Marwadi University

Faculty of Technology

Curriculum and Syllabus

For the Batch

2018 - 22

B.Tech.

in

Information and Communication Technology

Marwadi University

VISION STATEMENT OF INSTITUTE

Our vision is to address challenges facing our society and planet through sterile education that builds capacity of our students and empower them through their innovative thinking practice and character building that will ultimately manifest to boost creativity and responsibility utilizing the limited natural resources to meet the challenges of the 21st century

MISSION STATEMENT OF INSTITUTE

1. To Produce creative, responsible and informed professionals
2. To produce individuals who are digital-age literates, inventive thinkers, effective communicators and highly productive.
3. To deliver cost-effective quality education
4. To offer world-class, cross-disciplinary education in strategic sectors of economy though well devised and synchronized delivery structure and system, designed to tackle the creative intelligence and enhance the productivity of individuals.
5. To provide a conducive environment that enables and promotes individuals to creatively interact, coordinate, disseminate and examine change, opinion as well as concept that will enable students to experience higher level of learning acquired through ceaseless effort that lead to the development of character, confidence, values and technical skills.

Faculty of Technology

B. Tech. in Information and Communication Technology

PROGRAM OUTCOMES

PO1 Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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

PO4 Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

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

PO6 The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

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

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

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

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

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

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

Faculty of Technology

B. Tech. in Information and Communication Technology

PROGRAM SPECIFIC OUTCOMES

PSO-1: Graduates will be able to identify, analyze and solve the real time problems of the industries in the area of software development, embedded system, VLSI design, IoT and communication technologies.

PSO-2: Graduates will be able to contribute as an analyst and developer in the areas related to cloud computing, DevOps, security, machine learning, artificial intelligence and big data.

Faculty of Technology

B. Tech. in Information and Communication Technology

CREDIT DISTRIBUTION

Definition of Credit

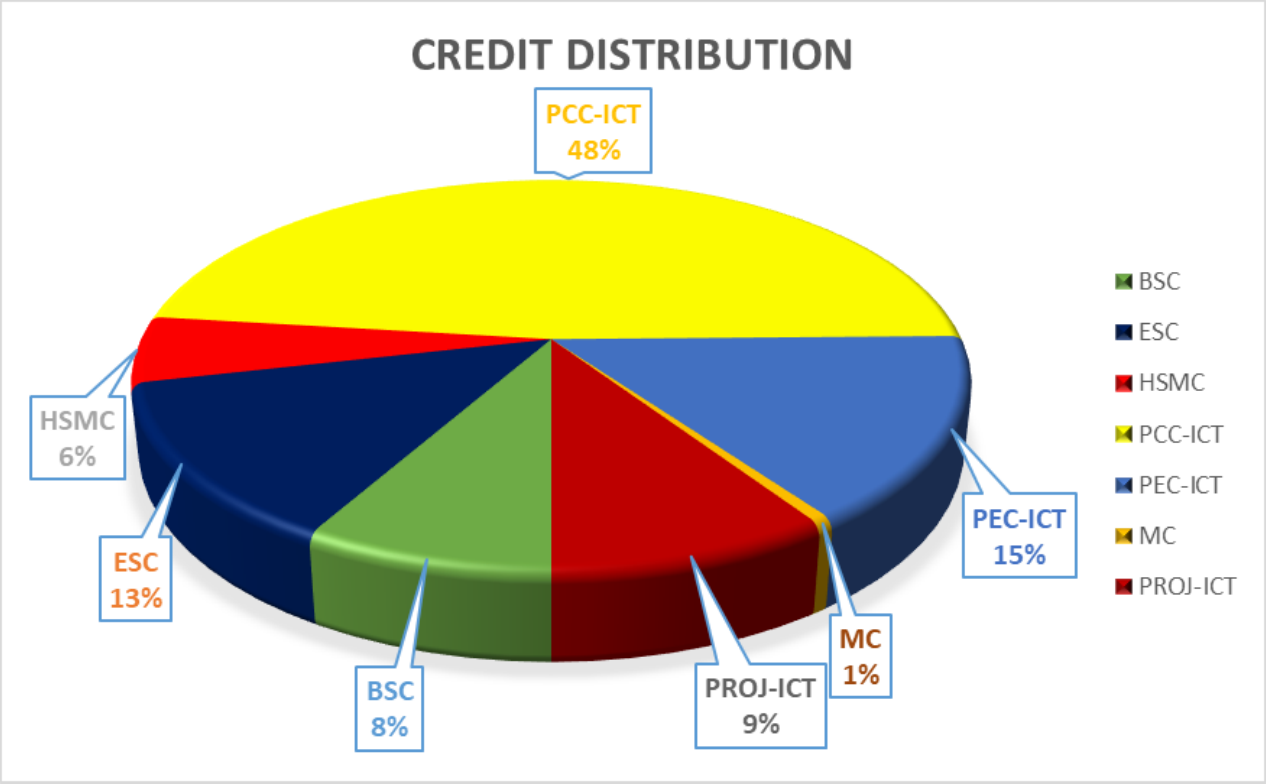
Mode	Definition	Credits
1 Hr. Lecture (L) per week	L	1 Credit
1 Hr. Tutorial (T) per week	T	0.5 Credit
1 Hr. Practical (P) per week	P	0.5 Credit
2 Hr. Practical (P) per week	P	1 Credit

Category-wise Credit distribution

Category	Definition	Credits
Basic Sciences Course	BSC	15
Engineering Science Courses	ESC	24
Humanities and Social Sciences & management Courses	HSMC	10
Professional Core Courses	PCC-ICT	87
Professional Elective Courses	PEC-ICT	28
Open Elective Courses	OEC-ICT	-
Summer Internship / Projects	PROJ-ICT	17
Mandatory courses	MC	1
	Total Credits	**182**

Credit Requirement

The candidate shall obtain minimum 182 credits for the degree of B.Tech. Information and Communication Technology as defined by the AICTE and approved by Academic Council of Marwadi University.



BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management courses
PCC-ICT	Professional Core Courses
PEC-ICT	Professional Elective Courses
MC	Mandatory Courses
PROJ-ICT	Project Courses

Faculty of Technology

B. Tech. in Information and Communication Technology

Course Code	Course Name	L	T	P	C	Sem
Basic Sciences Course (BSC)						
01MA1101	Differential and Integral Calculus	4	2	0	5	1
01MA1151	Matrix Algebra and Vector Calculus	4	2	0	5	2
01MA0231	Discrete Mathematics and Graph Theory	4	2	0	5	3

Course Code	Course Name	L	T	P	C	Sem
Engineering Science Courses (ESC)						
01CT0104	ICT Workshop	0	0	2	1	1
01CT0101	Introduction to Computer Programming	3	0	2	4	1
01EC0101	Basics of Electronics Engineering	3	0	2	4	1
01EE0104	Electrical Circuits	4	0	2	5	1
01ME0105	Engineering Drawing and Computer Aided Design	2	0	4	4	2
01EN0101	Basics of Environmental Studies	2	0	0	2	2
01EC0102	Digital Electronics	3	0	2	4	2

Course Code	Course Name	L	T	P	C	Sem
Humanities and Social Sciences & Management Courses (HSMC)						
01SL0102	Reading & Writing for Technology	2	0	0	2	1
01SL0103	Speaking & Presentation Skills	2	0	0	2	1
01CR0103	Value Education	2	0	0	2	2

01CR0302	Professional Ethics	1	0	0	1	3
01CT0406	Technical Writing	1	0	0	1	4
01CR0601	Business Benchmark	1	0	0	1	6
01CT0704	Management Information System	3	0	0	3	7

Course Code	Course Name	L	T	P	C	Sem
Professional Core Courses (PCC-ICT)						
01CT0103	Foundation skills in sensor interfacing	0	0	2	1	1
01CT0105	Object Oriented Programming	3	0	2	4	2
01CT0106	Introduction to R and RStudio	0	0	2	1	2
01CT0301	Computer Organisation and Architecture	3	0	2	4	3
01CT0302	Signals and Systems	3	0	2	4	3
01CT0303	Introduction to Communication Engineering	3	0	2	4	3
01CT0307	Data Structure and Algorithm	4	0	2	5	3
01CE0401	Operating System	4	0	2	5	4
01CT0401	Probability and Statistics	3	2	0	4	4
01CT0402	Problem solving using Python	3	0	2	4	4
01CT0403	Microcontroller and Interfacing	3	0	2	4	4
01CT0404	Analog and Digital Communication	3	0	2	4	4
01CT0405	Engineering Electrodynamics	3	0	0	3	4
01CT0501	Optimization Techniques	3	0	0	3	5
01CT0502	Database Management System	3	0	2	4	5
01CT0503	Computer Networks	3	0	2	4	5
01CT0504	Internet and Web Technology	3	0	2	4	5
01CT0505	Introduction to Single Board Computer Programming	0	0	2	1	5
01CT0601	Digital Signal Processing	3	0	2	4	6
01CT0602	Wireless Communication and Mobile Computing	3	0	2	4	6
01IT0601	Software Engineering	3	0	2	4	6
01CT0701	Cryptography and Network Security	3	0	2	4	7
01CT0702	Information Theory and Coding	3	0	2	4	7
01CT0703	Artificial intelligence	3	0	2	4	7

Course Code	Course Name	L	T	P	C	Sem
Professional Elective Courses (PEC-ICT)						
01CT0507	Advanced Microprocessor	4	0	2	5	5
01CT0508	Optical Communication	4	0	2	5	5
01CT0509	Linux Administration	4	0	2	5	5
01CT0510	Applied Linear algebra	4	0	2	5	5
01CT0511	Theory of Computation	4	0	2	5	5
01CT0604	Embedded System Design	4	0	2	5	6
01CT0605	RF and Microwave Communication	4	0	2	5	6
01CT0606	Advanced Computer Networks	4	0	2	5	6
01CT0607	Machine learning	4	0	2	5	6
01CT0608	Compiler Design	4	0	2	5	6
01CT0609	VLSI Designs	4	0	2	5	6
01CT0610	Satellite Communication	4	0	2	5	6
01CT0611	Cloud Computing	4	0	2	5	6
01CT0612	Data Warehousing and Data mining	4	0	2	5	6
01CT0613	.NET Technology	4	0	2	5	6
01CT0705	Digital Design using Verilog	4	0	2	5	7
01CT0706	Computer Vision	4	0	2	5	7
01CT0707	Multimedia computing	4	0	2	5	7
01CT0708	Big Data Analytics	4	0	2	5	7
01CT0709	Advance Java	4	0	2	5	7
01CT0710	Embedded Operating System	4	0	2	5	7
01CT0711	Wireless system Design	4	0	2	5	7
01CT0712	Internet of Things	4	0	2	5	7
01CT0713	Programming for Application Development	4	0	2	5	7
01CT0714	Human computer interaction	4	0	2	5	7
01CT0802	Cross Platform Mobile Development	3	0	0	3	8
01CT0803	SEO And Digital Marketing	3	0	0	3	8
01CT0804	VLSI Physical Design	3	0	0	3	8
01CT0805	Data Visualization	3	0	0	3	8

01CT0806	Advance Database	3	0	0	3	8
01CT0807	Network Administration	3	0	0	3	8
01CT0808	FPGA Based System Design	3	0	0	3	8
01CT0809	Advance C++ Programming	3	0	0	3	8
01CT0810	Game Development	3	0	0	3	8
01CT0811	Introduction to Devops Tools	3	0	0	3	8
01CT0812	Deep Learning for Computer Vision	3	0	0	3	8
01CT0813	Embedded Linux	3	0	0	3	8
01CT0814	Spread Spectrum Communications	3	0	0	3	8
01CT0815	Advance Web Technology	3	0	0	3	8

Course Code	**Course Name**	**L**	**T**	**P**	**C**	**Sem**
Projects (PROJ-ICT)						
01CT0306	Design Engineering	0	0	2	1	3
01CT0506	Human Centered Design	0	0	2	1	5
01CT0603	Reverse Engineering	0	0	2	1	6
01CT0801	Project	0	0	28	14	8

Course Code	**Course Name**	**L**	**T**	**P**	**C**	**Sem**
Mandatory courses (MC)						
01PE0101	Physical Education/Sports/Yoga	0	0	2	1	1
01GS0501	Cognitive Aptitude -1	2	0	0	0	5
01GS0601	Cognitive Aptitude -2	2	0	0	0	6

Marwadi University

Faculty of Technology

B. Tech. in Information and Communication Technology

4-year Curriculum structure

Total credits (4-year course): 182

B. Tech. Year I, Sem I						
Subject Code	**Subject Name**	**Category**	**Teaching Scheme (Hours)**			**Credits**
			L	**T**	**P**	
01MA1101	Differential and Integral Calculus	BSC	4	2	0	5
01EE0104	Electrical Circuits	ESC	4	0	2	5
01EC0101	Basics of Electronics Engineering	ESC	3	0	2	4
01SL0102 / 01SL0103	Reading & Writing for Technology / Speaking & Presentation Skills	HSMC	2	0	0	2
01CT0101	Introduction to Computer Programming	ESC	3	0	2	4
01CT0103	Foundation skills in sensor interfacing	PCC-ICT	0	0	2	1
01CT0104	ICT Workshop	ESC	0	0	2	1
01PE0101	Physical Education/Sports/Yoga	MC	0	0	2	1
	Total		**16**	**2**	**12**	**23**

