic Microwave ICs.

Text/Reference Books:

1. R.E. Collins, Microwave Circuits, McGraw Hill
2. K.C. Gupta and I.J. Bahl, Microwave Circuits, Artech house
3. Samuel Liao, Microwave Devices and Circuits, 3rd Edition, Pearson Education
4. R.Chatterjee, Elements of Microwave Engineering,EWP
5. SushrutDas,MicrowaveEngineering,Oxford University Press.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Understand and apply knowledge for designing various microwave communication systems using planar transmission line technology that can be applied in various fields of communication.
2. Analyze various microwave circuits for verifying their properties and bringing up new designs for obtaining better performances which in turn will be used for betterment of human kind.
3. Inspect various microwave power generation sources and will be able to design circuits with improved power handling capacities.
4. Measure various parameters related to microwave systems and will be able to work towards improving those parameters to make such systems more suitable and efficient for everyday life of human kind.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

ECE381C Microwave Theory and Techniques Lab

B.Tech. 3rd YEAR (SEMESTER –V)

Electronics & Communication Engineering

L	T	P	Credits		
0	0	2	1	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

List of Experiments:

1 To study various waveguide components.

2 To analyze generation of microwave power & basic set-up of waveguide bench.

3 To generate and analyze the characteristics of reflex klystron.

4 To measure the frequency of microwave source and demonstrate relationship among frequency, free space wavelength and guide wave length.

5 To measure VSWR of an unknown load.

6 To measure standing wave ratio of an unmatched load.

7 To match impedance for maximum power transfer using slide screw tuner.

8 To measure VSWR, insertion loss and attenuation of a fixed and variable attenuator.

9 To measure coupling factor and directivity of directional coupler.

10 To determine the insertion loss, isolation of three port circulator.

11 To determine the insertion loss, isolation of an isolator.

12 To generate and analyze the characteristics of a Gunn Diode.

Text/Reference Books:

1. R.E.Collin, Foundations for Microwave Engineering,MGH.
2. Samuel Liao, Microwave Devices and Circuits, 3rd Edition, Pearson Education.
3. R.Chatterjee, Elements of Microwave Engineering,EWP

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Understand the operational mechanism of various microwave devices which inturn can be used for designing of various microwave based devices that can be used for betterment of human life.
2. Measure various parameters related to microwave devices, hence verifying their characteristics and modifying them to develop more power efficient devices.
3. To plot various voltage and power characteristic curves required for better understanding of the device and enhancing its voltage and power characteristics.
4. Design and handle high power devices which inturn will improve safety of human body.

Note:

1. Each laboratory class/section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands on experience to each student, each experiment may be either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.
3. Ten experiments are to be performed out of which at least seven experiments should be performed from the above list. Remaining three experiments should be performed from the above list or designed and set by the concerned department as per the scope of the syllabus.

ECE303C Antennas and Wave Propagation

B.Tech. 3rd YEAR (SEMESTER –V)

Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1(12 Lectures)

Introduction To EM Waves: Introduction, Electromagnetic Wave Equations, Poynting Theorem & Electromagnetic Power, Short Electric Dipoles, Retarded Vector Potential, Radiation from a Small Current Element.

Current Element Characteristics: Power Radiated by a Current Element and Its Radiation Resistance, Radiation from a Half Wave Dipole, Radiation Patterns, Radiation Power Density, Radiation Intensity.

Unit 2(10Lectures)

Antenna Pattern: Antenna Pattern, Antenna Parameters: Front To Back Ratio, Gain, Directivity, Radiation Resistance, Efficiency, Aperture Area, Impedence, Effective Length and Beam width, Reciprocity Theorem for Antenna and Its Applications.

Antenna Parameters: Impedance Measurements, Radiation Pattern Measurement, Beam width Measurement, Phase And Current, Radiation Resistance, Directivity and Polarization Measurement.

Unit 3(12 Lectures)

Types Of Antennas: Introduction,Isotropic,Yagi-Uda,Biconical,Helical,Horn,Slot,Parabolic Feeds, Conical, Log Periodic, Microwave and Patch Antenna.

Antenna Arrays: Types of Antenna Array: Broadside Array, End Fire Array, Collinear Array and Parasitic Array, array of point sources, pattern multiplication, Linear Array, Phased Array, Tapering of Arrays, Binomials Arrays, Continuous Arrays and Superdirective Array, effect of ground on antennas.

Unit 4(12 Lectures)

Transmission Parameters: Reflection and refraction of plane waves at the surface of a perfect conductor & perfect dielectric (both normal incidence as well as oblique incidence), Brewester's angle and total internal reflection, reflection at the surfaces of a conductive medium, surface impedance, transmission-line analogy, poynting theorem, interpretation of E x H, power loss in a plane conductor.

Radio Wave Propagation: Introduction, Ground Wave, Sky Wave, Space Waves and Tropospheric Abnormalities, Multi-Hop Propagation, Effect of Earth, Skip Distance, Ionospheric Abnormalities, Mechanism of Ionospheric propogation, critical frequency,MUF , Duct Propagation.

Text Books :

1. Antennas by J.D.Kraus, TMH.
2. Antenna & Wave Propagation by G.S.N Raju, Pearson Education.
3. Antenna & Wave Propagation by K.D Prasad.

Reference Books:

1. Antenna & Radiowave Propogation by Collin,TMH
2. Antenna Theory Analysis & Design by Balanis, Wiley.
3. Electromagnetic Waves & Radiating Systems by Jordan & Balmain, Pearson Education,2015.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Understand & analyse various antenna parameters using antenna theory & concepts that in turn will enhance antenna efficiency and provide better communication facilities for human convenience.
2. Modify & enhance various antenna patterns to achieve better directivity & gain and understand various methods of measurements for antenna parameters for needful corrections, hence upgrading its impact on society.
3. Analyse various types of antennas & modify their parameters to deign more efficient antennas for improving communication capabilities in turn reduce impact of radiation.
4. Understand basic theories of antenna & wave propagation and implement them in designing better antennas in terms of size and power requirement.

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Note:

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2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

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ECE305C Probability Theory and Stochastic Processes for Communication Engineering

B.Tech. 3rd YEAR (SEMESTER –V)
Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1(10 Lectures)

Spectral Analysis: Fourier Transform & its Properties, Convolution & Correlation, Autocorrelation & Cross Correlation, Orthogonal Representation of Signal, Signal Transmission through a Linear system, Signal Distortion over a Communication Channel, Energy spectral density, Power spectral density.

Unit 2(12 Lectures)

Distribution Functions And Random Processes-I: Sets and Set Operations; Probability Space; Conditional Probability and Bayes Theorem; Combinatorial Probability and Sampling Models. Discrete Random Variables, Probability Mass Function, Probability Distribution Function, Example Random Variables and Distributions; Continuous Random Variables, Probability Density Function, Probability Distribution Function, Example Distributions; Joint Distributions, Functions of One and Two Random Variables, Moments Of Random Variables; Conditional Distribution, Densities and Moments

Unit 3(12 Lectures)

Distribution Functions And Random Processes-II: Characteristic Functions of a Random Variable; Markov, Chebyshev and Chernoff Bounds; Random Sequences and Modes of Convergence (Everywhere, Almost Everywhere, Probability, Distribution and Mean Square); Limit Theorems; Strong and Weak Laws of Large Numbers, Central Limit Theorem, Random Process, Stationary Processes, Mean and Covariance Functions, Ergodicity, Transmission of Random Process through LTI System.

Unit 4(11 Lectures)

Base Band Shaping For Data Transmission: Discrete PAM Signal, Power Spectra for Digital PAM Signal, Inter Symbol Interference, Nyquist Criterion for Distortionless Baseband Binary Transmission, Correlation Coding, Eye Pattern, Base Band M-Ary PAM System, Adaptive Equalization for Data Transmission.

Spread Spectrum Modulation:PN Sequences, A Notion of Spread Spectrum, Direct Sequence Spread Spectrum, Frequency Hopping Spread Spectrum, Application.

Reference Books:

1. Digital Communication — By Simon Haykins – Wile
2. Probability, Random Variables and Stochastic Processes — By A.Papoulis and S. Unnikrishnan Pillai- McGraw Hill
3. Probability, Statistics and Random Processes — By Kousalya, Pearson Education, 2013
4. Digital Communication — By Sklar & Ray- Pearson Education, 2nd Edition.
5. Principle of Communication Systems — By Taub & Schilling – TMH
6. Electronics Communication Systems — By Tomasi -5th Edition, Pearson Education.
7. Communication System — By Haykin & Moher- Wiley
8. Digital Communication — By J. G. Proakis
9. Digital Communication — By B. P. Lathi
10. Communication Systems — By Manoj Duhan – I. K. International

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1 Understand Fourier transform, its properties and utility in communication engineering.
2 Understand representation of random signals and investigate characteristics of random processes
3 Apply theorems related to random signals in communication engineering and get acquainted with the propagation of random signals in LTI systems
4 Understand base band shaping for data transmission and spread spectrum techniques.

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Note:

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2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

ECE307C Digital Signal Processing

B.Tech. 3rd YEAR (SEMESTER –V)
Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (10 Lectures)

Introduction: Review of Signals and Systems, Analog Signal Processing (ASP), Digital Signal Processing (DSP), Comparison of ASP & DSP, Discrete –Time Processing of Continuous –Time Signals, Basic Sampling & Reconstruction Theorem, Effect of Under sampling, Aliasing.

Discrete Fourier Transform, Fast Fourier Transform, Relationship of the DFT to Z- transform, Properties of DFT, Radix-2 Fast Fourier Transform Algorithm: Decimation -In -Time, Decimation –in-Frequency, Applications of FFT Algorithms: Efficient Computation of the DFT of Two Real Sequences, Efficient Computation of the DFT of a 2N –Point Real Sequence, Computing Inverse DFT using Direct DFT.

Unit 2 (10 Lectures)

Realization of Digital Linear Systems: Realization Block Diagram and Signal –Flow Graph, Structures for IIR Systems: Direct Form I, Direct Form II, Cascade and Parallel Realization, Transposed Direct Form I and II.

Structures for FIR Structures: Direct –Form Structures, Cascade –Form Structures, Comparison of Different structures, single and multistage lattice filters.

Unit 3 (12 Lectures)

Frequency Domain Analysis of LTI Systems: Response to Complex Exponential & Sinusoidal Signals, Steady –state and Transient response with Input as a sinusoidal signal, Steady state response to periodic input signals, response to Aperiodic Input Signals, magnitude and phase response, measuring the impulse response of an unknown system by correlation.

LTI Systems as Frequency Selective Filters: Ideal Filter Characteristics, lowpass, Highpass, Bandpass; pole –zero pattern for lowpass and highpass filters, lowpass to highpass filter transformation, Invertibility of systems & Deconvolution: LTI systems invertibility, maximum, minimum phase, and mixed phase systems.

Unit 4 (12 Lectures)

Testing the Frequency response for practical realization: Paley –Wiener Theorem, characteristics of Practical Frequency –selective filters, FIR and IIR filters comparison, Design of FIR filters: importance of Linear Phase response, Zero locations for a linear phase FIR filter, Design of linear phase FIR filters using Windows, Desirable Window function properties for FIR filter design.

Design steps for IIR Filter design, Design of IIR lowpass analog filters: Butterworth, Chebyshew, Elliptic; Conversion of analog system to digital system by: Approximation of Derivatives, Impulse Invariance, Bilinear Transformation, Analog Domain Frequency Transformations, Digital Domain Frequency Transformations.

Text Books :

1. J. G. Proakis, D. G. Manolakis, "Digital Signal Processing, Principles, Algorithms, & Applications", 4th Edition, Pearson Education.
2. S. Salivahanan, C.Gnanapriya, " Digital Signal Processing", Second Edition, McGraw Hill Education.

Reference Books:

1. L. R. Rabiner& B. Gold, "Theory and Application of Digital Signal Processing", Pearson Education, 2015.
2. A. V. Oppenheim, R. W. Schafer, J. R. Buck, "Discrete –Time Signal Processing",3rd Edition, Pearson Education, 2014
3. A. V. Oppenheim, R. W. Schafer, "Digital Signal Processing", Pearson Education, 2015.
4. S.K.Mitra, Digital Signal Processing: A computer based approach.TMH.

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Compute DFT, FFT and using these in various applications.
2. Utilize the design techniques for digital IIR and FIR filters.
3. Analyze signals mathematically in time and frequency domain and obtain the response of an LTI system to different signals.
4. Design of different types of digital filters for various applications.

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Note:

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2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

ECE387C Digital Signal Processing Lab

B.Tech. 3rd YEAR (SEMESTER –V)

Electronics & Communication Engineering

L	T	P	Credits		
0	0	2	1	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

List of Experiments:

1. To study basics of MATLAB and to practice different kind of loop and conditional statements.
2. To represent basic signals (Unit step, unit impulse, ramp).
3. To represent basic signals (exponential, sine and cosine).
4. To develop program for discrete convolution & discrete correlation.
5. To understand stability test.
6. To develop program for computing FFT & IDFT.
7. To design analog filter (low-pass, high pass).
8. To design analog filter (band-pass, band-stop).
9. To design digital IIR filters (low-pass, high pass).
10. To design digital IIR filters(band-pass, band-stop).
11. To design FIR filters using windows technique.
12. To design a program to compare direct realization values of IIR digital filter
13. To develop a program for computing parallel realization values of IIR digital filter.
14. To develop a program for computing cascade realization values of IIR digital filter
15. To develop a program for computing inverse Z-transform of a rational transfer function.
16. To design equiripple FIR filter for given specifications and plot its magnitude & Phase Response.
17. To plot pole zero diagram for given FIR system.
18. To plot pole zero diagram for given IIR system.

Text/Reference Books:

1. S. Salivahanan, C.Gnanapriya, " Digital Signal Processing", Second Edition, McGraw Hill Education.
2. S.K.Mitra, Digital Signal Processing: A computer based approach.TMH.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Plot and analyze signals using MATLAB.
2. Compute, visualize and analyze DFT, FFT of signals to use information in frequency domain for different applications.
3. Realize various types of structures using MATLAB for various applications.
4. Design and visualize FIR and IIR filters as Low-pass, high-pass, band-pass, band-stop.