B. Tech. Year I, Sem II						
Subject Code	**Subject Name**	**Category**	**Teaching Scheme (Hours)**			**Credits**
			L	**T**	**P**	
01MA1151	Matrix Algebra and Vector Calculus	BSC	4	2	0	5
01EC0102	Digital Electronics	ESC	3	0	2	4
01ME0105	Engineering Drawing and Computer Aided Design	ESC	2	0	4	4
01CT0105	Object Oriented Programming	PCC-ICT	3	0	2	4
01EN0101	Basics of Environmental Studies	ESC	2	0	0	2
01CT0106	Introduction to R and RStudio	PCC-ICT	0	0	2	1
01CR0103	Value Education	HSMC	2	0	0	2
	Total		**16**	**2**	**10**	**22**

B. Tech. Year II, Sem III						
Subject Code	**Subject Name**	**Category**	**Teaching Scheme (Hours)**			**Credits**
			L	**T**	**P**	
01MA0231	Discrete Mathematics and Graph Theory	BSC	4	2	0	5
01CT0301	Computer Organisation and Architecture	PCC-ICT	3	0	2	4
01CT0302	Signals and Systems	PCC-ICT	3	0	2	4
01CR0302	Professional Ethics	HSMC	1	0	0	1
01CT0303	Introduction to Communication Engineering	PCC-ICT	3	0	2	4
01CT0307	Data Structure and Algorithm	PCC-ICT	4	0	2	5
01CT0306	Design Engineering	PROJ-ICT	0	0	2	1
	Total		**18**	**2**	**10**	**24**

B. Tech. Year II, Sem IV						
Subject Code	**Subject Name**	**Category**	**Teaching Scheme (Hours)**			**Credits**
			L	**T**	**P**	
01CT0401	Probability and Statistics	PCC-ICT	3	2	0	4
01CT0402	Problem solving using Python	PCC-ICT	3	0	2	4
01CT0403	Microcontroller and Interfacing	PCC-ICT	3	0	2	4
01CT0404	Analog and Digital Communication	PCC-ICT	3	0	2	4
01CT0405	Engineering Electrodynamics	PCC-ICT	3	0	0	3
01CE0401	Operating System	PCC-ICT	4	0	2	5
01CT0406	Technical Writing	HSMC	1	0	0	1
	Total		**20**	**2**	**8**	**25**

B. Tech. Year III, Sem V						
Subject Code	**Subject Name**	**Category**	**Teaching Scheme (Hours)**			**Credits**
			L	**T**	**P**	
01CT0501	Optimization Techniques	PCC-ICT	3	0	0	3
01CT0502	Database Management System	PCC-ICT	3	0	2	4
01CT0503	Computer Networks	PCC-ICT	3	0	2	4
01CT0504	Internet and Web Technology	PCC-ICT	3	0	2	4
01CT0505	Introduction to Single Board Computer Programming	PCC-ICT	0	0	2	1
01CT0506	Human Centered Design	PROJ-ICT	0	0	2	1
01CT05XX	Department Elective - 1	PEC-ICT	4	0	2	5
01GS0501	Cognitive Aptitude -1	MC	2	0	0	0
	Total		**18**	**0**	**12**	**22**
	Department Elective – 1 1) 01CT0507 - Advanced Microprocessor 2) 01CT0508 - Optical Communication 3) 01CT0509 - Linux Administration 4) 01CT0510 - Applied Linear algebra 5) 01CT0511 - Theory of Computation					

B. Tech. Year III, Sem VI						
Subject Code	**Subject Name**	**Category**	**Teaching Scheme (Hours)**			**Credits**
			L	**T**	**P**	
01CT0601	Digital Signal Processing	PCC-ICT	3	0	2	4
01CT0602	Wireless Communication and Mobile Computing	PCC-ICT	3	0	2	4
01IT0601	Software Engineering	PCC-ICT	3	0	2	4
01CT0603	Reverse Engineering	PROJ-ICT	0	0	2	1
01CT06XX	Department Elective - 2	PEC-ICT	4	0	2	5
01CT06XX	Department Elective - 3	PEC-ICT	4	0	2	5
01CR0601	Business Benchmark	HSMC	1	0	0	1
01GS0601	Cognitive Aptitude -2	MC	2	0	0	0
	Total		**20**	**0**	**12**	**24**

Department Elective – 2,3

1) 01CT0604 - Embedded System Design
2) 01CT0605 - RF and Microwave Communication
3) 01CT0606 - Advanced Computer Networks
4) 01CT0607 - Machine learning
5) 01CT0608 - Compiler Design
6) 01CT0609 - VLSI Designs
7) 01CT0610 - Satellite Communication
8) 01CT0611 - Cloud Computing
9) 01CT0612 - Data Warehousing and Data mining
10) 01CT0613 - .NET Technology

B. Tech. Year IV, Sem VII						
Subject Code	**Subject Name**	**Category**	**Teaching Scheme (Hours)**			**Credits**
			L	**T**	**P**	
01CT0701	Cryptography and Network Security	PCC-ICT	3	0	2	4
01CT0702	Information Theory and Coding	PCC-ICT	3	0	2	4
01CT0703	Artificial intelligence	PCC-ICT	3	0	2	4
01CT0704	Management Information System	HSMC	3	0	0	3
01CT07XX	Department Elective – 4	PEC-ICT	4	0	2	5
01CT07XX	Department Elective – 5	PEC-ICT	4	0	2	5
	Total		**20**	**0**	**10**	**25**

Department Elective - 4,5

1) 01CT0705 - Digital Design using Verilog
2) 01CT0706 - Computer Vision
3) 01CT0707 - Multimedia computing
4) 01CT0708 - Big Data Analytics
5) 01CT0709 - Advance Java
6) 01CT0710 - Embedded Operating System
7) 01CT0711 - Wireless system Design
8) 01CT0712 - Internet of Things
9) 01CT0713 - Programming for Application Development
10) 01CT0714 - Human computer interaction

B. Tech. Year IV, Sem VIII						
Subject Code	**Subject Name**	**Category**	**Teaching Scheme (Hours)**			**Credits**
			L	**T**	**P**	
01CT0801	Project	PROJ-ICT	0	0	28	14
01CT08XX	Department Elective – 6	PEC-ICT	3	0	0	3
	Total		**3**	**0**	**28**	**17**

Department Elective - 6 (MOOC)