Note:

1. Each laboratory class/section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands on experience to each student, each experiment may either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.
3. Ten experiments are to be performed out of which at least seven experiments should be performed from the above list. Remaining three experiments should be performed from the above list or designed and set by the concerned department as per the scope of the syllabus.
4. Any open source tool can be used to perform the experiments.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

ECE309C Linear Integrated Circuit & Applications

B.Tech. 3rd YEAR (SEMESTER –V)

Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (11 Lectures)

Differential Amplifier Fundamentals: Differential Amplifier, Differential Amplifier Circuit Configuration: DC and AC Analysis of all Four Types of Configurations, FET Differential Amplifiers, Differential Amplifier with Swamping Resistor, Constant Current Bias, Current Mirror, Cascaded Differential Amplifier, Cascode Configurations.

Operational Amplifier Fundamentals: Amplifier Fundamentals, the Operational Amplifier, Block Diagram Representation, Ideal OP-AMP, OP-AMP Equivalent Circuit, Ideal Voltage Transfer Curve, Open Loop OP-AMP Configurations, OP-AMP with Negative Feedback: voltage series & voltage shunt feedback amplifiers, Current feedback Amplifiers.

Unit 2 (12 Lectures)

Characteristics Of Op-Amp: Input Offset Voltage, Input Bias Current, Input Offset Current, Output Offset Voltage, Thermal Drift, Effect of Variation in Power Supply Voltages on Offset Voltage, Common Mode Configuration and CMRR, Frequency Response of OP-AMP: Open Loop Response, Close Loop Response, Input and Output Impedances, Effect of Finite Gain Bandwidth Product, Slow Rate.

Linear Applications: DC and AC Amplifier, Peaking Amplifier, Summing, Scaling And Averaging Amplifiers, Instrumentation Amplifier, Voltage to Current Converter, Current to Voltage Converter, Difference Amplifier, Integrator, Differentiator, very high input impedance circuit.

Unit 3 (12 Lectures)

Noise and Stability: Noise Properties, Sources of Noise, OP-AMP Noise, Stability Problems, Stability in Constant GBP OP-AMP Circuits, Internal Frequency Compensation, External Frequency Compensation, Stability In CFA Circuits.

Active Filters and Oscillators: Transfer Function, Active Filters, First Order LP & HP Butterworth Filters, Second Order LP & HP Butterworth Filters, Higher Order Filters, Band Pass Filters, Band Rejection Filters, Oscillators: Phase Shift , Wein Bridge Oscillator, quadrature oscillator, Square Wave Generator, Triangular Wave Generator, saw tooth wave generator, Voltage Controlled Oscillator.

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Unit 4 (12 Lectures)

Non Linear Circuits: Voltage Comparator, Zero Crossing Defector, Schmitt Trigger, Peak Detector, Sample and Hold Circuit, Voltage To Frequency and Frequency To Voltage Converter, ADC and DAC, clippers and clampers, absolute value output circuit.

Specialized IC Application: Switched Capacitor Filter, 555 Timer: As Monostable Multivibrator, Astable Multivibrator. Phase-Locked Loops, Voltage Regulators: Fixed and Adjustable Voltage Regulator, power amplifiers, Switching Regulators.

Text/Reference Books:

1. OPAMPS and Linear Integrated Circuit — By Ramakant A Gayakwad –4th Edition, Pearson Education, 2015.
2. Design with Operational Amplifiers and Analog Integrated Circuits — By Sergio Franco -- MGH
3. Integrated Circuits — By K .R. Botker –Khanna pub.
4. Linear Integrated Circuits — By D.Roy Choudhary & S.Jain.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Understand various basic parameters related to differential operation of an amplifier which can be used for designing low power devices.
2. Understand various applications of OP-AMP and will be to make its judicious use in other user defined applications.
3. Understand and design low noise active filters that will improve signal quality.
4. Design various linear and non-linear applications using OP-AMP.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

ECE321C Electronics Measurement

B.Tech. 3rd YEAR (SEMESTER –V)
Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (12 Lectures)

Introduction to Oscilloscope and Electronics Instruments:- Block Diagram of Oscilloscope and study of its various stages, High Frequency CRO, Sampling and Storage CRO, Lissajous Pattern, DC and AC Voltage and Current measurements, Ohmmeter, Multimeter, Calorimeter, Bolometer.

Unit 2 (08 Lectures)

Display and Recording Devices:- Nixie Tubes, LEDs, LCDs, Discharging Devices, Strip Charts Recorder, Single Point Recorder, Magnetic Tape Recorder.

Unit 3 (10 Lectures)

Generation and Analysis of Waveforms, Signal Conditioning:- Pulse Generator, Signal Generator, Wave Analyzer, Distortion analyzer, Spectrum Analyzer, Harmonic Analyzer, Power Analyzer, DC and AC Signal Conditioning Systems, Data Acquisition and Conversion System, Characteristics of Modern Digital Data Acquisition System.

Unit 4 (12 Lectures)

Transducers and Measurements of Time and Frequency:- Classification of Transducers, Transducers of types: Resistive, Capacitive and Inductive, Basic Schemes for the measurements of Displacement, Velocity, Acceleration, Strain, Pressure, Liquid Level and Temperature Photocells, Study of Decade Counting Assembly, Frequency Measurements, Period Measurements, Universal Counters, Introduction to Digital Meters.

Text/Reference Books:

1. A Course in Electrical and Electronics Measurements and Instrumentation by A.K.Sawhney, Dhanpat Rai & Sons.
2. Electronics Measurements and Instrumentation Techniques by Helfrick & Cooper, Pearson Education, 2015.
3. Textbook of Measurements and Instrumentation by J S Saini, New Age International Publishers.
4. Electronics Instrumentation by Kalsi, TMH
5. Electronic Measurement and Instrumentation by K.Lal Kishore, Pearson Education.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Measure various electrical signal parameters with accuracy, precision, resolution with help of electronics measuring instruments will help in predicting natural disasters etc.
2. Test and troubleshoot electronic circuit and equipment using various measuring instruments.
3. Hands on experience of various measuring instruments as per industry requirements like CRO, Bolometer, Power meter, Multimeter etc. which helps them in getting direct placements in industries.
4. The knowledge of transducers and signal conditioning techniques leads to new innovations and productive applications and indirectly improve the quality of sensing devices and will reduce the health threats.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

ECE391C Electronic Measurement Lab

B.Tech. 3rd YEAR (SEMESTER –V)
Electronics & Communication Engineering

L	T	P	Credits		
0	0	2	1	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

List of Experiments:

1. To measure Displacement using LVDT.
2. To determine Distance using LDR.
3. To measure Temperature using R.T.D.
4. To find Temperature using Thermocouple.
5. To measure Pressure using Strain Gauge.
6. To measure Pressure using Piezo-electric pick up.
7. To calculate Distance using Capactive pick up.
8. To determine Distance using Inductive pick up.
9. To measure Speed of DC motor using Magnetic pick up.
10. To measure Speed of DC motor using Photoelectric pick up.

Text/Reference Books:

1. A Course in Electrical and Electronics Measurements and Instrumentation by A.K.Sawhney, Dhanpat Rai & Sons.
2. Electronics Measurements and Instrumentation Techniques by Helfrick & Cooper, Pearson Education, 2015.
3. Textbook of Measurements and Instrumentation by J S Saini, New Age International Publishers.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Students get hands on training on various transducers used in various industrial applications.
2. They will understand apt use of all the principles of a transducer for proper design and improvement in various transducers applications.
3. They learn to explore the various aspects of measurement and applications of CRO.
4. The students will become creative and will channelize and mobilize their skills for underdeveloped instrumentation sectors like rural areas.

Note:

1. Each laboratory class/section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands on experience to each student, each experiment may either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.
3. Ten experiments are to be performed out of which at least seven experiments should be performed from the above list. Remaining three experiments should be performed from the above list or designed and set by the concerned department as per the scope of the syllabus.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

ECE323C Digital System Design with VHDL

B.Tech. 3rd YEAR (SEMESTER –V)

Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (12 Lectures)

Introduction to VHDL: Concepts of Digital System Design Process, Design automation, Hardware Description Language, HDL based Digital Design, VHSIC Hardware Description Language: Program structure. Types, Constants and Arrays. Functions and Procedures. Structural design elements. Dataflow design elements. Behavioral design elements.

Unit 2 (11 Lectures)

Combinational Logic Design Practices: VHDL for combinational circuits: Assignment statements, Signal assignments, Generate statements, Concurrent and sequential assignment statements, Process statements, Case statements and VHDL operators. VHDL description of Decoders, Encoders, Multiplexers, Comparators and arithmetic circuits.

Unit 3 (11 Lectures)

Sequential Logic Design Practices: VHDL models of sequential logic blocks: Latches, Flip-flops, Registers, Shift registers, Counters and Memory. Synchronous sequential circuit design with VHDL: Basic design steps, State assignment problems, VHDL models for Moore and Mealy type FSMs. State minimization. State Machine design examples.

Unit 4 (11 Lectures)

Asynchronous Sequential Circuits: Asynchronous behavior, Analysis of Asynchronous sequential circuits, Synthesis of Asynchronous sequential circuits, Hazards, Design examples using VHDL.

VHDL simulation and synthesis: Event driven simulation, Simulation of VHDL models, RTL synthesis, Constraints, Behavioral synthesis. Fault models for testing of logic circuits.

Text/Reference Books:

1. Brown S. and Vranesic Z., *Fundamentals of Digital Logic with VHDL Design*,TMH.
2. Wakerly J. F., *Digital Design – Principles and Practices*,Pearson Education.
3. Mark Zwolinski, *Digital System Design with VHDL*, 2/e, Pearson Education.
4. J.Bhasker, V*HDL Primer*, 3/e, Pearson Education, India.
5. Roth C. H., *Digital System Design Using VHDL*, Cengage Learning,2008.
6. Perry D. L., *VHDL Programming by Example*, **4/e**, TMH,2008. 3.
7. Pedroni V. A., *Circuit design with VHDL*, PHI,2008.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand digital system design process and apply knowledge for designing the digital circuits using different style of modeling in VHDL.
2. Analyze, design and implement combinational logic circuits using hardware description language.
3. Analyze and design VHDL models for sequential logic blocks and Moore/ Mealy-type finite state machines.
4. Simulate and synthesize the VHDL models of logic circuits and test these circuits using fault models.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

ECE393C Digital System Design with VHDL Lab

B.Tech. 3rd YEAR (SEMESTER –V)

Electronics & Communication Engineering

L	T	P	Credits		
0	0	2	1	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

List of Experiments:

1. To design and simulate VHDL code to realize any Boolean function.
2. To design and simulate VHDL code for realizing logic gates.
3. To write VHDL codes for realizing adder and subtractor circuits using different modeling styles.
4. To write VHDL programs for realizing multiplexer & demultiplexer circuits.
5. To design and simulate VHDL code for code converters.
6. To design and simulate VHDL codes for encoder and decoder circuits.
7. To write a VHDL program for a comparator and check the wave forms.
8. To write a VHDL program for carry look ahead adder.
9. To write VHDL programs for S-R, J-K, D and T Flip-flops.
10. To write a VHDL program for synchronous counter and asynchronous counter.
11. To write VHDL program for designing universal shift register.
12. To write a VHDL code for designing sequence detector.
13. To design and implement finite state machine on FPGA kit.

Text/Reference Books:

1. Brown S. and Vranesic Z., *Fundamentals of Digital Logic with VHDL Design*,TMH.
2. Wakerly J. F., *Digital Design – Principles and Practices*,Pearson Education.
3. Mark Zwolinski, *Digital System Design with VHDL*, 2/e, Pearson Education.
4. J.Bhasker, V*HDL Primer*, 3/e, Pearson Education, India.
5. Perry D. L., *VHDL Programming by Example*, **4/e**, TMH,2008. 3.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Simulate and synthesize digital systems using VHDL.
2. Design digital systems using various modeling styles.
3. Implement combinational and sequential circuits on FPGA devices.
4. Design finite state machines using VHDL and implement on FPGA.

Note:

1. Each laboratory class/section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands on experience to each student, each experiment may either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.
3. Ten experiments are to be performed out of which at least seven experiments should be performed from the above list. Remaining three experiments should be performed from the above list or designed and set by the concerned department as per the scope of the syllabus.

ECE325C Microcontroller & Interfacing

B.Tech. 3rd YEAR (SEMESTER –V)

Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (12 Lectures)

Microcontrollers, 8051 microcontroller: pin diagram explanation, internal diagram 8051, Instruction Set, Addressing mode, data transfer instruction, logical, arithmetic instruction, bit instruction, branching instruction.Timer: Control Word, mode of timers, Serial interface: Introduction, Control Word, mode of serial interface, Interrupts: Introduction, Control word.

Unit 2 (10 Lectures)

Applications based on 8051 microcontroller: Interfacing of memory, intelligent LCD, 8255, ADC, DAC, LED display, Memory Card, Bio-metric system.

Unit 3 (12 Lectures)

PIC microcontrollers: Introduction, features of PIC family microcontrollers, architecture and pipelining, program memory considerations, addressing modes, CPU registers, Instruction set, Timer: Control Word, mode of timers, Watch-dog timer, Serial interface: Introduction, Control Word, mode of serial interface, Interrupts: Introduction, Control.

Unit 4 (12 Lectures)

Applications based on PIC microcontroller: Interfacing of Graphical Display, Memory Card, Bio-metric system Music box, Applications like Mouse wheel turning, PWM motor control, ultra sonic distance measuring, Temperature Sensor, Pressure Sensor, Magnetic Field Sensor.

Text / Reference Books:

1. Scott Mackenizie, 8051, PHI, Englewood Cliffs, New Jersey.
2. Myke Predko Programnming & Customizing the 8051 Microcontroller, Tata McGraw-Hill Pub. Co. Ltd., New Delhi.
3. K. J. Ayala, 8051 Architecture Programming & Applications, Penram International Publishers, India.
4. Myke Predko, Programnming & Customizing the PIC Microcontroller, Tata McGraw-Hill Pub. Co. Ltd., New Delhi.
5. Subrata Ghoshal, 8051 Microprocessors: Internals, Instructions, Programming & Interfacing, 2nd Edition, Pearson Education 2014.

Course Outcomes: At the end of this course, the students will demonstrate the ability to:

1. Understand the basics of 8051 microcontroller.
2. Do interfacing design of peripherals with 8051 microcontroller.
3. Understand the basics of PIC microcontroller.
4. Do interfacing design of peripherals with PIC microcontroller.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

ECE395C Microcontroller and Interfacing Lab

B.Tech. 3rd YEAR (SEMESTER –V)
Electronics & Communication Engineering

L	T	P	Credits		
0	0	2	1	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	:3Hours

List of Experiments:

1 To study architecture of 8051 Microcontroller.
2 To write an assembly language program to add eight 8-bit numbers.
3 To write an assembly language program for 8-bit subtraction using Arithmetic Operation of 8051 Microcontroller.
4 To interface LED and switch with microcontroller 8051.
5 To interface LCD and switch with microcontroller 8051.
6 To interface stepper motor with microcontroller 8051.
7 To write program to generate delay using serial port and on-Chip timer /Counter.
8 To interface ADC with microcontroller 8051 for measurement of temperature.
9 To interface DC motor with microcontroller 8051and speed control using PWM.
10 To write a program for Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII.
11 To write a program for Elevator interface to 8051.
12 To interface Alphanumeric LCD panel and Hex keypad input interface to 8051.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Familiarize with the assembly level and embedded C programming using 8051.
2. Familiarize with the assembly level programming using low powered MSP430.
3. Familiarize with the Keil µVision-3/4 and IAR Embedded Workbench tools.
4. Design circuits for various applications using microcontrollers.

Text/Reference Books:

1. Muhammad Ali Mazidi, The 8051 Microcontroller and Embedded Systems.
2. Kenneth Ayala**,** 8051 Microcontroller.
3. Mazidi, Microcontroller : Architecture, Programming and Applications.

Note:

1. Each laboratory class/section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands on experience to each student, each experiment may be either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.
3. Ten experiments are to be performed out of which at least seven experiments should be performed from the above list. Remaining three experiments should be performed from the above list or designed and set by the concerned department as per the scope of the syllabus.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

ECE327C Consumer Electronics

B.Tech. 3rd YEAR (SEMESTER –V)

Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1(12 Lectures)

Monochrome TV (Introduction): Elements of a TV System,Picture transmission,Sound transmission,Picture reception,Sound reception,Synchronization,Receiver control,Image continuity, Scanning Process, Aspect Ratio, Flicker, Composite Video Signal, Picture Elements,Kell factor, Vertical Resolution,Horizontal Resolution,Video bandwidth,Interlacing, 625 Line System,Bandwidths for TV Transmission,Vertical and horizontal synch detail,Vestigial Side Band transmission(Advantages and Disadvantages)

Monochrome TV (Picture and Camera Tubes): Monochrome picture tube,beam reflection,Beam focussing,Screen Phosphor,Face plate,Picture tube characteristics,picture tube circuit controls,Monochrome Camera Tubes:Basic principle,Image Orthicon, Vidicon,Plumbicon

Unit 2(12 Lectures)

Colour TV Essentials: Compatibility , Colour perception,Three Colour theory,Luminance,Hue and Saturation, Dispersion and Recombination of light,Primary and secondary colours,luminance signal,Chrominance Signal, Colour picture tube,colour TV Camera,Colout TV display Tubes,colour Signal Transmission,Bandwidth for colour signal transmission,Colour TV controls. Cable TV,Block Diagram and principle of working of cable TV.

Plasma and LCD: Introduction,liquid crystals,types of LCD's,TN,STN,TFT,Power requirements,LCD working,Principle of operation of TN display,Construction of TN display,Behaviour of TN liquid crystals,Viewing angle,colour balance, colour TN display, limitatons, advantages, disadvantages, applications.

Unit 3(10 Lectures)

LED and DMD : Introduction to LED Television , comparison with LCD and Plasma TV's, schematic of DMD, introduction to Digital MicroMirror device, Diagram of DMD, principle of working, emerging applications of DMD.

Microwave Ovens and Air Conditioners: Microwaves,Transit Time,Magnetron,Waveguides,Microwave Oven,Microwave Cooking. Air conditioning,Components of air conditioning systems,all water Air conditioning systems,all air air conditioning Systems,Split air conditioner.

Unit 4(11 Lectures)

Microphones: Introduction, characteristics of microphones,types of microphone:carbon,moving coil,wireless,crystal,introduction to tape recorder.

Loudspeaker: Introduction to ideal and basic loudspeaker,loudspeaker construction types of loudspeaker: Dynamic and permanent magnet,woofers,tweeters, brief introduction to baffles,equalisers.

Text Books :

1. Consumer Electronics by S. P. Bali, Pearson Education.
2. Complete Satellite and Cable T.V by R.R Gulati, New Age International Publishers

Reference Books:

1. Monochrome and Colour Television by R. R. Gulati, New Age International Publishers

Course outcomes: At the end of the course, students will demonstrate the ability to:

1. Identify and explain basic working of electronics products like TV, Microphone, loudspeaker, AC, Microwave ovens.
2. Learn various components of composite video signal and differentiate between line, brightness, saturation and to design the lower power consumption device, the primary challenge is how to minimize overall cost.
3. Acquire ability to design different display screen so as effect of radiations on eyes will be reduced.
4. Understand the general importance of product safety to consumers & producers will reduce the various adverse impacts of these devices on common man.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

ECE397C Consumer Electronics Lab

B.Tech. 3rd YEAR (SEMESTER –V)

Electronics & Communication Engineering

L	T	P	Credits		
0	0	2	1	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

List of Experiments:

1 To plot frequency response of different types of loudspeaker.
2 To identify and realize different sections of Monochrome Television.
3 To find out different sections of Colour Television and study their working.
4 To learn principal of working of a colour television camera.
5 To identify functional block diagram & front panel control of Microwave Oven.
6 To find out the working of display devices like Plasma,LCD,LED,DMD.
7 Demonstration of the working of all type of air conditioner like water air conditioning, split air conditioners etc.
8 Demonstration of the working of domestic refrigerators.
9 To plot the frequency response of microphone.
10 To study the block diagram of Transmitter & Receiver.

Text/Reference Books:

1. Monochrome and Colour Television by R. R. Gulati, New Age International Publishers
2. Consumer Electronics by S. P. Bali, Pearson Education

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. The students will have a better understanding of mechanisms that actually operates the respective consumer products.
2. The students will be able to generate frequency response for loudspeakers as well as microphone.
3. The students will have more knowledge about digital display devices.
4. The students will understand the general importance of product safety to consumers as well as producers.

Note:

1. Each laboratory class/section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands on experience to each student, each experiment may either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.
3. Ten experiments are to be performed out of which at least seven experiments should be performed from the above list. Remaining three experiments should be performed from the above list or designed and set by the concerned department as per the scope of the syllabus.

ECE399C Professional Training (Level-2)

B.Tech. 3rd YEAR (SEMESTER –V)

Electronics & Communication Engineering

L	T	P	Credits		
0	0	2	2	Class Work	: 100
				Total	: 100
				Duration of Exam	: 3 Hours

At the end of 4th semester each student would undergo four weeks Professional Training in an Industry/ Institute/ Professional Organization/Research Laboratory etc. with the prior approval of the Training and Placement Officer of the University and submit in the department a typed report along with a certificate from the organization.

The typed report should be in a prescribed format.

The report will be evaluated in the 5th Semester by a Committee consisting of three teachers from different specialization to be constituted by the Chairperson of the department. The basis of evaluation will primarily be the knowledge and exposure of the student towards different processes and the functioning of the organization.

The student will interact with the committee through presentation to demonstrate his/her learning.

Teachers associated with evaluation work will be assigned 2 periods per week load.

COURSE OUTCOMES:

1. After the course is completed the student will have additional knowledge about professional attributes.
2. The students will develop a more professional outlook.
3. The students will know how to deal with time bound tasks in a more effective way.
4. The students will have more efficient attribute of multi-tasking.

HUM301C Essence of Indian Traditional Knowledge

Mandatory Course

(Common for All Branches)

B.Tech. 3rd YEAR (SEMESTER –V)

Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	-	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1(10 Lectures)

Indian Knowledge Traditions and Processes: An Overview
Vedic Tradition, Epical Tradition, Sutra Tradition, Scholastic Tradition

Unit 2(10 Lectures)

Vedic and Upnishadic Traditions
Vedic Mantras: Hymn of Creation, To Vāk
UpnishadicNarraatives: The Story of Nachiketa

Unit 3(10 Lectures)

Epical Insights
Gyanmarg(The Yoga of Wisdom)

Unit 4(10 Lectures)

Folk Wisdom

(A) Folk Tales as knowledge: "The Blind Man and an Elephant"#
"The Goat who saved the Priest", " Buried Treasure" , " Little Prince, No Father", " Demons in the Desert"##

"The Story of Meddlesome Monkey" , " The Story of the Lion and the Rabbit" "The Story of Three Fishes""The Story of DharmabudhiamndPapabuddhi"###

(B) Haryanvi Ragini as Moral lesson: Raja Harishchandra

Note: Different signs such as # etc. indicate source of the primary texts enlisted in the 'RECOMMENDED READING

Text /Reference Books:

1. Mitchell, Stephen. *The Bhagavad Gita*. Harmony Books, 2007(Ch.4 for UNIT III).
2. Radhakrishnan, S. & Charles A. Moore. eds. *A Source Book in Indian Philosophy*. Princeton UP, 1957 ("General Introduction:History of Indian Thought" for UNIT I, Ch.1-2 for UNIT II))
3. ###Sharma, Vishnu.*Panchatantra*. Translated by RohiniChowdhury. Puffin Books.
4. Sharma, Puran Chand. *Pundit Lakhmi Chand Granthavali*. Haryana SahityaAkademi, 2010.
5. # https://www.peacecorps.gov/educators/resources/story-blind-men-and-elephant/
6. ##www. buddhanet.net

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Understand, appreciate and explain Indian traditional knowledge systems.
2. Relate life and learning with traditional knowledge in present times.

Pedagogy:

Through lectures, self study, group discussion, Projects and seminar

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

ECE302C Control Systems

B.Tech. 3rd YEAR (SEMESTER –VI)
Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1(10 Lectures)

Input / Output Relationship: System / Plant model, illustrative examples of plants & their inputs and outputs, open loop & closed loop control system & their illustrative examples, Mathematical modeling and representation of physical systems, Concept of transfer function, relationship between transfer function and impulse response, order of a system, block diagram algebra, signal flow graphs: Mason's gain formula & its application, characteristic equation, derivation of transfer functions of electrical and electromechanical systems.

Unit 2(12 Lectures)

Time Domain Analysis: Typical test signals, time response of first order systems to various standard inputs, time response of 2nd order system to step input, time domain specifications, steady state error and error constants, concept of stability, pole-zero configuration and stability, necessary and sufficient conditions for stability, Hurwitz stability criterion, Routh stability criterion and relative stability. Root locus concept, development of root loci for various systems, stability considerations.

Unit 3(11 Lectures)

Frequency Domain Analysis: Relationship between frequency response and time-response for 2nd order system, polar, Nyquist, Bode plots, stability, Gain-margin and Phase Margin, relative stability, frequency response specifications.

Unit 4(10 Lectures)

Compensation: Necessity of compensation, compensation networks, application of lag and lead compensation, basic modes of feedback control, proportional, integral and derivative controllers.

Control Components: Synchros, servomotors, stepper motors, magnetic amplifier.

Text book:

1. Control System Engineering: I.J. Nagrath& M. Gopal; New Age Publishers.

Reference books:

1. Automatic Control Systems: B.C. Kuo, PHI. Publishers.
2. Modern Control Engg: K. Ogata; PHI. Publishers.
3. Control Systems - Principles & Design: Madan Gopal; Tata Mc Graw Hill. Publishers.
4. Modern Control Engineering, R.C. Dorf & Bishop; Addison-Wesley Publishers.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Understand the important aspect of classical control system which will provide the opportunity to control machine & industrial process for benefit of society.
2. In order to efficiently ensure a certain level of security, ant organization with valuable assets should have an automated key control system with the help of this student will be able to gain the knowledge regarding automated control system.
3. It will help to understand how to mange command direct or regulate the behavior of devices or system using control loop. It is the most important aspect of any industry which will help the student to perform this duty properly.
4. Practically all system requires stability and control thereby ensure that stability is achieved.It will help to understand the control system of single home heating controller using a thermostat controlling and also the large industrial control system which are used for controlling processes or machine.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

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ECE304C VLSI Design

B.Tech. 3rd YEAR (SEMESTER –VI)

Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (9 Lectures)

Introduction to MOSFET: Structure and cross-sectional view of a MOSFET, Enhancement and Depletion mode MOSFETs, Operation of Enhancement and Depletion mode MOSFETs.

Device Modelling: DC MOSFET Model, Small Signal MOSFET Model, High Frequency MOSFET Model, Measurement of MOSFET Model Parameters.

Unit 2 (10 Lectures)

Basic Integrated Circuit Building Blocks: Introduction, Switches, Active Resistors, Current Sources and Sinks.

Digital Circuits: Introduction, Characteristics of Digital Circuits: Logic Level Standards, Inverter Pair Characteristics, Logic Fan-Out Characteristics, Digital Logic Analysis.

Unit 3 (10 Lectures)

MOS/CMOS Inverters: Basic Single Channel Inverters, Inverter Device Sizing, Enhancement Load versus Depletion Load Inverter, A Basic CMOS Inverter, CMOS Inverter Logic Levels, Device Sizing.

NMOS/ CMOS NOR and NAND Logic Gates: Basic NMOS NOR Logic Circuits, Basic NMOS NAND Logic Circuits, Multi-Input NMOSNOR and NAND Logic Gates, NMOS Pass Transistor, CMOS NOR Logic Circuits, CMOS NAND Logic Circuits, Multi-Input CMOS NOR and NAND Logic Gates, CMOS Transmission Gates.

Unit 4 (12 Lectures)

Signal Propagation Delays and Power Dissipation: Ratio-Logic Models, Process Characteristics Time Constant, Inverter-Pair Delay, Super buffers, NMOS NAND and NOR Delays, Enhancement versus Depletion Loads, CMOS Logic Delays, Interconnection Characteristics, NMOS Power Dissipation, CMOS Power Dissipation, Clocked CMOS Logic: C2MOS, Precharge-Evaluate Logic, Domino CMOS.

Semiconductor Memories: Memory Organization, Erasable Programmable Read-Only Memory, Electrically Erasable Programmable Read-Only Memory, Static RAM Memories, Dynamic RAM Memory.