1) 01CT0802 - Cross-Platform Mobile Development
2) 01CT0803 - SEO and Digital Marketing
3) 01CT0804 - VLSI Physical Design
4) 01CT0805 - Data Visualization
5) 01CT0806 - Advance Database
6) 01CT0807 - Network Administration
7) 01CT0808 - FPGA Based System Design
8) 01CT0809 - Advance C++ Programming
9) 01CT0810 - Game Development
10) 01CT0811 - Introduction to DevOps Tools
11) 01CT0812 - Deep Learning for Computer Vision
12) 01CT0813 - Embedded Linux
13) 01CT0814 - Spread Spectrum communications
14) 01CT0815 - Advance Web Technology

Marwadi University

Faculty of Technology

B. Tech. in Information and Communication Technology

Semester I

Subject Code: 01MA1101

Subject Name: Differential and Integral Calculus

B. Tech. Year – I (Semester I)

Objective:
This paper aims to provide an essential background of differential and integral calculus to students of science and engineering courses at graduate level. A good science or engineering graduate is expected to have a sound knowledge of these two areas of mathematics as Differential and integral calculus are essential tools for learning Technology, Engineering and Sciences.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Expand functions using Maclaurin's and Taylor's series.
2. Apply and solve first order differential equations to real life problems
3. Verify Euler's theorem and Modified Euler's theorem for given function of several variable
4. Apply Multiple Integral to evaluate the Surface Area and Volume of any 3D objects
5. Apply the concepts of convergence and divergence of infinite series in problem of science, technology and engineering.
6. Apply the method of Lagrange's multiplier to solve the problems of constrained optimization.

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	02	00	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Infinite Series** Concept of sequence, nature of infinite series, Properties for convergence, geometric series, Tests for convergence of positive term series.	10
2	**Expansion of functions** Concept of Expansion of functions, Taylor's series expansion, Maclaurin's series expansion	07
3	**Ordinary Differential Equations** Reorientation, order and degree, Variable separable method, Linear differential equations, Bernoulli's and Exact differential equations.	10
4	**Partial differentiation** Partial derivatives, Euler's theorem, Modified Euler's theorem and their applications, Implicit functions, Chain rule, Total differentials.	08
5	**Applications of Partial differentiation** Errors and approximations, Tangent plane and normal line to a surface, Constrained optimization using Lagrange's multiplier, Jacobian.	07
6	**Multiple Integrals** Calculation of double and triple integrals, reverse the order of integration, Change into polar, spherical and cylindrical coordinates.	10
	Total Hours	52

Suggested Text books / Reference books:

1. M. D. Weir et al: Thomas' Calculus, 11th Ed., Pearson Eduaction, 2008.
2. Stewart James: Calculus Early Transcendental, 5th Ed., Thomson India, 2007
3. Wylie & Barrett: Advanced Engineering Mathematics, Mc graw Hill pub.
4. Greenberg M D: Advanced Engineering Mathematics, 2nd ed., Pearson
5. B.S.Grewal: Higher Engineering Mathematics, 43rd ed., Khanna publishers
6. Erwin Kreyszig , Advanced Engineering Mathematics, 9/e, JOHN WILEY & SONS, INC
7. H. K. Dass, Advanced Engineering Mathematics, S Chand Publishing..

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	30%	15%	10%	5%

Supplementary Resources:

1. http://mathworld.wolfram.com/
2. http://en.wikipedia.org/wiki/Math

Subject Code: 01EE0104

Subject Name: Electrical Circuits

B. Tech. Year – I (Semester I)

Objective:
Students are expected to learn basics of Electrical Engineering which will help them to apply these concepts in day-to-day life. The course is divided into two parts: DC circuits and AC circuits. Analysis of DC circuit using theorems will useful to solve any electronics network. Grounding and Bonding will ensure safe and quality working conditions.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Interpret the role of resistor, capacitor and inductor and their behaviour under various system conditions.
2. Analyze different types of magnetic circuit.
3. Describe qualitative comparison between AC and DC system.
4. Analyse and solve DC Circuits and AC Circuits with network theorems.
5. Obtain two port parameters of given electric network.
6. Analyse earth resistance to ensure safe and quality working environment.

Pre-requisite of course: Basic concepts of Physics

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Fundamentals of DC Circuits** Definition of Current, Voltage, e.m.f., Power, Energy, Resistance, Ohm's Law, Effect of variation in temperature on resistance, Series, Parallel and series-parallel connection of resistances, Comparison between series and parallel circuits, Open circuit and Short circuit, Delta-Star and Star-Delta transformation, Kirchoff's Laws, Nodal Analysis, Mesh Analysis of Electrical Networks	06
2	**Network Theorems** Ideal voltage and current sources, Practical Sources, Dependent Sources: Voltage Dependent Voltage Source, Voltage Dependent Current Source, Current Dependent Voltage Source, Current Dependent Current Source. Network theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem.	08
3	**Two Port Parameters** Need and application of Two Port parameters: Z-parameters, Y-parameters, h-parameters, ABCD-parameters	06
4	**Magnetic Circuits and Electromagnetics** Definition of quantities related to magnetic circuits, Comparison of electric and magnetic circuits, Concept of Ampere turns, Leakage flux, Magnetization curve Electromagnetic induction, Faraday's Laws, Induced emf and direction of induced emf, self-inductance, mutual inductance, coefficient of coupling, energy stored in magnetic field, Charging and discharging of inductor, magnetic hysteresis, eddy current losses	06
5	**Electrostatics and Capacitance** Electric charge, permittivity, Coulomb's law, Electric Flux, Electric Field, Flux density, Electric field Intensity, Electric potential and potential gradient, Dielectric strength. Capacitor, Types of capacitors, series and parallel connection of capacitors, energy stored in capacitor, charging and discharging of capacitor.	06
6	**Fundamental of AC Quantities** Generation of Alternating voltage and current, Sinusoidal function-Terminologies, Form Factor and Peak Factor, Phase and Phase Difference, Phasor representation of alternating quantities, Phasor addition and subtraction.	05
7	**Analysis of AC circuits** Behaviour of purely resistive, inductive and capacitive AC circuits, Phase relation between voltage and current in AC circuit, Power Factor and its significance in series RL circuit, RC and RLC circuit, Active, Reactive and Apparent Power, Series, Parallel and Series-Parallel AC circuits,	07

	phasor method, admittance method of analysis of AC circuits.	
8	**Resonance** Introduction, series resonance, selectivity and bandwidth, quality factor, voltage/current magnification, parallel resonance, bandwidth and Q-factor of parallel resonant circuits, Comparison of series and parallel resonance circuits, Application of resonance in Electrical and Electronics Engineering	03
9	**Grounding and Bonding** Introduction, Shock and Fire Hazards, National Electrical Code Grounding Requirements, Essentials of a Grounded System, Ground Electrode, Earth Resistance Tests, Earth–Ground Grid Systems, Power Ground System, Signal Reference Ground, Signal Reference Ground Methods, Single-Point and Multipoint Grounding, Ground Loops, Electrochemical Reactions Due to Ground Grids, examples of Grounding Abnormalities or Problems, Loss of Ground Causes Fatality, Stray Ground Loop Currents Cause Computer Damage	05
	Total Hours	52