Text/ Reference Books:

1. Basic VLSI: Design: Douglas A. Pucknell, Kamran Eshragian.
2. CMOS VLSI: Design: Neil H.E.Weste, David Money Harris.
3. VLSI: Design: K.Lal Kishore, V.S.V. Prabhakar.
4. Digital Integrated Circuits: Rabaey, Chandrakasn, Nikolic.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Understand the basic concepts and operations of different types of MOSFETs and the device modelling related to MOSFEs in different types of signal Levels.
2. Understand the properties of various digital circuits used in all spheres of life and the basic building blocks to realize these digital circuits.
3. Understand the designing of the various digital gates, to calculate their sizes in the Integrated circuits and the performance in single channel and CMOS circuits.
4. Measure various performance parameters related to digital circuits realized in the Integrated Circuits and the circuits used in the realization Semiconductor Memories.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

ECE384C VLSI Design Lab

B.Tech. 3rd YEAR (SEMESTER –VI)
Electronics & Communication Engineering

L	T	P	Credits		
0	0	2	1	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

List of Experiments:

1. Design a CMOS inverter in schematic and simulate for Transient Characteristics.
2. Design a CMOS two input NAND gate, Two input NOR gate, Two input AND gate and Two input OR gate in schematic and simulate for Transient Characteristics.
3. Design the layout of a CMOS Inverter and simulate for DC (Transfer) and Transient characteristics.
4. Design the layout for two inputs NAND gate, two input OR gate, two input AND gate and two input NOR gate and simulate for DC (Transfer) and Transient characteristics.
5. Realized a two input EXOR gate in schematic, draw its layout and simulate for DC (Transfer) and Transient characteristics.
6. To realize a 1 bit full adder in CMOS schematic, design its layout using tool option and simulate for Transient Characteristics.
7. To realize a Boolean expression Y=Not ((A+B)C) in schematic, draw its layout and simulate for Transient Characteristics..
8. To realize a 4 X 1 MUX using transmission gates in schematic and simulate for Transient Characteristics.
9. To Realize JK FLIPFLOP in CMOS schematic, design its layout and simulate for Transient Characteristics.
10. To Realize D FLIPFLOP and T FLIPFLOP in CMOS schematic, design its layout and simulate for Transient Characteristics.

Text/Reference Books:

1. Basic VLSI: Design: Douglas A. Pucknell, Kamran Eshragian.
2. CMOS VLSI: Design: Neil H.E.Weste, David Money Harris.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Understand the basic of digital VLSI Design.
2. Understand the schematic designing of Digital circuits and analysis these for AC ,DC, and Transient.
3. Design a gate of any given arbitrary logic function at the transistor-level.
4. Design the Layout a Basics gates in CMOS VLSI technology.

Note:

1. Each laboratory class/section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands on experience to each student, each experiment may either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.
3. Ten experiments are to be performed out of which at least seven experiments should be performed from the above list. Remaining three experiments should be performed from the above list or designed and set by the concerned department as per the scope of the syllabus.

ECE306C Verilog Based Digital System Design

B.Tech. 3rd YEAR (SEMESTER –VI)
Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (9 Lectures)

Basic Digital Systems: Introduction to Digital Design, Introduction to Verilog HDL: ASIC / FPGA design flow, Advantages of HDL, Overview of digital design with Verilog HDL. Hierarchical modeling: Basic concepts – Modules and ports. Overview of different levels of abstractions: Gate level modeling, Dataflow modeling, Behavioral modeling, Switch level modeling.

Unit 2 (10 Lectures)

Combinational Logic Design: Modeling at Data Flow Level, Continuous Assignment Structures, Delays and Continuous Assisgnments, Assignment to Vectors, Operators, Verilog HDL for combinational Circuits, Design of Adder, Subtractor, Decoders, Encoders, Multiplexer, code Converter.

Unit 3 (12 Lectures)

Sequential Logic Design: Behavioral Modeling: Operator and Assignments, Functional Bifurcation, Initial & Always Construct, Assignments with Delays, wait construct, Multiple always blocks, If and if-else, assign-deassign, repeat Construct, Loop Construct: for, while & forever, Parallel blocks, force-release construct, event, Design of Flip flop, Shift register and Counters using Verlilog HDL.

Unit 4 (12 Lectures)

Modeling Techniques: Functions, Tasks, user defined primitives, Pipeline principle, State Machine: Moore and mealay state model, Verilog HDL code for moore-type FSM, Specification of Mealy FSM using Verilog HDL, Mealy-type and Moore-type FSM for Serial Adder.

Text/Reference Books:

1. J. F. Wakerly, Digital Design: Principles and Practices, Prentice Hall.
2. M.G.Arnold, Verilog Digital – Computer Design, Prentice Hall (PTR), 1999.
3. S. Palnitkar , Verilog HDL – A Guide to Digital Design and Synthesis, Pearson , 2003.
4. M.D. Ciletti, Modeling, Synthesis and Rapid Prototyping with the Verilog HDL, Prentice Hall, 1999.
5. W.Wolf, FPGA- based System Design, Pearson, 2004
6. PLD, FPGA data sheets.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Describe Verilog hardware description languages (HDL).
2. Design Digital Circuits.
3. Write behavioral models of digital circuits.
4. Write Register Transfer Level (RTL) models of digital circuits.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

ECE386C Verilog Based Digital System Design Lab

B.Tech. 3rd YEAR (SEMESTER –VI)

Electronics & Communication Engineering

L	T	P	Credits		
0	0	2	1	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

List of Experiments:

1. Write a Verilog code to realize all the logic gates.
2. Design a Verilog code to implement Half Adders, Full adders and Subtracters using Gates.
3. Write a Verilog code to describe the function of Multiplexer and Demultiplexer using different modelling styles.
4. Design a Verilog code to realize D Flip-Flop and D Latch.
5. Write a Verilog code to implement 2:1 Mux and D Latch using Switches.
6. Write a Verilog code to implement Encoders and Decoders Using if-else Statement and case Statement.
7. Design a Verilog code to implement SR Flip Flop using UDP (User Defined Program).
8. Write the Verilog code for a JK Flip-flop, and its test bench. Use all possible combinations of inputs to test its working.
9. Design the hardware description of a 8-bit register with parallel load, shift left and shift right modes of operation and test its operation.
10. Write a Verilog code to realize Up/Down Counter and Divide by 4.5 Counter.
11. Design a Verilog code to describe the function of Synchronous FIFO.
12. Write a Verilog code using FSM to realize a sequence detector (101101).
13. Design any one Digital System using Verilog.

Text/Reference Books:

1. Verilog HDL:A Guide to Digital Design and Synthesis by Samir Palnitkar ,PHT .
2. HDL Programming Fundamentals:VHDL and Verilog by Nazeih Botros,Dream Tech Press.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Design any basic building blocks and simulate all digital function in Verilog HDL.
2. Simulate and synthesis digital system using Verilog HDL.
3. Test the functionality of combinational and sequential logic design with the help of Verilog HDL.
4. Design and simulate finite state machine in Verilog HDL.

Note:-

1. Each laboratory class/section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands on experience to each student, each experiment may either be done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.
3. Ten experiments are to be performed out of which at least seven experiments should be performed from the above list. Remaining three experiments should be performed from the above list or designed and set by the concerned department as per the scope of the syllabus.
4. Any open source tool can be used to perform the experiments.

ECE308C Wireless Communication System

B.Tech. 3rd YEAR (SEMESTER –VI)
Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1(12 Lectures)

Introduction to Wireless Communication Systems: Evolution of Mobile Radio Communications : Introduction, First Generation (1G), Second Generation (2G), Generation (2.5G) , Third Generation (3G), Evolution from 2G To 3G, Fourth Generation (4G), Examples of Wireless Communication Systems , Difference Between Fixed Telephone Network and Wireless Telephone Network, Wireless Local Loop [WLL], Wireless Local Area Networks (WLAN) , Personal Area Network(PAN), Bluetooth, GSM and CDMA System.
The Cellular Concept-System Design Fundamentals: Introduction, Frequency Reuse, Channel Assignment Strategies, Hand-Off Strategies, Interference and System Capacity, Trunking and Grade of Service, Improving Coverage and Capacity in Cellular Systems.

Unit 2(12 Lectures)

Large Scale Path Loss: Introduction to Radio Wave Propagation, Free Space Propagation Model, Practical Link Budget Design Using Path Loss Models, Outdoor Propagation Models, Indoor Propagation Models, Signal Penetration into Buildings.
Small Scale Fading and Multipath: Small Scale Multipath Propagation, Impulse Response Model of a Multipath Channel, Small Scale Multipath Measurements, Parameters of Mobile Multipath Channels ,Types of Small Scale Fading, Rayleigh and Ricean Distributions.

Unit 3(10 Lectures)

Equalization and Diversity : Fundamentals of Equalization, Equalizer in a Communication Receiver, Linear Equalizer, Non Linear Equalization, Diversity Techniques, Rake Receiver, Interleaving
Multiple Access Techniques for Wireless Communication : Introduction, Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Spread Spectrum Multiple Access, Space Division Multiple Access (SDMA), Capacity of Cellular System.

Unit 4(10Lectures)

Wireless Networking : Introduction to Wireless Networks, Development of Wireless Networks, Traffic Routing in Wireless Networks, Wireless Data Services, Common Channel Signaling, Integrated Services Digital Network (ISDN), Signalling System No.7(SS 7),Personal Communication Services/Networks.(PCS/PCN)
Advance Intelligent Networks: Introduction, Intelligent Networks and its architecture, Advanced Intelligent Networks and its application.

Text/Reference Books:

1. V.K.Garg, J.E.Wilkes, "Principle and Application of GSM", Pearson Education, 5th edition, 2008.
2. Rajeshwar Dass, "Wireless Communication Systems," I.K International Pvt. Ltd
3. Mobile Communication: Jochen Schiller Pearson Education.
4. V.K.Garg, "IS-95 CDMA & CDMA 2000", Pearson Education, 4th edition, 2009.
5. T.S.Rappaport, "Wireless Communications Principles and Practice", 2nd edition, PHI,2002.
6. William C.Y.Lee, "Mobile Cellular Telecommunications Analog and Digital Systems", 2nd edition, TMH, 1995.
7. Asha Mehrotra, "A GSM system Engineering" Artech House Publishers Bosten, London,1997.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Understand basics of wireless communication and propagation mechanism in cellular networks.
2. Understand various propagation and fading models prevalent in wireless networks.
3. Identify various diversity techniques and multiple access techniques available in wireless networks.
4. Understand various standards or services available in wireless communication systems .

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

Note:

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2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

ECE322C Speech and Audio Processing

B.Tech. 3rd YEAR (SEMESTER –VI)
Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1(10 Lectures)

Speech signal and signal processing, Digital signal processing, Digital speech processing: Digital transmission and storage of speech, speech synthesis systems, speaker verification and identification, speech recognition systems, aids-to-the handicapped, enhancement of signal quality.

Fundamentals of digital speech processing: Discrete –time signals and systems, representation of signals and systems using Z-transform, Fourier Transform, and discrete Fourier Transform; Fundamentals of FIR and IIR Digital filters; sampling of signals, Decimation and Interpolation of sampled waveforms.

Unit 2(10 Lectures)

Digital Models for the Speech Signal: Process of speech production, mechanism of speech production, Acoustic phonetics; Acoustic theory of speech production-sound propagation, example of uniform lossless tube, Effects of losses in the vocal tract, Effects of radiation at the lips, vocal tract transfer functions for vowels, Effect of Nasal Coupling, Models based on Acoustic theory.

Lossless tube models:Wave propagation in concatenated lossless tubes, boundary conditions, relationship to digital filters, Transfer function of the Lossless tube model; Digital models for speech signals-Vocal tract, Radiation, Excitation, complete model.

Unit 3(12 Lectures)

Digital Representations of the speech waveform: Sampling speech signals, statistical model for speech, instantaneous Quantization-uniform quantization, instantaneous companding, Quantization for optimum SNR, Adaptive quantization- feed forward adaptation, feedback adaptation; Differential PCM (DPCM)-DPCM with adaptive quantization and prediction.
CD-Quality audio, Synthesized audio.

Short –Time Fourier Analysis: Fourier Transform interpretation, Linear filtering interpretation, sampling rates of $X_n(e^{j\omega})$ in time and frequency, Filter bank summation method of short-time synthesis, overlap addition method for short time synthesis, summary of basic model for short-time analysis and synthesis of speech.

Unit 4(12 Lectures)

Design of digital filter banks: practical considerations, Filter bank design using IIR and FIR filters, Implementation of the filter bank summation method using Fast Fourier Transform-analysis techniques, synthesis techniques, Pitch Detection, Analysis by synthesis-pitch synchronous spectrum analysis, Pole-zero analysis.

Analysis synthesis systems:Digital coding of the time dependent Fourier transform, phase vocoder, Channel vocoder.

Text/Reference Books:

1. "Digital processing of speech signals" by L. R. Rabinar and R. W. Schafer, Pearson Education.
2. "Digital Speech" by A.M.Kondoz, Second Edition (Wiley Students_ *Edition), 2004.*
3. "Speech Coding Algorithms: Foundation and Evolution of Standardized Coders", W.C.Chu, Wiley Inter science, 2003.
4. "Multimedia Communication, applications, Networks, Protocols and Standards", Fred Halsall, Pearson Education.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Use concepts of signal processing in speech processing, and relate parameters to get desired quality of audio.
2. Mathematically model the speech signal to synthesize in applications.
3. Analyze the quality and properties of speech signal.
4. Modify and enhance the speech and audio signals for applications in speech and audio Processing applications.

Note:

Paper setter will set two questions (each with 2-3 sub-parts) from each of the four units, & a ninth compulsory

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

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ECE324C Introduction to MEMS

B.Tech. 3rd YEAR (SEMESTER –VI)
Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1(10 Lectures)

MEMS Introduction: Overview of CMOS process in IC fabrication, Microfabrication Evolution, Microsystems miniaturi zation, Materials for MEMS and Microsystems , Microsystem Applications in health care industry, aerospace industry, telecommunications, automobile industry, multidisciplinary aspect of MEMS.

Unit 2 (12 Lectures)

Microsensors and Microactuation: Microsensors: overview,:pressure sensor and its application like accelerometer, gyroscope, acoustic wave sensors, biomedical sensors, thermal sensors,. Microactuation: overview, microactuation using thermal forces, electrostatic forces, shaped memory alloys, examples of microactuators like Microgrippers, Micromotors, Microvalves, Micropumps.

Unit 3 (8Lectures)

Scaling laws in MEMS: Scaling in electrostatic forces, electromagnetic forces, Scaling in electricity, fluid mechanics and heat transfer.

Unit 4 (12 Lectures)

Micromanufacturing and Micropackaging: Micromanufacturing: Bulk Micromanufacturing, Surface Micromachining, LIGA Process.Micropackaging: Microsystem Packaging, Packaging Technologies, Three dimensional packaging, Selection of Packaging Materials.

Text/Reference Books:

1. Tai-Ran Hsu,"Mems &microsystems design and manufacture"Mc Graw Hill,2002.
2. Nadim Maluf, An Introduction to Microelectromechanical Systems Engineering, Artech House, 2000.
1. M.H. Bao, Micro Mechanical Transducers, Volume 8, Handbook of Sensors and Actuators, Elsevier, 2000.
2. H. J. De Los Santos, Introduction to Microelectromechanical (MEM) Microwave Systems, Artech, 1999.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Apply and analyze the concepts of advanced Microsystem fabrication technologies in order to design devices that are more power efficient.
2. Design different techniques and processes for microsensor & microactuators that will ease the work for human kind.
3. Understand various scaling laws that governs the designing of MEMS devices and inturn will be able to design improved versions of existing devices.
4. Understand and design different packaging techniques for MEMS devices using variety of materials available for providing more rugged structures for human use.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

ECE326C Scientific computing

B.Tech. 3rd YEAR (SEMESTER –VI)
Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (10 Lectures)

Introduction: Sources of Approximations, Data Error and Computational, Truncation Error and Rounding Error, Absolute Error and Relative Error, Sensitivity and Conditioning, Backward Error Analysis, Stability and Accuracy.
Nonlinear equations: Fixed Point Iteration, Newton's Method, Inverse Interpolation Method, Interpolation: Purpose for Interpolation, Choice of Interpolating, Function, Polynomial Interpolation, Piecewise Polynomial Interpolation

Unit 2 (11 Lectures)

System of liner equations: Linear Systems, Solving Linear Systems, Gaussian elimination,Pivoting, Gauss-Jordan, Norms and Condition Numbers, Symmetric Positive Definite Systems and Indefinite System, Iterative Methods for Linear Systems.
Linear least squares: Data Fitting, Linear Least Squares, Normal Equations Method, Orthogonalization Methods, QR factorization, Gram-Schmidt Orthogonalization, Rank Deficiency, and Column Pivoting, Nonlinear Least Squares.

Unit 3 (13 Lectures)

Eigen values and singular values: Eigen values and Eigenvectors, Methods for Computing All Eigen values, Jacobi Method, Methods for Computing Selected Eigen values, Singular Values Decomposition, Application of SVD.
Optimization: One-Dimensional Optimization, Multidimensional Unconstrained Optimization.
Numerical Integration and Differentiation: Quadrature Rule, Newton-Cotes Rule, Gaussian Quadrature Rule, Finite Difference Approximation.
Partial Differential Equations: Time Dependent Problems, Time Independent Problems, Solution for Sparse Linear Systems, Iterative Methods.

Unit 4 (8 Lectures)

Initial Value Problems for ODES: Euler's Method, Taylor Series Method, Runga-Kutta Method, Extrapolation Methods.
Boundary Value Problems for ODES: Finite Difference Methods, Finite Element Method, Eigenvalue Problems.
Fast Fourier Transform: FFT Algorithm, Limitations, DFT, Fast polynomial Multiplication,Wavelets, Random Numbers and Simulation, Stochastic Simulation, Random Number Generators, Quasi-Random Sequences.

Text Books:

1. Heath Michael T., "Scientific Computing: An Introductory Survey", McGraw-Hill, 2nd Ed., 2002
2. Press William H., Saul A. Teukolsky, Vetterling William T and Brian P. Flannery,"Numerical Recipes: The Art of Scientific Computing", Cambridge University Press,3rd Ed., 2007
3. Xin-she Yang (Ed.). "Introduction to Computational Mathematics", World Scientific Publishing Co., 2nd Ed.

Reference Books:

1. Kiryanov D. and Kiryanova E., "Computational Science", Infinity Science Press, 1stEd., 2006
2. Quarteroni, Alfio, Saleri, Fausto, Gervasio and Paola, "Scientific Computing With MATLAB and Octave", Springer, 3rd Ed., 2010

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Students will understand different types of errors and several necessary functions of scientific computing.
2. Students will have a clear understanding of system of linear equations.
3. Understand the significance of computing methods, their strengths and application areas.
4. Perform the computations on various data using appropriate computation tools.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

ECE328C Optimization Techniques

B.Tech. 3rd YEAR (SEMESTER –VI)
Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (10 Lectures)

Introduction to Operation Research: Introduction to models and modeling techniques, general methods for Operation Research models, methodology and advantages of Operation Research.

Linear Programming (LP): Introduction to LP and formulation of Linear Programming problems, Graphical solution method, alternative or multiple optimal solutions, Unbounded solutions, Infeasible solutions, Maximization – Simplex Algorithm, Minimization – Simplex Algorithm using Big-M method, Two phase method, Duality in linear programming, Integer linear programming.

Unit 2 (12 Lectures)

Transportation & Assignment Problems: Introduction to Transportation problems, various methods of Transportation problem, Variations in Transportation problem, introduction to Assignment problems, variations in Assignment problems.

Unit 3 (10 Lectures)

Network Analysis: Network definition and Network diagram, probability in PERT analysis, CPM, project time cost trade off, introduction to resource smoothing and allocation.

Sequencing: Introduction, processing N jobs through two machines, processing N jobs through three machines, processing N jobs through m machines.

Unit 4 (10 Lectures)

Inventory Model: Introduction to inventory control, deterministic inventory model, EOQ model with quantity discount.

Queuing Models: Concepts relating to queuing systems, basic elements of queuing model, role of Poisson & exponential distribution, concepts of birth and death process.

Text/ Reference Books:

1. J K Sharma, Operations Research Theory and Applications, MacMillan India Ltd.
2. N D Vohra, Quantitative Techniques in management, Tata McGraw Hill.
3. Handy A Taha, Operations Research – An Introduction, Prentice Hall of India, New Delhi.
4. Wagner H M, Principles of Operations Research: With Applications to Management Decisions, Prentice-Hall of India, New Delhi.
5. Hillier F S and Lieberman G J, Operations Research, Holden Day Inc., San Francisco.
6. Payne T A, Quantitative Techniques for Management: A Practical Approach, Reston Publishing Co. Inc., Virginia.
7. Wilkes F M, Baum P and Smith G D, Management Science: An introduction, John Wiley and Sons, Santa Barbara.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Understand importance of optimization of industrial process management
2. Apply basic concepts of mathematics to formulate an optimization problem
3. Analyse and appreciate variety of performance measures for various optimization problems
4. Evaluate the solutions from different perspective, which are given in the absence of input of optimization.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

HUM350C Communication Skills for Professionals (Except BME & BTE)

B.Tech. 3rd YEAR (SEMESTER –VI)

Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (8 Lectures)

Mechanics of Report Writing: Objectives of Report Writing; Types of Reports on the basis of forms and content. Introduction to Formats of Reports; Structure of Reports:Front Matter, Main Body, Back Matter.

Unit 2 (10 Lectures)

Writing Business and Technical Report: Preliminary Strategies for Report Writing: Data Collection, Report Planning,Use of Illustrations, Point Formation, Preparing Notes/Drafts. Using Appropriate Formats: Memo Format, Letter Format,Manuscript Format, Printed Forms

Unit 3 (10 Lectures)

Oral Communication and Soft Skills : Group Discussions; Interviews for jobs: preparation and facing them.Professional Presentations: Power Point Presentation, Oral Presentation. Role of Kinesics (Body Language) in Communication.General Etiquettes in Office areas, corporate lunch and dinner. Handling Telephone calls.

Unit 4 (8 Lectures)

Resumes and Job application: Writing of Resume--Chronological Resume and Functional Resume.Request for Reference/Recommendation .Writing Application Letters for Job; Writing Covering letter.

Text/ Reference Books:

1. Sharma,Sangeeta, and Binod Mishra. *Communication Skills for Engineers and Scientists.* PHI,2009.
2. Tyagi,Kavita, and Padma Mishra. *Advanced Technical Communication.* PHI, 2011.
3. Rizvi, M. Ashraf. *Effective Technical Communication*. McGraw Hill Education, 2014.
4. Kumar, Sanjay, and PushpLata. *Communication Skills*. OUP, 2011.
5. Raman, Meenakshi and SangeetaSharma.*Communication* Skills. OUP,2011.
6. *Bhatnagar, Nitin, and MamtaBhatnagar. *Communicative English for Engineers and Professionals*. Pearson Education, 2013. (The soft copy of the book is available in the university library)
7. Mitra,Barun K. *Personality Development and Soft Skills*. OUP,2011.
8. Kaul, Asha. *Business Communication*. PHI, 2nd Edition.
9. Namee, Patrick Mc. *Success in Interviews: How to Succeed in any Job Interview*, Ist Edition.
10. Argenti, Paul. *Corporate Communication*.6th Edition. McGraw Hill Education, 2012.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Get acquainted with multiple forms and formats of various technical and business reports
2. Develop competence for report writing with a focus on its complex writing techniques and procedures.
3. Develop their speaking skills with professional proficiency.
4. Equip themselves for Letter Writing Skills.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

HUM352C Soft Skills And Interpersonal Communication

B.Tech. 3rd YEAR (SEMESTER –VI)

Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (8 Lectures)

Soft Skills: Introduction to Soft Skills & their classification.Importance of Soft Skills: Writing Resume/CV, Engaging in Group discussion, Appearing for Job interviews.

Unit 2 (10 Lectures)

Interpersonal Skills, Behaviour, Relationships and Communication: Development and Role of Effective Interpersonal Skills.Development of Effective Speaking and Listening Skills.

Unit 3 (10 Lectures)

Non-Verbal Elements in Interpersonal Communication : Role of Body Language, Paralinguistic Features, Proxemics/Space Distance and Haptics in Interpersonal Communication.

Unit 4 (8 Lectures)

Personality Development for Personal and Professional Growth: Desirable Personality Attributes, Personality Types, Analysis of Personality Development (Freudian and Swami Vivekananda's Concept), Grooming Personality for Personal and Professional Life.

Text/ Reference Books:

1. Mitra, Barun K. *Personality Development and Soft Skills*. Delhi: OUP, 2nd Edition, 2016.
2. Butterfield, Jeff.*Soft Skills for Everyone.* Cengage Learning, 2017.
3. Raman, Meenakshi and Sangeeta Sharma. *Communication Skills.* OUP, 2011.
4. Ramesh, Gopalaswamy and Mahadevan Ramesh. *The ACE of Soft Skills,* Pearson India,2010.
5. Ribbons, Geoff and Richard Thompson.*Body Language*.Hodder& Stoughton, 2007.
6. Sharma, Sangeeta and Binod Mishra.*Communication Skills for Engineers and Scientists.* PHI, 2017.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Know now how soft skills complement hard skills for career growth.
2. Enhance communicative competence for professional enhancement.
3. Learn desirable body language and other non-verbal elements in interpersonal communication.
4. Groom personality for handling effectively various situations of personal and professional life.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

MGT402C Human Values, Ethics And IPR

B.Tech. 3rd YEAR (SEMESTER –VI)
Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (10 Lectures)

Human Values: Understanding the need, basic guidelines, Self Exploration - its content and process; 'Natural Acceptance' and Experiential Validation, Continuous Happiness and Prosperity- Human Aspirations, Right understanding, Relationship and Physical Facilities, Understanding Happiness and Prosperity correctly.

Unit 2 (12 Lectures)

Different kinds of value: Understanding human being as a co-existence of the sentient 'I' and the material 'Body' Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

Unit 3 (10 Lectures)

Modern approach to the study of values: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship Understanding harmony in the Family, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman).

Unit 4 (10 Lectures)

Professional Ethics & IPR: Values in Work-life, Professional Ethics and Ethos, Code of conduct, Whistle Blowing, Corporate Social Responsibility.IPR: meaning, nature, scope and relevance of IPR. Kinds of IPR: Copyright, Patents, Trademark, Geographical Indication, Industrial design, Plant Variety. Benefits, Emerging dimensions and Rational for protection of IPR.

Suggested Readings:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics, Excel Books, New Delhi
2. A.N. Tripathy, 2003, Human Values, New Age International Publishers.
3. E G Seebauer& Robert L.Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
4. M Govindrajan, S Natrajan& V. S Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
5. S. B. Gogate, Human Values & Professional Ethics, Vikas Publishing House Pvt. Ltd., Noida.

Reference Books:

1. A Nagraj, 1998 JeevanVidyaekParichay, Divya Path Sansthan, Amarkantak.
2. P. L. Dhar, R. R. Gaur, 1990, Science and Humanism, Commonwealth Publishers.
3. Prof. A.R.Aryasri, DharanikotaSuyodhana, Professional Ethics and Moral, Maruthi Publications.
4. A. Alavudeen, R.Kalil Rahman and M. Jayakumaran, Professional Ethics and Human Values, University Science Press.
5. Prof.D.R.Kiran, 2013, Professional Ethics and Human Values, Tata McGraw-Hill
6. Jayshree Suresh and B. S. Raghavan, Human Values And Professional Ethics, S.Chand Publications

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Students will be able to understand the significance of value inputs in a classroom and start applying them in their life and profession
2. Understand and can distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
3. Understand the role of a human being in ensuring harmony in society and nature.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

4. Students will be aware of the significance of Intellectual Property as a very important driver of growth and development in today's world and to be able to statutorily acquire and use different types of intellectual property in their professional life.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

MGT404C Human Resource Management

B.Tech. 3rd YEAR (SEMESTER –VI)
Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (10 Lectures)

Introduction: Nature and scope of human resource management, HRM objectives and functions, HRM policies, HRM in globally competitive environment; strategic human resource management.

Unit 2 (12 Lectures)

Acquiring human resources: Man power planning, Job evaluation, job analysis and job design. Recruitment: Sources, Methods, constraints & challenges, selection: objectives and process, placement and induction.