Suggested Text books / Reference books:

1. E. Hughes, 'Electrical and Electronic Technology', Prentice Hall India, 10th edition, 2008
2. V.N. Mittal, 'Basic Electrical Engineering', Tata Mcgraw-Hill, 2nd edition, 2006.
3. A. Chakrabarti, S. Nath, C. Chanda, 'Basic Electrical Engineering', Tata McGrawHill Education India Pvt. Ltd, 2013.
4. B. L. Theraja, 'Electrical Technology', S. Chand Publication, 2012.
5. Boylestad, Robert L. Introductory circuit analysis', Pearson Education India, 2016.
6. Kumar, KS Suresh, 'Electric circuits and networks', Pearson Education India, 2009.
7. C. Sankaran, 'Power Quality', CRC Press, 2002.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
15%	45%	20%	15%	5%	0%

Suggested List of Experiments:

1. To study and demonstrate function of basic instruments
2. To observe the effect of temperature variation on resistance

3. To determine of B-H curve of magnetic material
4. To determine equivalent capacitance of series and parallel connection of capacitors
5. To determine basic terms of alternating waveform
6. To determine power in a single-phase circuit using wattmeter
7. To determine parameters in series RL, RC and RLC circuit
8. To study and observe series resonance in RLC circuit
9. To verify Superposition theorem
10. To verify Maximum Power Transfer theorem
11. To obtain and verify h-parameter and ABCD-parameters of electric network

Supplementary Resources:

1. http://nptel.ac.in/courses/103107081/
2. http://nptel.ac.in/courses/103106109/
3. https://ocw.mit.edu/courses/audio-video-courses/#chemical-engineering

Subject Code: 01EC0101

Subject Name: Basics of Electronics Engineering

B. Tech. Year – I (Semester I)

Objective: After completion of this course, student will be able to:

1. Understand operation of semiconductor devices & Operational Amplifier
2. Understand DC analysis and AC models of semiconductor devices.
3. Apply concepts for the design of Regulators and Amplifiers
4. Verify the theoretical concepts through simulation sessions
5. Implement and analyze the mini projects based on concept of electronics circuit concepts

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand the Voltage current and operation of semiconductor devices, circuits, and operational Amplifier
2. Apply basic fundamentals of semiconductor devices and operational amplifier to illustrate/show the operation of application
3. Apply the basic knowledge of simulation tool & Circuit level concepts to synthesize real life problems
4. Analyze the behaviour of Electronics circuits containing Semiconductor device, Operational Amplifier or Verify using Modern tools
5. Design, implement and analyse of electronic circuits to solve the problem with in society

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	02	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Fundamentals of Semiconductor Material** Energy Band Diagram of conductor, semiconductor, and insulator; Bhor Atomic Model for Atom, Crystal Structure of Semiconductor Materials, Intrinsic and Extrinsic Semiconductor Materials	04
2	**Semiconductor Diodes** Symbol and Construction, Operating Characteristics in Forward and Reverse Bias, Applications of Diode as Switch, Clipper, Clamper and Rectifier; Special Purpose Diodes: Zener Diode; Optical Diodes like LED, Photo Diode, Laser Diode, Seven Segment Display; Other Diodes like Varactor Diode, Schottky Diode, PIN Diode, Tunnel Diode, Step Recovery Diode.	06
3	**Bipolar Junction Transistor (BJT)** History of BJT invention; Types, Symbol, and Construction of BJT; Basic Operation of BJT; BJT Configurations: Common Base, Common Emitter, Common Collector with Operation, Input/output Characteristics; Applications of Transistors as Switch and Amplifier.	06
4	**BJT Biasing** DC Operating Point, Fixed (Base) Biasing, Emitter Biasing, Voltage Divider Bias, Emitter Feedback Bias, Collector Feedback Bias, Collector and Emitter Feedback Bias.	07
5	**Field Effect Transistor** Types, Symbol, Construction, Operation, Input/output Characteristics and Applications of Junction Filed Effect Transistor (JFET), Metal Filed Effect Transistor (MOSFET)	06
6	**Operational Amplifiers** Introduction to OpAmp, Differential and Common Mode Operation, OpAmp Basics, Practical OpAmp Circuits, OpAmp Applications as Summer, Integrator and Differentiator	07
7	**Basic of Organic Electronics** Introduction, Types of Organic Materials, Organic Electronic Devices, Applications	06
	Total Hours	42

Suggested Text books / Reference books:

1. Albert Malvino and David Bates, “Electronics Principles” Tata McGraw-Hill, 7th Edition, 2006.
2. Robert Boylestad and Louis Nashelsky, “Electronic Devices and Circuit Theory”, Pearson Education, 10th Edition, 2009.
3. Hagen Klauk “Organic Electronics: Materials, Manufacturing, and Applications”, WILEY – VCH, 2006, ISBN: 978-3-527-31264-1

4. Thomas L. Floyd, “Electronics Devices: Conventional Current Version”, Pearson Education, 7th Edition, 2008.
5. S Salivahanan and N Suresh Kumar, “Electronics Device and Circuits” Tata McGraw-Hill Education Private Limited, 2nd Edition, 2008.
6. Jacob Milman and Christos C. Halkias, “Electronics Device and Circuits”, Tata McGraw-Hill, 3rd Edition, 2008.

Suggested Theory distribution:

The suggested theory distribution as per Bloom’s taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	30%	15%	10%	5%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. To study and perform the V-I characteristic of Silicon Diode and Zener Diode.
2. To use the Zener Diode as voltage regulator.
3. To use silicon Diode as a Clipper and Clamper.
4. To analyze the Half Wave, Full Wave and Bridge Rectifiers.
5. To study and perform the Input and Output characteristic of BJT.
6. To use Transistor as a Switch.
7. To Analyze CE, CB and CC Amplifier Circuit.
8. To measure the variation of current gain with variation in temperature for different biasing of a transistor.
9. To study and perform the Input and Output characteristic of FET.
10. To study and perform the Input and Output characteristic of MOSFET.
11. To Study and Perform the Common mode and Differential mode of operation for OpAmp.
12. To use OpAmp as summer, Integrator and Differentiator.
13. To test the performance of negative feedback amplifier and compare gain, BW with and without feedback.
14. To Study and Perform Wien Bridge Oscillator.
15. To Analyze Voltage Regulator by using Integrated Circuit.
16. Design a full wave bridge rectifier for input 50 Hz 10Vp-p AC signal and expected output of 5 V DC signal.
17. Design a regulated power supply using Zener diode for input variation of 10 to 20 Vp-p.