Unit 3 (10 Lectures)

Developing human resources: Training: types, methods, training vs. development and evaluation of a training programme and training need assessment, career planning and development.

Unit 4 (10 Lectures)

Performance appraisal: Methods, process and challenges of performance appraisal, performance appraisal vs. potential appraisal, Compensation: wages & salaries administration and factors influencing compensation levels.

Suggested Readings:

1. Jyothi, Human Resource Management, Oxford University Press
2. Bohlander George and Scott Snell, Management Human Resources, Cengage, Mumbai
3. Bhattacharyya, Dipak Kumar, Human Resource Management, Excel Books, NewDelhi
4. Cascio Wayne F., Managing Human Resources, TMH, New Delhi
5. DeCenzo, David A, and Stephan P. Robbins, Fundamentals of Human Resource Management, Wiley India, New Delhi
6. Denisi, Angelo S, and Ricky W Griffin, Human Resource Management, Biztantra, New Delhi

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. To have an understanding of the basic concepts, functions and processes of human resource management
2. To be aware of the role, functions and functioning of human resource department of the organizations.
3. To Design and formulate various HRM processes such as Recruitment, Selection, Training, Development, Performance appraisals and Reward Systems, Compensation Plans and Ethical Behavior.
4. Develop ways in which human resources management might diagnose a business strategy and then facilitate the internal change necessary to accomplish the strategy.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

HUM354C Introduction To French Language

B.Tech. 3rd YEAR (SEMESTER –VI)
Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (10 Lectures)

VOCABULAIRE
Les Salutations
Les jours de la semaine, Les moins de l'année, Les couleurs, Les professions
Les nombrescardinaux
Les lieux de la ville, Les nationalites
Personnesetobjetscaractéristiques d'un pays
Civilisation: France,de la sociétéfrancaise, les monuments, les fêtes

Unit 2 (10 Lectures)

GRAMMAIRE
Conjugation des verbeetre, avoir, aller; Conjugation des verbe –er, -ir, -re
Masculin/feminine,Singulier/ pluriel
Accord des nomset des adjectives
Articles indéfinisetdéfines
Négation simple
Interrogation
Futurproche
On= Nous
Articles partitifsetcontractes
La date etl'heure

Unit 3 (8 Lectures)

ECRITURE (comprehension des écrits, Production écrite)
Presentez- vous, Mon meuillierami, Ma famille
Carteset messages d'invitation, d'acceptationou de refus
Ecrives des scenes

Unit 4 (8 Lectures)

COMPREHENSION (écouter, production orale)
Se presenter à ungroupe
Parlez/ écoutezdevotreville
Parlez/écoutezdesesactivités de loisirs
Parlez /écoutez de vosgo*ûts*
Demander/ donnerun explication
Identifier unepersonneouun objet
Demander/dire cequ'ona fait

Text/ Reference Books:

1. Echo – A1 Methode de Francais, CLE International (Distributed in India by W. R. Goyal Publishers & Distributors, Delhi).
2. Connexions, niveau 1, Yves Loiseau and R_gineM_rieux(Goyal Publishers).
3. Alter Ego-1, Hachette (Distributed in India by W. R. Goyal Publishers & Distributors, Delhi).
4. Forum- Methode de Francais 1, Hachette (Distributed in India by W. R. Goyal Publishers & Distributors, Delhi).

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

5. 450 Exercises de Grammaire, CLE International (Distributed in India by W. R. Goyal Publishers & Distributors, Delhi).
6. Audio- Video study material.
7. Supplementary handouts

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Familiarize with the basics of French language.
2. Understand and express vocabulary and grammar through writing.
3. Demonstrate understanding through simple dialogues in French.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

HUM356C Introduction To German Language

B.Tech. 3rd YEAR (SEMESTER –VI)
Electronics & Communication Engineering

L	T	P	Credits		
3	0	0	3	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (10 Lectures)

Introduction to German alphabets
Numbers 0- 100 (basic algebraic expressions)
Vocabulary of days and months
Adverbs of time
Ordinal numbers in German
Phonetics and pronunciation

Unit 2 (10 Lectures)

Introduction to the simple possessive pronouns
Sentence: statement, question, (question for completion and decision) command
Coordination of clauses
Placing of the verb in the sentence: first, second and last place
Word order in main clause
Details of time, manner and place (casual)

Unit 3 (8 Lectures)

Verb: infinitive, imperative, indicative – Präsens, Perfekt, Präteritum of auxiliary and modal verbs, modal verbs (meaning, indicative Präsens&Präteritum, möchten)
Verbs with prefixes – separable and inseparable
Nouns: Gender, plural, Nominative, Accusative, Dative
Articles: Definite and Indefinite
Adjectives: predicative use

Unit 4 (8 Lectures)

Day-to-day conversation in German: Introducing oneself and other, greeting and taking leave, Meeting people, Time and date, months and weekdays
Inquire and name the country of origin, languages
Introduce family members and friends

Text/ Reference Books:

1. Tangram AktuellNiveau A1, Max HeuberVertag, Ismaning, 2005 (Published and distributed in India by German Book Depot, Delhi).
2. Netzwerk A1, KlettVerlag, Muenchen, 2013 (Published and distributed in India by German Book Centre, Delhi 2015).
3. *Sprachkurs Deutsch I &2*. Diesterweg (Moritz) Verlag, Frankfurt am Main, 1989, (Published and distributed in India by Goyal Saab Publishers & Distributors, New Delhi).
4. *Schuelerduden Grammatik*, BibliographischesInstitutand F.ABrockhaus, 2000.
5. *ThemenAktuell 1, Kursbuch*, Max HeuberVerlag, Ismaning, Deutschland, 2003 (Published and distributed in India by German Book Centre, Delhi,2010).
6. Audio-video Study Material.
7. Supplementary Handouts.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Familiarize with the basics of German language.

2. Understand and express vocabulary and grammar through writing.
3. Demonstrate understanding through simple dialogues in German.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

SPEC301C Statistics and Predictive Analytics

B. Tech. (Hons./Minor degree) with Specialization in Artificial Intelligence & Machine Learning
3rd YEAR (SEMESTER –V)

L	T	P	Credits		
4	0	0	4	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1(15 lectures)

Descriptive Statistics: Data exploration (histograms, bar chart, box plot, line graph, scatter plot),Qualitative and Quantitative Data, Measure of Central Tendency (Mean, Median and Mode), Measure of Positions (Quartiles, Deciles, Percentiles and Quantiles), Measure of Dispersion (Range, Median, Absolute deviation about median, Variance and Standard deviation), Anscombe's quartet, Other Measures: Quartile and Percentile, Interquartile Range.
Statistical Analysis: Relationship between attributes: Covariance, Correlation Coefficient, Chi Square, Measure of Distribution (Skewness and Kurtosis), Box and Whisker Plot (Box Plot and its parts, Using Box Plots to compare distribution) and other statistical graphs, Probability (Joint, marginal and conditional probabilities), Probability distributions (Continuous and Discrete), Density Functions and Cumulative functions.

Unit 2 (15 lectures)

Sampling and Estimation: Sample versus population, Sample techniques (simple, stratified, clustered, random), Sampling Distributions, Parameter Estimation, Unbalanced data treatment.
Inferential Statistics: Develop an intuition how to understand the data, attributes, distributions, Procedure for statistical testing, Test of Hypothesis (Concept of Hypothesis testing, Null Hypothesis and Alternative Hypothesis), Cross Tabulations (Contingency table and their use, Chi-Square test, Fisher's exact test), One Sample t test (Concept, Assumptions, Hypothesis, Verification of assumptions, Performing the test and interpretation of results), Independent Samples t test , Paired Samples t test, One way ANOVA (Post hoc tests: Fisher's LSD, Tukey's HSD), z-test and F-test.

Unit 3 (15 lectures)

Linear Regression: Regression basics: Relationship between attributes using Covariance and Correlation, Relationship between multiple variables: Regression (Linear, Multivariate) in prediction, Residual Analysis, Identifying significant features, feature reduction using AIC, multi-collinearity, Non-normality and Heteroscedasticity, Hypothesis testing of Regression Model, Confidence intervals of Slope R-square and goodness of fit, Influential Observations – Leverage.
Multiple Linear Regression: Polynomial Regression, Regularization methods, Lasso, Ridge and Elastic nets, Categorical Variables in Regression.

Unit 4 (15 lectures)

Non-Linear Regression: Logit function and interpretation, Types of error measures (ROCR), Logistic Regression in classification.
Forecasting models: Trend analysis, Cyclical and Seasonal analysis, Smoothing, Moving averages, Box-Jenkins, Holt-winters, Auto-correlation; ARIMA.

Text/ Reference Books:

1. Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", 5th Edition, Academic Press, 2014.
2. C. R. Kothari, "Research Methodology Methods and Techniques", 2nd Edition, New Age International Publishers, 2004.
3. Trevor Hastie, Robert Tibshirani and Jerome Friedman, "The Elements of Statistical Learning-Data Mining, Inference and Prediction", 2nd Edition, Springer Verlag, 2009.
4. Thomas W. Miller, "Modelling Techniques in Predictive Analytics", 1st Edition, Pearson, 2018.
5. J. S. Milton and J.C. Arnold, "Introduction to Probability and Statistics", 4th Edition, Tata McGraw Hill, 2007.
6. R. A. Johnson and C. B. Gupta, "Miller and Freund's Probability and Statistics for Engineers", 7th Edition, Asia, Pearson Education, 2007.
7. Douglas C. Montgomery and George C. Runger, "Applied Statistics and Probability for Engineers", 7th Edition, John Wiley & Sons, 2018.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Analyze the data based on large and small sample sizes. Understand the fundamental knowledge of the concepts of probability, measures of central tendency, correlation, regression and their properties.
2. Acquire the knowledge of standard distributions which can describe real life phenomenon. Have the notion of sampling distributions and statistical techniques used in engineering problem
3. Recognize statistical methods of studying data samples, hypothesis testing, statistical quality control and their properties. Use statistical methodology and tools in the engineering problem-solving process.
4. Compute and interpret descriptive statistics using numerical and graphical techniques. Extract information from data and use it to predict trends and behavior pattern.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

SPEC302C Python Programming

B. Tech. (Hons./Minor degree) with Specialization in Artificial Intelligence & Machine Learning/Internet of Things/Robotics

3rd YEAR (SEMESTER –VI)

L	T	P	Credits		
4	0	0	4	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (15 Lectures)

Introduction and Overview: Introduction to Python, Origin, Comparison, Comments, Operators, Variables and Assignment, Numbers, Strings, Lists and Tuples, Dictionaries, if Statement, while Loop, for Loop and the range(), Built-in Function, Files, Errors and Exceptions, Functions, Classes, Modules Syntax and Style Statements and Syntax, Variable Assignment, Identifiers, Memory Management, Python Applications.

Unit 2 (15 Lectures)

Numbers and Strings: Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions. Sequences: Strings, Lists, and Tuples, Sequences, Strings, Strings and Operators, String-only Operators, Built-in Functions, String Built-in Methods, Special Features of Strings.

Lists and Dictionaries: Operators, Built-in Functions, List Type Built-in Methods, Special Features of Lists, Tuples, Tuple Operators and Built-in Functions, Special Features of Tuples, Introduction to Dictionaries, Operators, Built-in Functions, Built-in Methods, Dictionary Keys.

Unit 3 (15 Lectures)

Functions: Functions, Calling Functions, Creating Functions, Formal Arguments, Positional Arguments, Default Arguments, Default Function Object Argument Example, Variable-length Arguments, Non-keyword Variable Arguments (Tuple), Keyword Variable Arguments (Dictionary).

Classes: Problems in Procedure Oriented Approach, Features of Object Oriented Programming System (OOPS), Classes and objects, Encapsulation, Abstraction, Inheritance, Polymorphism.

Unit 4 (15 Lectures)

Files and Input/output: File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Using context managers with files.

Errors and Exceptions : Introduction to Exceptions, Exceptions in Python, Detecting and Handling Exceptions, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, Regular Expressions, Special Symbols and Characters for Regular expressions.

Text/Reference Books:

1. Wesley J. Chun, "Core Python Programming", 2nd Edition, Pearson, 2007 (Reprint 2010).
2. Paul Barry, "Head First Python", 2nd Edition, O Rielly, 2010.
3. Mark Lutz, "Learning Python", 4th Edition, O Rielly, 2009.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Explain the various concept of Python Programming.
2. Apply the basic concepts of Python Programming for writing simpler programs in Python.
3. Apply the advance concepts of Python Programming for writing advance programs in Python.
4. Develop applications in Python.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

SPEC304C Machine Learning

B. Tech. (Hons./Minor degree) with Specialization in Artificial Intelligence & Machine Learning
3rd YEAR (SEMESTER –VI)

L	T	P	Credits		
4	0	0	4	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (15 Lectures)

Foundations for ML: ML Techniques overview; Validation Techniques (Cross-Validations); Feature Reduction/Dimensionality reduction, Decision tree: Introduction, classification and algorithms; Principal components analysis (Eigen values, Eigen vectors, Orthogonality).

Unit 2 (15 Lectures)

Clustering: Different clustering methods (Distance, Density, Hierarchical), Iterative distance-based clustering; Dealing with continuous, categorical values in K-Means, Constructing a hierarchical cluster, K-Medoids, k-Mode and density-based clustering, Measures of quality of clustering.

Unit 3 (15 Lectures)

Classification : Naïve Bayes Classifier: Model Assumptions, Probability estimation, Required data processing, M-estimates, Feature selection: Mutual information. K-Nearest Neighbors: Computational geometry, Voronoi Diagrams, Delaunay Triangulations, K-Nearest Neighbor algorithm, Wilson editing and triangulations, Aspects to consider while designing K-Nearest Neighbor.

Support Vector Machines: Linear learning machines and Kernel space, Making Kernels and working in feature space, SVM for classification and regression problems.

Unit 4 (15 Lectures)

Ensemble methods: Bagging & boosting and its impact on bias and variance, C5.0 boosting, Random forest, Gradient Boosting Machines and XGBoost.

Data Mining: Techniques and Applications.

Text/ Reference Books:

1. Ethem Alpaydin, " Introduction to Machine Learning", 2nd Edition, MIT Press Ltd, 2010.
2. Stephen Marsland, "Machine Learning: An Algorithmic Perspective", 2nd Edition, CRC Press, 2014.
3. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer Science+Business Media, LLC, New York, 2006.
4. Tom M. Mitchell, "Machine Learning", McGraw Hill, 1997.
5. Luis Pedro Coelho and Willi Richert, "Building Machine Learning Systems with Python", 2nd Edition, PACKT, 2013.
6 Jake VanderPlas, "Python Data Science Handbook Essential tools for working with data", O'Reilly, USA, 2017.
7 Allen B. Downey, "Think Stats Exploratory data analysis in Python", Green Tea Press, Massachusetts, 2014.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Identify potential applications of machine learning in practice and select the appropriate machine learning task.
2. Describe the core differences in Analyzes enabled by regression, classification, and clustering.
3. Apply regression, classification and clustering techniques.
4. Apply the algorithms to a real-world problem and optimize the models learned.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

SPEC384C Machine Learning Lab

B. Tech. (Hons./Minor degree) with Specialization in Artificial Intelligence & Machine Learning
3rd YEAR (SEMESTER –VI)

L	T	P	Credits		
0	0	2	1	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

List of Experiments:

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Text/ Reference Books:

1. A. C. Muller and S. Guido, "Introduction to Machine Learning with Python", O'Reilly, 2016.
2. Jake VanderPlas, "Python Data Science Handbook Essential tools for working with data", O'Reilly, USA, 2017.
3. Allen B. Downey, "Think Stats Exploratory data analysis in Python", Green Tea Press, Massachusetts, 2014.
4. Ethem Alpaydin, " Introduction to Machine Learning", 2nd Edition, MIT Press Ltd, 2010.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Understand the basic concepts of training and testing the machine.
2. Practically understand the working of various algorithms applied in machine learning.
3. Implement and evaluate performance of various classification and clustering algorithms.
4. Apply the machine learning concepts to solve real world problems.

Note:

1. Each laboratory class/section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands on experience to each student, each experiment may be either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.
3. Ten experiments are to be performed out of which at least seven experiments should be performed from the above list. Remaining three experiments should be performed from the above list or designed and set by the concerned department as per the scope of the syllabus.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

SPEC401C Artificial Intelligence

B. Tech. (Hons./Minor degree) with Specialization in Artificial Intelligence & Machine Learning
4th YEAR (SEMESTER –VII)

L	T	P	Credits		
4	0	0	4	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (15 lectures)

Foundations of Artificial Intelligence (AI): Introduction, AI techniques, AI Basics (Divide and Conquer, Greedy, Branch and Bound, Gradient Descent), Solving Problems by Searching, heuristic search techniques, constraint satisfaction problems, stochastic search methods, Neural Network (NN) basics (Perceptron and MLP, FFN, Back propagation).

Unit 2 (15 lectures)

Convolution Neural Networks: Image classification, Text classification, Image classification and hyper-parameter tuning, Emerging NN architectures.

Unit 3 (15 lectures)

Recurrent Neural Networks: Building recurrent NN, Long Short-Term Memory, Time Series Forecasting.

Unit 4 (15 lectures)

Deep Learning and Natural Language Processing: Auto-encoders and unsupervised learning, Stacked auto-encoders and semi-supervised learning Regularization - Dropout and Batch normalization, Introduction to natural language processing.

Text/ Reference Books:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", 3rd Edition, Pearson Education, 2010.
2. Ian Goodfellow and Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press, 2016.
3. Elaine Rich and Kevin Knight, "Artificial Intelligence", 2nd Edition, McGraw-Hill, 2018.
4. Eugene Charniak and D. McDermott, "Introduction to Artificial Intelligence", Pearson Education, 1985.
5. Dan W. Patterson, "Artificial Intelligence and Expert Systems", Prentice Hall of India, 1990.
6. Nils J. Nilsson, "Artificial Intelligence: A New Synthesis", Morgan Kaufmann Publications, 2000.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Create different neural networks of various architectures. Perform the training and testing of neural networks using various learning rules. Analyze these networks for various applications.
2. Identify problems where artificial intelligence techniques are applicable. Apply selected basic AI techniques; judge applicability of more advanced techniques.
3. Participate in the design of systems that act intelligently and learn from experience.
4. Understand the basic concepts of natural language processing.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

SPEC481C Artificial Intelligence Lab

B. Tech. (Hons./Minor degree) with Specialization in Artificial Intelligence & Machine Learning
4th YEAR (SEMESTER –VII)

L	T	P	Credits		
0	0	2	1	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

List of Experiments:

1. To classify linear separable data with a perceptron.
2. To design and train a perceptron for basic logic gate.
3. To design and train a perceptron for universal gate.
4. To design and train a perceptron for identifying ODD and EVEN number.
5. To solve XOR problem with different AI techniques.
6. To classify a 4-class problem with (i) a perceptron (ii) a multilayer perceptron.
7. To construct an ADALINE for adaptive prediction of time series based on past time series data.
8. Write a python program to generate Calendar for given month and year.
9. Write a python program to implement simple calculator.
10. Write a python program to implement Library Management System.
11. Write a program to implement simple chatbot.
12. Write a python program to implement breadth first/ depth first search traversal.
13. Write a python program to solve traveling salesman problem.
14. Write a python program to implement Hangman/ Tic-tac-teo or similar games.

Text/Reference Books:

1. Stuart Russell and Peter Norvig, “Artificial Intelligence – A Modern Approach”, 3rd Edition, Pearson Education, 2010.
2. Ian Goodfellow and Yoshua Bengio and Aaron Courville, “Deep Learning”, MIT Press, 2016.
3. Elaine Rich and Kevin Knight, “Artificial Intelligence”, 2nd Edition, McGraw-Hill, 2018.
4. Eugene Charniak and D. McDermott, “Introduction to Artificial Intelligence”, Pearson Education, 1985.
5. Dan W. Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall of India, 1990.
6. Nils J. Nilsson, “Artificial Intelligence: A New Synthesis”, Morgan Kaufmann Publications, 2000.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Identify the type of an AI problem i.e. search, inference, decision making under uncertainty, game theory, etc).
2. Formulate the problem as a particular type.
3. Compare the difficulty of different versions of AI problems, in terms of computational complexity and the efficiency of existing algorithms.
4. Implement, evaluate, and compare the performance of various AI algorithms, including both empirical demonstration and theoretical proofs.

Note:

1. Each laboratory class/section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands on experience to each student, each experiment may be either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.
3. Ten experiments are to be performed out of which at least seven experiments should be performed from the above list. Remaining three experiments should be performed from the above list or designed and set by the concerned department as per the scope of the syllabus.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

SPEC303C IoT and Applications

B. Tech. (Hons./Minor degree) with Specialization in Internet of Things

3rd YEAR (SEMESTER –V)

L	T	P	Credits		
4	0	0	4	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (16 Lectures)

Introduction to Internet of Things (IoT): Definition of the Internet of Things (IoT), The Importance of the Internet of Things (IoT) in Society IoT Architecture, History of IoT, M2M Machine to Machine, Web of Things, The Layering concepts, IoT Communication Pattern.

IoT protocol: Wireless communication protocols: Wifi, IPV4/IPV6, 6LOWPAN, ZigBee, Bluetooth Low Energy (BLE), Application layer protocols: MQTT/MQTTS, CoAP, REST/HTTP, XMPP, SCADA Authentication Protocols.

Unit 2 (14 Lectures)

Operating System used for IoT: Linux Operating System introduction,Working with the command line and the Shell, Managing directories and files, Managing user access and security, Setting up a Linux file system, Understanding system initialization, Connecting a system to the network, Installing and Configuring Linux.

Shell Scripting Programming for IoT: Introduction, Creating Shell Scripts, Flow control in the Shell, Advanced Shell features Programming Language used in IoT, C Programming.

Unit 3 (14 Lectures)

Hardware Interfacing for IoT: Overview of IoT Hardware platforms, Sensors interfacing, Actuators interfacing**.**

Communication Protocol for IoT: UART Communication, RS485 Communication, I2C Protocol device interfacing, SPI Protocol device interfacing, Ethernet configuration, Zigbee interfacing, Wi-Fi AP and Router interfacing.

Unit 4 (16 Lectures)

IoT Applications: IoT in Agriculture, IoT in Home Automation, IoT in Security Solutions, IoT in Healthcare, IoT in Robotics, Internet of Vehicles (IoV), Internet of Everything (IoE).

Text/ Reference Books:

1. Shriram K Vasudevan, Abhishaek S Nagarajan and RMD Sundaram, “Internet of Things”, 1st Edition, Wiley, 2019.
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos and David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.
3. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.
4. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013.
5. Rajkumar Buyya and Amir Vahid Dastjerdi, “Internet of Things: Principles and paradigms”, Elsevier, 2016.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Explain the various concepts of IoT.
2. Use Devices and Software needed in IoT.
3. Design state-of the-art architecture of IoT related to the domain the problem.
4. Develop IoT based Application.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines “AICTE Examination Reforms”. Students shall be informed about these reforms.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

SPEC383C IoT Lab

B. Tech. (Hons./Minor degree) with Specialization in Internet of Things
3rd YEAR (SEMESTER –V)

L	T	P	Credits		
0	0	2	1	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

List of Experiments:

1. Study and working of IOT Builder Platform.
2. Implementation of different Linux OS Commands.
3. Basics programming of Raspberry Pi.
4. Interfacing Sensors with Raspberry Pi.
5. Interfacing LCD display with Raspberry Pi.
6. Health monitoring using Raspberry pi.
7. Facial Recognition Door using android and Raspberry pi.
8. Temperature transmission using Raspberry Pi.
9. House monitoring using Raspberry Pi.
10. Study the Temperature sensor and Write Program for monitoring temperature using Raspberry Pi.
11. Write a Program to upload temperature and humidity data on cloud.

Text/ Reference Books:

1. Shriram K Vasudevan, Abhishaek S Nagarajan and RMD Sundaram, “Internet of Things”, 1st Edition, Wiley, 2019.
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos and David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.
3. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.
4. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013.
5. Rajkumar Buyya and Amir Vahid Dastjerdi, “Internet of Things: Principles and paradigms”, Elsevier, 2016.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Write program in C on Raspberry Pi platform.
2. Write program in Python on Raspberry Pi platform.
3. Design interfacing program using Raspberry Pi.
4. Develop applications using Raspberry Pi.

Note:

1. Each laboratory class/section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands on experience to each student, each experiment may be either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.
3. Ten experiments are to be performed out of which at least seven experiments should be performed from the above list. Remaining three experiments should be performed from the above list or designed and set by the concerned department as per the scope of the syllabus.
4. Pre-experimental & post experimental quiz / questions may be offered for each lab experiment to reinforce & aid comprehension of the experiment.

SPEC306C Embedded IoT

B. Tech. (Hons./Minor degree) with Specialization in Internet of Things
3rd YEAR (SEMESTER –VI)

L	T	P	Credits		
4	0	0	4	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (14 Lectures)

Introduction to Embedded IoT: Introduction to Embedded System Design, Categories of ES, Overview of Embedded System Architecture, Recent Trends in Embedded Systems, Hardware Architecture of Embedded System, Real-time Embedded Systems and Robots, Robots and Robotics, Microprocessors and Microcontrollers, Microcontroller or Embedded Controller.

Unit 2 (16 Hours)

IoT Controllers: Introduction to IoT controllers, features of IoT controllers, different types of IoT microcontroller, architecture, memory access and instruction execution, pipelining, program memory considerations, addressing modes, CPU registers, Instruction set, and simple operations, Embedded C Programming of IoT controllers.

Unit 3 (16 Hours)

Arduino: Architecture, Setup the IDE, Writing Arduino Software, Arduino Libraries, Embedded C programming for Arduino, Interfacing LED, push button and buzzer with Arduino, Interfacing Arduino with LCD, Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor with Arduino, Interfacing of Actuators with Arduino, Interfacing of Relay Switch and Servo Motor with Arduino.

Unit 4 (14 Hours)

Cloud for IoT: Need of Cloud for IoT applications, Cloud Architecture for IoT applications, challenges in IoT with Cloud, Various Cloud Service Providers for IoT: ThingSpeak, Blynk etc., Embedded C programming for posting sensors data to web server.

Text/ Reference Books:

1. Shriram K Vasudevan, Abhishaek S Nagarajan and RMD Sundaram, “Internet of Things”, 1st Edition, Wiley, 2019.
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos and David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.
3. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.
4. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013.
5. Rajkumar Buyya and Amir Vahid Dastjerdi, “Internet of Things: Principles and paradigms”, Elsevier, 2016.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Understand about various types of Robots & Controls used in the Robotics.
2. Know the Sensors and Actuators in Robotics.
3. Work on various Robotic Platforms.
4. Develop applications based on these platforms.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines “AICTE Examination Reforms”. Students shall be informed about these reforms.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

SPEC386C Embedded IoT Lab

B. Tech. (Hons./Minor degree) with Specialization in Internet of Things
3rd YEAR (SEMESTER –VI)

L	T	P	Credits		
0	0	2	1	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

List of Experiments:

1. To interface Arduino with Bluetooth.
2. To interface Arduino with ESP8266.
3. To interface Arduino 16 x 2 LCD Display.
4. To interface Arduino with Ultrasonic Sensor.
5. To interface Arduino with keypad.
6. Implement a C program to interface GPIOs.
7. Implement a C program to interface DC Motor.
8. Implement a C program to interface Graphical LCD.
9. Implement a Python program to interface GPIOs.
10. Implement a Python program to interface DC Motor.
11. Implement a Python program to interface Graphical LCD.

Text/ Reference Books:

1. Shriram K Vasudevan, Abhishaek S Nagarajan and RMD Sundaram, “Internet of Things”, 1st Edition, Wiley, 2019.
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos and David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.
3. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.
4. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013.
5. Rajkumar Buyya and Amir Vahid Dastjerdi, “Internet of Things: Principles and paradigms”, Elsevier, 2016.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Write program in C on Arduino platform.
2. Write program in C on Arduino platform.
3. Write interfacing programs using Arduino platform.
4. Develop applications using Arduino platform.

Note:

1. Each laboratory class/section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands on experience to each student, each experiment may be either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.
3. Ten experiments are to be performed out of which at least seven experiments should be performed from the above list. Remaining three experiments should be performed from the above list or designed and set by the concerned department as per the scope of the syllabus.