18. A silicon diode has a reverse current of 5 μA at 25°C and 100 μA at 100°C. What are the values of the saturation current and the surface-leakage current at 25°C?
19. Demonstrate Automatic street light control system using LED.
20. Design a +5 to +25 V variable power supply.

Supplementary Resources:

1. http://textofvideo.nptel.iitm.ac.in/video.php?courseId=117103063
2. https://www.coursera.org/course/eefunlab
3. https://www.coursera.org/course/introtoelectronics
4. https://www.edx.org/course/circuits-electronics-1-basic-circuit-mitx-6-002-1x
5. http://www.learnabout-electronics.org
6. http://www.electronics-tutorials.ws
7. http://101science.com/Radio.htm
8. http://www.electronicsandyou.com

Subject Code: 01SL0102

Subject Name: Reading and Writing for Technology

B. Tech. Year – I (Semester I)

Objective:
This course offers an orientation towards reading and writing in technical contexts. It aims at helping learners in acquiring reading and writing ability in English to foster their learning in the specified domain i.e. technology. It engages students through various activities to learn techniques and approaches of reading and writing skills. to develop their reading capability in terms of understanding, identifying, analyzing and critically evaluating texts; to understand and comprehend various forms of writings used in technical education and academic contexts and to develop their writing abilities.

Credits Earned: 02 Credits

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
02	00	00	02	00	30	20	25	25	100

Contents:

Unit	Topics	Hours
1	**Introduction to Technical Communication** History/ Story of Technical Writing, English in Technical Communication	03
2	**Reading Strategies** Know your textbook: Exploring the textbook, its parts and purposes, approaching reading: Reading Strategies, Reading for Various Purposes: reference books, stories, articles, technical surveys, reports, blog posts, & reviews	12
3	**Writing Strategies** Understanding the writing process: Thinking about writing processes, key Attributes of academic and technical texts, Writing process - Visualizing your text Approaching Writing: Writing Strategies, Understanding various forms of writing: essay, case study, research paper, term paper,	13

	maths/physics problems, lab report, book report/review, surveys, blog posts, & dissertation, Writing for various purposes: essays, writing answers in exam, lab reports, process and instructions, reviews, blog post, & assignments	
	Total Hours	28

Suggested Text books / Reference books:

1. Tavia, Yasmin. "Story of Technical Writing." *YouTube*, 28 March 2016, https://www.youtube.com/watch?v=QomPdtnZa4k. Accessed 30 June 2017.
2. AbodeTCS. "Future of TechComm." *YouTube*, 16 July 2012, https://www.youtube.com/watch?v=dSdhnyDF0YY. Accessed 30 June 2017.
3. Lowe, Janet. *Google Speaks: Secrets of World's Greatest Billionaire Entrepreneurs, Sergey Brin and Larry Page*. John Wiley & Sons, 2009.
4. Howard, Nicole. *The Life Story of a Technology*. Greenwood Press, 2005.
5. "Engineering Stories." Engineering Stories, 2017, https://engineerstories.com/. Accessed 30 June 2017.
6. "10 Breakthrough Technologies 2017." MIT Technology Review, 2017, https://www.technologyreview.com/lists/technologies/2017/. Accessed 30 June 2017.
7. High, Peter. "Top 10 Technology Stories of 2016." Forbes, 4 Jan. 2017, https://www.forbes.com/sites/peterhigh/2017/01/04/top-ten-technology-stories-of-2016/2/#2d72b2be9de7. Accessed 30 June 2017.
8. Teaching and Learning Resources for Me. "Understanding the Purpose of Different Types of Texts." YouTube, 12 Sept. 2015, https://www.youtube.com/watch?v=lZtxWTk7tpk. Accessed 30 June 2017.
9. Galloway, Bek. "Purposes and Text Types." YouTube, 30 Sept. 2016,
10. https://www.youtube.com/watch?v=-LULx42tOA4&t=34s . Accessed 4 July 2017.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
30%	30%	30%	10%	0%	0%

Supplementary Resources:

1. Kane, Thomas S. The Oxford Essential Guide to Writing. Berkeley, 2000
2. Anderson, P. Technical Communication. Harcourt Brace, 1998.
3. Cox, Kathy, and David Hill. Eap Now!: English for Academic Purposes. Pearson Australia, 2011.
4. Doren, Charles Van, and Mortimer J. Adler. How to Read a Book. Washington Square Press, 1974.
5. Emden, Joan Van. Writing for Engineers. Palgrave Macmillan, 2005.

6. Glendinning, Eric H., and Beverly Holmström. Study Reading: A Course in Reading Skills for Academic Purposes. Cambridge University Press, 2012.
7. Hamp-Lyons, Liz, and Ben Heasley. Study Writing: A Course in Writing Skills for Academic Purposes. Cambridge University Press, 2013.
8. Langan, John, and Judith Nadell. Doing Well in College: A Concise Guide to Reading, Writing, and Study skills. McGraw-Hill Book Col., 1980.
9. Vise, David A., and Mark Malseed. The Google Story. Bantam Dell, 2008.

Subject Code: 01SL0103

Subject Name: Speaking and Presentation Skills

B. Tech. Year – I (Semester I)

Objective:
The course intends to make students confident in speaking in English with the help of various language functions. It also focuses on developing students' presentation skills.

Credits Earned: 02 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Share information on familiar matters/issues in English;
2. Make effective presentations in English;
3. Gain confidence in speaking in English.

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
02	00	00	02	00	30	20	25	25	100

Contents:

Unit	Topics	Hours
1	**Speaking/Interacting in an Academic Context** Greetings, introducing self and peers, Asking and sharing information, expressing points of view, Discussions, facing viva voce, Group discussions, Facing an interview (interview skills)	12
2	**Effective Presentation Skills** Introduction to effective presentation skills, Preparing the presentation (Collection of Data/Information, exploring the topic etc.), Using ICT for the presentation, getting ready for the presentation, Effective body language, Effective pronunciation, Interacting with the audience (Q & A), Practice (with video recording), Feedback and Suggestions	16
	Total Hours	28

Suggested Text books / Reference books:

1. TED Talks
2. INK Talks
3. Toastmasters Videos
4. Courtroom Dramas

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	30%	30%	30%	0%	0%

Supplementary Resources:

1. "Communication." themuse. 2017. https://www.themuse.com/tags/communication. Accessed 4 July 2017.
2. Presentation Magazine. 2017. https://www.presentationmagazine.com/. Accessed 4 July 2017.
3. "Presentation Skills." SKIlIS YOU NEED. 2017. https://www.skillsyouneed.com/presentation-skills.html. Accessed 4 July 2017.
4. Siddons Suzy. The Complete Presentation Skills Handbook. Kogan Page, 2008.
5. Sprague Jo, and Douglas Stuart. The Speaker's Handbook. 8th ed., Thomson Wadsworth, 2008.

Subject Code: 01CT0101

Subject Name: Introduction to Computer Programming

B. Tech. Year – I (Semester I)

Objective:
In this basic course, we will move through a number of introductory C concepts, such as basic syntax, looping, arrays, pointers, and elementary functions and data types. The course will also aim to stimulate students into thinking like programmers and provide an understanding of programming techniques that reaches beyond familiarity and basic fluency with the C programming language.

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand Flowchart, Algorithms and Pseudocode that helps to develop logical base of any problem statement
2. Understand the usage of different primitive, derived and user defined datatypes
3. Analyze the use of different conditional and looping control statements in a complex problem
4. Apply the knowledge of decisional control statements to deal with pre-processors, macros, pointers and file management to enhance the coding skills.
5. Apply overall programming knowledge that brings the solution of real-world problems/ use cases

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	02	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to c language** Pseudo code solution to problem, problem solving using flowchart and algorithm, Basic concepts in a C program, Structure of 'C' program, compilation and linking processes, Declaration, Assignment & Print statements, Data Types, operators and expressions, Type Conversion and Type Casting, Programming examples and exercises	06
2	**Branching and looping** Two-way selection (if, if-else, nested if-else, cascaded if-else), switch statement, ternary operator? Go to, Loops (For, while-do, do-while) in C, break and continue, Programming examples and exercises	06
3	**Arrays and strings** ARRAYS AND STRINGS: Using an array, Using arrays with Functions, Multi- Dimensional arrays. String: Declaring, Initializing, Printing and reading strings, string manipulation functions, String input and output functions, array of strings, Programming examples and Exercises.	06
4	**Functions & pointers** FUNCTIONS: Functions in C, Argument Passing – call by value, call by reference, Functions and program structure, location of functions, void and parameter less Functions, Recursion, Programming examples and exercises. POINTERS: Introduction to Pointers, Pointers as Function Parameter, Pointer, Arithmetic, Pointers and Arrays, Function Pointers, Programming examples and exercises.	07
5	**Structure, union & file management** STRUCTURE: Need of Structure, Basic of structures, structure declaration and definition, structures and Functions, Array of structures, structure Data types, type definition, UNION: Union declaration and definition, structure vs union, FILE MANAGEMENT: Introduction to file management and its functions, opening and closing of files, Input and output operations, Programming examples and exercises.	08
6	**Pointers and preprocessors & data structures** Pointers and address, pointers and functions (call by reference) arguments, pointers and arrays, address arithmetic, character pointer and functions, pointers to pointer, Initialization of pointer arrays, Dynamic memory allocations methods, Introduction to Preprocessors, compiler control Directives, Programming examples and exercises. Introduction to Data Structures: Primitive and non-primitive data types, Abstract data types, Definition and applications of Stacks, Queues, Linked Lists and Trees.	09
	Total Hours	42

Suggested Text books / Reference books:

1. Paul Deitel, Harvey Deitel, C How to Program, Pearson, 7th edition
2. Pradip Dey & Manas Ghosh, Programming in C, Oxford Publication, 2nd edition
3. Ritchie Dennis M, Kernighan Brain W, C: Programming Language, Prentice Hall Of India Private limited, 2nd edition
4. E. Balagurusamy, Programming in ANSI C, Tata Mcgraw-Hill Publishing Com. Ltd., 7th edition
5. Yashavant P. Kanetkar, Let Us C, BPB Publications, 10th edition
6. E.V. Kameshwar, Numerical techniques in C, BPB Publications
7. Schildt, Herbert, The Complete Reference C, Tata Mcgraw-Hill Publishing Com. Ltd., 4th edition

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	15%	30%	15%	15%	15%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Write a program to print student detail.
2. Write a program to calculate simple interest.
3. Write a program that accepts centigrade and convert it into Fahrenheit.
4. Write a program that accepts two numbers in A and B interchange value of A and B variable.
5. Write a program to demonstrate the use of the basic data types int, char and float.
6. Write a program to demonstrate the use of Arithmetic operators by getting two numbers from the user
7. Write a program that accepts a number from keyboard and find weather the number is ODD or EVEN using Conditional operators.
8. Write a program to demonstrate the use of increment and decrement operator.
9. Write a program to demonstrate the use of shorthand operators.
10. Write a program to demonstrate the use of sizeof() of operator.
11. Write a program to demonstrate the use of bitwise operators.
12. Write a program that accepts three numbers from the user and print maximum of them.
13. Demonstrate the use of GOTO statement.
14. Write a program to input the Name and the Salary of an Employee. Calculate and print the Name, Salary and Bonus of the Employee, where bonus= 5.3% if salary is at least Rs. 10,000 and 6.5% otherwise.

15. Admission to professional course is subject to the following conditions. Marks in Mathematics>=60
16. Marks in Physics>=50 Marks in Chemistry>=40
17. Total in all three subjects>=200 or total in mathematics and physics>=150
18. Given the marks in the three subjects, write a program to process the application to list the eligible candidates.
19. Write a program that accepts two numbers and one code (1,2,3,4) from the user. According to the code, the operations to be performed, using switch case statements as follows: (Code: 1→ Addition, 2→ Subtraction, 3→ Multiplication, 4→ Division).
20. Write a program that reads the marks for five subjects of a student. Calculate and print the grade for the student [i.e. Grade A, B, C, D and F] using Else-If ladder.
21. Write a program that do sum=1+3+5+……. N terms Print value of Sum.
22. Write a program to print the Fibonacci Series [i.e. 1,1,2,3,5,8,13…N terms].
23. Write a program to accept one number from the user.
24. Display reverse of that number.
25. Find if it is Armstrong or not.
26. Write a program that accepts a number from the user and print prime numbers from 0 to that number.
27. Write a C program to display various Patterns.
28. Write a program to accept 5 numbers in an array and display it.
29. Write a program to accept 9 numbers in form of matrix and display in matrix form.
30. Write a program to accept 5 numbers in array and find maximum and minimum value of it.
31. Write a program to accept 5 numbers in array and find maximum and minimum value of it.
32. Write a program to sort all elements of 1-D array in ascending and descending order.
33. Write a program to calculate and display addition of two matrix.
34. Write a program to count number of vowels in a given string.
35. Write a program to check whether entered string is palindrome or not.
36. Write a program for string concatenation without using library function.
37. Write a program to demonstrate the Library function for string.
38. Write a function which receives number as argument and return sum of digit.
39. Write a program for calculating Fibonacci series using UDF and call by value
40. Write a program to calculate Factorial using recursion in UDF.
41. Write a program to find Average, maximum and minimum of Array elements using UDF.
42. Write a program to calculate total number of positive, negative and zero value in array using UDF.
43. Write a program to swap two numbers using UDF and pointer.
44. Write a program using pointer to read in an array of integers and print its elements in reverse order.
45. Write a C program to create a structure of employees with Full Name, Last Name, City and Salary. Display it for n employees.
46. Write a program to demonstrate nested structure. (make structures for circle and rectangle)
47. Write a program to create array of structure. Make a structure for student having student_no, student_name, student_marks.
48. Write a program to create union cricketer having player_name, batting_avg, player_age.P for swapping of two values with help of UDF and call by reference.