SPEC403C Cloud Computing

B. Tech. (Hons./Minor degree) with Specialization in Internet of Things
4th YEAR (SEMESTER –VII)

L	T	P	Credits		
4	0	0	4	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (14 Lectures)

Introduction: Cloud computing history, architecture and essential characteristics, cloud service models, Cloud Deployment models, advantages of cloud computing, cloud v/s grid computing.

Unit 2 (15 Lectures)

Virtualization: Virtualization techniques, Benefits and drawbacks of virtualization, VMmigration with its types, hypervisors, types of hypervisors, distributed management of virtual infrastructures, scheduling techniques for advance reservation of capacity, Service-orientedarchitectures, SOA implementation, SOAP v/s REST, web 2.0.

Unit 3 (15 Lectures)

PaaS: Introduction, advantages and disadvantages of PaaS, introduction to google app engine,GAE cost structure, Apache Hadoop: MapReduce, HDFS, Hive, Map reduce programming model, Hadoop as a service.

Unit 4 (16 Lectures)

Migrating into the cloud: Introduction, challenges in the cloud, legal issues in cloud computing, Cloud Economics and Capacity Management: Restricted Choices, Capacity Planning, Queuing and Response Time, Evidence Based Decision Making, Instrumentation (Measuring Resource Consumption), Bottlenecks, Key Volume Indicators. Security in clouds, protocols, algorithms, Security as a service, Multi-cloud.

Text/ Reference Books:

1. Rajkumar Buyya, James Broberg and Andrzej Goscinski, " Cloud Computing Principles and Paradigms" , Wiley & Sons, 2011.
2. Christian Baun, Marcel Kunze, Jens Nimis and Stefan Tai, " Cloud Computing Web-Based dynamic IT services", Springer-Verlag Berlin Heidelberg, 1st Edition, 2011.
3. David E.Y. Sarna, "Implementing and Developing Cloud Computing Applications", CRC Press, 2011.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Explain the basic concepts along with evolution and features of cloud computing.
2. Demonstrate the concept of existing cloud paradigms and platforms.
3. Explore the issues of cloud computing in addition with various cloud models.
4. Attain the knowledge of virtualization through virtualization technologies.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

SPME301C Robotics and Applications

B. Tech. (Hons./Minor degree) with Specialization in Robotics

3rd YEAR (SEMESTER –V)

L	T	P	Credits		
4	0	0	4	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (14 Lectures)

Introduction to Robotics: History, evolution of Robots and Robotics, Laws of Robotics, Progressive advancement in Robots- first, second, third and fourth generations; Robot autonomy-links, joints notations scheme, degrees of freedom in a manipulator, arm configuration, wrist configuration, End-effector.

Human arm characteristics, Components of Robotics-mechanics, trajectory generation and motion planning, control system, Sensors and vision, AI in robotics, Robot programming -teach method, off-line programming, Robot programming languages; future prospects-bio robotics and humanoid Robotics.

Unit 2 (15 Lectures)

Robotic Sensors: Human sensing, problem of Robot sensing; Sensors in Robots-status sensors, environmental sensors, quality control sensors, safety sensors, workcell control sensors, classification of Robotic sensors.

Types of sensors used in Robotics: Optical, pneumatic sensors; tactile, acoustic, force, torque; Optical encoders, selecting right sensor.

Unit 3 (15 Lectures)

Robotic Vision: Introduction, industrial application of vision-controlled Robotic systems - presence, object location, pick and place, object identification, visual inspection, visual guidance;

Image acquiring and processing: Processing of imaging, architecture of Robotic vision system, Image acquisition, description of components of vision system, image representation, introduction to image processing.

Unit 4 (16 Lectures)

Robot applications: Industrial applications, Material handling- material transfer, loading and unloading; Processing applications- arc welding, spray painting; Assembly applications- assembly task, peg-in-hole assembly, steps in assembly, providing compliance; Inspection application: sensors and vision based inspection and testing.

Principles for Robot application and application planning, quantitative and qualitative justification of Robots, Robot safety, Non-industrial applications;

Text/ Reference Books:

1. R.K. Mittal and I. J. Nagrath, " Robotics and control", McGraw Hill,2003.
2. K. R. Guruprasad, " Robotics: Mechanics and control", PHI, 2019.
3. John J. Craig, " Introduction to Robotics: Mechanics and control",3rd Edition, Pearson, 2005.
4. Ashitava Ghosal, " Robotics: fundamental concepts and analysis", Oxford Pub, 2006.
5. Saeed B. Niku, " Introduction to Robotics: Analysis, control, applications", 2nd Edition, Wiley, 2010.
6. King-Sun Fu, C.S. George Lee and Ralph Gonzalez, "Robotics: control, sensing, vision and intelligence", 3rd Edition, McGraw Hill, 2004.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Explain the characteristics, architecture and applications of Robotic systems.
2. Identify and describe different types of end effectors and sensors required for specific applications.
3. Apply the basic concepts of robotic vision and image processing for robotic systems.
4. Analyze the applications of robots in various industrial applications and select a robotic system for given pplication.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

SPEC381C Robotics Lab

B. Tech. (Hons./Minor degree) with Specialization in Robotics
3rd YEAR (SEMESTER –V)

L	T	P	Credits		
0	0	2	1	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

List of Experiments:

1. Study of Robotic Arm.
2. Write a Programming to demonstrate working of Robotic Arm.
3. Study of Fire bird –V Robotic Platform.
4. Write a Programming to demonstrate working of Fire bird-V Robotic Platform.
5. Study of Hexpod Robotic Platform.
6. Write a Programming to demonstrate working of Hexpod Robotic Platform.
7. Study and working of Quad-copter.
8. Study and working of Scorbot-ER4u (A five degrees of freedom) robot along with its on hardware & software:
   a) Construction (Sketch) & its specifications.
   b) Components & their functions.
   c) Operating instructions.
   d) Safety instructions.
   e) Teach Pendant.
9. Programming of Scorbot-ER4u for loading and unloading a job along with its simulation.
10. Make a program for Scorbot-ER4u to weld (spot and seam welding) a job and simulate the code.

Text/ Reference Books:

1. R.K. Mittal and I. J. Nagrath, " Robotics and control", McGraw Hill,2003.
2. K. R. Guruprasad, " Robotics: Mechanics and control", PHI, 2019.
3. John J. Craig, " Introduction to Robotics: Mechanics and control",3rd Edition, Pearson, 2005.
4. Ashitava Ghosal, " Robotics: fundamental concepts and analysis", Oxford Pub, 2006.
5. Saeed B. Niku, " Introduction to Robotics: Analysis, control, applications", 2nd Edition, Wiley, 2010.
6. King-Sun Fu, C.S. George Lee and Ralph Gonzalez, "Robotics: control, sensing, vision and intelligence", 3rd Edition, McGraw Hill, 2004.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Analyze various Robotic Platforms.
2. Work on various Robotic Platforms.
3. Write basic programs for running various Robotic Platforms.
4. Perform small jobs with various Robotic Platforms.

Note:

1. Each laboratory class/section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands on experience to each student, each experiment may be either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.
3. Ten experiments are to be performed out of which at least seven experiments should be performed from the above list. Remaining three experiments should be performed from the above list or designed and set by the concerned department as per the scope of the syllabus.
4. Pre-experimental & post experimental quiz / questions may be offered for each lab experiment to reinforce & aid comprehension of the experiment.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

SPEC308C Embedded Robotics

B. Tech. (Hons./Minor degree) with Specialization in Robotics
3rd YEAR (SEMESTER –VI)

L	T	P	Credits		
4	0	0	4	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (14 Lectures)

Introduction to Embedded Robotics: Introduction to Embedded System Design, Categories of ES, Overview of Embedded System Architecture, Recent Trends in Embedded Systems, Hardware Architecture of Embedded System, Real-time Embedded Systems and Robots, Robots and Robotics, Microprocessors and Microcontrollers, Microcontroller or Embedded Controller.

Unit 2 (16 Lectures)

AVR Microcontroller: Introduction to AVR microcontroller, features of AVR family microcontrollers, different types of AVR microcontroller, architecture, memory access and instruction execution, pipelining, program memory considerations, addressing modes, CPU registers, Instruction set, and simple operations.

Unit 3 (14 Lectures)

Features & Programming of AVR Microcontroller: Timer: Control Word, mode of timers, simple programming, generation of square wave, Interrupts: Introduction, Control word Simple Programming, generation of waveforms using interrupt, Serial interface using interrupt, Watch-dog timer, Power-down modes of AVR microcontroller, UART, SRAM, Programming of AVR microcontroller.

Unit 4 (16 Lectures)

Robotic Platforms & Applications: Introduction to Robotic Platforms such as Robotic Arm, Fire-fird, Hexpod, Quad-copter etc., Robotic Applications such as Motion Control, Line follower, Serial Communication, Zig-bee Communication, Automatic Cruise Control, Drone etc.

Text/ Reference Books:

1. S.K. Saha, "Introduction to Robotics", 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
2. Ashitava Ghosal, "Robotics- Fundamental Concepts and Analysis", Oxford, New Delhi, 2006.
3. Dhananjay V. Gadre, " Programming and customizing the AVR Microcontroller", McGraw-Hill, 2011.
4. Thomas Grace , " Programming and Interfacing Atmel AVR Microcontrollers", Cengage Learning PTR,2015.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Analyze basics concepts of embedded Robotics.
2. Write Program using AVR Microcontroller.
3. Work on various Robotic Platforms.
4. Develop applications based on these platforms.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.

2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

SPEC388C Embedded Robotics Lab

B. Tech. (Hons./Minor degree) with Specialization in Robotics
3rd YEAR (SEMESTER –VI)

L	T	P	Credits		
0	0	2	1	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

List of Experiments:

11. To study the Robotic Platforms (Fire Bird V).
12. Write a Program to demonstrate operation of Buzzer Beep using Fire Bird V Robotics Platform.
13. Design a Program to demonstrate I/O interfacing using Fire Bird V Robotics Platform.
14. Write a Program to demonstrate motion control using Fire Bird V Robotics Platform.
15. Write a Program to demonstrate position control using Fire Bird V Robotics Platform.
16. Design a Program to demonstrate velocity control using Fire Bird V Robotics Platform.
17. Write a Program to LCD interfacing using Fire Bird V Robotics Platform.
18. Write a Program to Serial Communication using Fire Bird V Robotics Platform.
19. Design a Program to demonstrate operation of white line follower using Fire Bird V Robotics Platform.
20. Write a Program to demonstrate operation of Adaptive Cruise control using Fire Bird V Robotics Platform.
21. Write a Program to Serial Communication via Zig Bee using Fire Bird V Robotics Platform.
22. Design a Program to demonstrate operation of Robotic Arm.
23. Write a Program to demonstrate operation of Hexapod.

Text/ Reference Books:

1. S.K. Saha, “Introduction to Robotics”, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
2. Ashitava Ghosal, “Robotics- Fundamental Concepts and Analysis”, Oxford, New Delhi, 2006.
3. Dhananjay V. Gadre, “ Programming and customizing the AVR Microcontroller”, McGraw-Hill, 2011.
4. Thomas Grace, “ Programming and Interfacing Atmel AVR Microcontrollers”, Cengage Learning PTR,2015.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Write Program using AVR microcontroller.
2. Write interfacing programs using AVR microcontroller.
3. Develop robotics applications using AVR microcontroller.
4. Develop robotics applications using Robotic Platforms.

Note:

1. Each laboratory class/section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands on experience to each student, each experiment may be either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.
3. Ten experiments are to be performed out of which at least seven experiments should be performed from the above list. Remaining three experiments should be performed from the above list or designed and set by the concerned department as per the scope of the syllabus.

B. Tech. 3rd Year (V & VI semester) Electronics & Communication Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

SPME401C Mechanics and Control in Robotics

B. Tech. (Hons./Minor degree) with Specialization in Robotics
4th YEAR (SEMESTER –VII)

L	T	P	Credits		
4	0	0	4	Class Work	: 25
				Examination	: 75
				Total	: 100
				Duration of Exam	: 3 Hours

Unit 1 (16 Lectures)

Introduction to Robotics, Coordinate frames, mapping and Transforms – coordinate frames, description of objects in space, transformation of vectors, inverting a homogeneous transform, fundamental rotation matrices, exercises.
Forward kinematics: mechanical structure and notations, description of links and joints, kinematic modelling of manipulator, Denavit-Hartenberg notation, kinematic relationship between adjacent links, manipulator transformation matrix.

Unit 2 (15 Lectures)

Inverse kinematics: Manipulator workspace, solvability of inverse kinematic model, solution techniques, closed form solution.
Manipulator differential motion and statics: relationship between transformation matrix and angular velocity, mapping velocity vector, velocity propagation along links, Manipulator Jacobian and its inverse, Jacobian singularities, exercises.

Unit 3 (15 Lectures)

Robot Dynamics: Lagrange mechanics, dynamic model of two degree of freedom manipulator, Lagrange-Euler formulation, Newton-Euler formulation; Inverse dynamics.
Trajectory planning: definition and planning tasks, steps in trajectory planning, joint space technique, Cartesian space techniques.

Unit 4 (14 Lectures)

Control of manipulators: Open and closed loop control, manipulator control problem, linear control schemes, characteristics of second-order linear system.
Joint Actuators – model of a DC motor; Partitioned PD control scheme, PID control scheme.

Text/ Reference Books:

1. R.K. Mittal and I. J. Nagrath, " Robotics and control", McGraw Hill,2003.
2. K. R. Guruprasad, " Robotics: Mechanics and control", PHI, 2019.
3. John J. Craig, " Introduction to Robotics: Mechanics and control",3rd Edition, Pearson, 2005.
4. Ashitava Ghosal, "Robotics- Fundamental Concepts and Analysis", Oxford, New Delhi, 2006.
5. Saeed B. Niku, " Introduction to Robotics: Analysis, control, applications", 2nd Edition, Wiley, 2010.
6. King-Sun Fu, C.S. George Lee and Ralph Gonzalez, "Robotics: control, sensing, vision and intelligence", 3rd Edition, McGraw Hill, 2004.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

a. Analyze a manipulator through evaluation of forward kinematics, inverse kinematics and Jacobian singularities.
b. Formulate and evaluate the dynamics of robot.
c. Describe the trajectory planning techniques for robotic manipulators.
d. Analyze the control problems and apply the control schemes for manipulators and actuators.

Note:

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3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

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