49. Write a program to Display contents of a file on screen. Use functions (fopen,fclose, getc,putchar,eof)
50. Write a program to count number of characters in a file.

Supplementary Resources:

1. http://nptel.ac.in/courses/106105085/4
2. http://nptel.ac.in/courses/106104128
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-087-practical- programming-in-c-january-iap-2010

Subject Code: 01CT0103

Subject Name: Foundation skills in sensor interfacing

B. Tech. Year – I (Semester I)

Objective:

After completion of this course, student will be able to:

1. To stimulate students programming and debugging abilities
2. To improve the logical ability
3. To design programs using open-source integrated development environments and programmable microcontroller-based boards
4. To interface various sensors and modules like IR, ultrasonic, temperature, humidity, accelerometer, gyroscope, etc.
5. To control various aceturates and electronics devices
6. To implement data transfer using various protocols like bluetooth, Wi-Fi, GSM, etc.

Credits Earned: 01 Credit

Course Outcomes: After completion of this course, student will be able to:

1. Understand application-based programming concept
2. To create programmes for various open-source programmable boards
3. To develop programmes for specific requirements with interfacing of various components and modules
4. To develop hardware and software interfacing for engineering applications

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
00	00	02	01	00	00	00	25	25	50

Contents:

Unit	Topics	Hours
1	**Open source boards and IDE** Overview, various boards, hardware specifications, components and various pins, gui of ide, installation of ide, combination of software and hardware, connection with hardware and libraries	04
2	**Programming using IDE** Program structure, data types, variables, constants, operators, control statements, loops, functions, arrays, strings	08
3	**Function libraries** Input and output functions, character functions, math functions, tone generation, communication protocols and trigonometric functions	04
4	**User centric applications** Concept of pulse width modulation, sensors and actuators interfacing, short-range and long-range communication, project implementation and debugging skills	12
	Total Hours	28

Suggested Text books / Reference books:

1. Massimo Banzi, "Getting Started with Arduino", O'Reilly Media, September 2011: Second Edition
2. Michael Margolis, "Arduino Cookbook", O'Reilly Media, March 2011, First Edition
3. Rui Santos and Sara Santos, "Arduino For Beginners"
4. Alan G. Smith, "Intro Arduino Book A piece of cake!"

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	10%	30%	20%	10%	20%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Introduction to open source boards and programing IDEs
2. Various pins available on boards and it's functionally
3. Basic programming to interface LEDs and switches
4. Data types and variables, interfacing of LCD Display

5. Operators and control statement, Interfacing of Temperature and Humidity sensors
6. Programming using with Time, Loops and Functions, Interfacing Ultra sonic sensor for distance measurement
7. Use of Strings and arrays in programming
8. Function Libraries installation and use
9. High voltage applications and controlling, Interfacing of DC Motors
10. Speed and intensity control using PWM
11. IR transmitters and receivers applications
12. Robotics application design using servo motor interfacing
13. Integration of communication protocols like bluetooth, Wi-Fi, GSM, etc.
14. Project assessment

Supplementary Resources:

1. https://www.arduino.cc/en/Main/Education
2. https://www.tutorialspoint.com/arduino
3. http://tronixstuff.com/tutorials
4. https://www.arduino.cc/en/Guide/HomePage
5. https://startingelectronics.org/software/arduino/learn-to-program-course

Subject Code: 01CT0104

Subject Name: ICT Workshop

B. Tech. Year – I (Semester I)

Objective:
This course deals with basic introduction of system components of electronic systems, and provides hands on practice in assembling, interconnecting, testing, and repairing such system by making use of various tools. Also, this course will provide a much needed knowledge of computer hardware and networking, enabling them to identify and rectify the onboard computer hardware, software and network related problems. With the help of this course the student will be able to understand the hardware specifications that are required to run operating system and various application programs.

Credits Earned: 01 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand Basic Electronic components and tools.
2. Understand Basic Computer components and tools.
3. The students will apply knowledge of engineering to design and conduct experiments using PCB design software
4. Identify the existing configuration of the computers and peripherals.
5. Apply their knowledge about computer peripherals to identify / rectify problems onboard.
6. Integrate the PCs into local area network and re-install operating system and various application programs.

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
00	00	02	01	00	00	00	25	25	50

Contents:

Unit	Topics	Hours
1	**Introduction to Basics of Electronic Components and Instruments** Study of electronic components- active & passive, Electronic Instruments: CRO, Function generator, Power Supply, Multi-meter, IC tester. Solder practice	04
2	**Introduction to Computer Components** Basics of computer modules, Understanding the input-Output devices, Understanding the primary and Secondary Storage Memory, Understanding the functionality of ALU	04
3	**Assembling a PC** Assembling various computer parts like Processor (CPU), Computer Case, Optical Drives, Memory, Power Supply, Motherboard, Processor Fan, Case Fan	05
4	**Introduction to various network components** Understanding Network Components like Routers, Hubs, Switch, Bridge, Gateways, NICs, Wireless Access Points, Modems	05
5	**PCB Design Process** Conception Level Introduction: Specifying Parts, Packages and Pin Names, Libraries and Checking foot prints of the components, Partlist, Placing Parts, Routing Traces, Modifying Traces, Mounting Holes, Adding Text, PCB Layout, Pattern Transfer.	06
6	**Installation of operating system** Introduction to Operating systems, Step wise process to install Operating Systems	04
	Total Hours	28

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	15%	20%	20%	15%	20%

Suggested List of Experiments:

1. Identify the hardware and software list of the given system.
2. Install and uninstall given software step-by-step.
3. Explain step-by-step installation process for given operating system.
4. Designing single layer PCB and understanding Double layer PCB.

Faculty of Technology

B. Tech. in Information and Communication Technology

Semester II

Subject Code: 01MA1151

Subject Name: Matrix algebra and vector calculus

B. Tech. Year – I (Semester II)

Objective:
This subject aims to provide fundamentals of matrix algebra and vector calculus. The topics delivered in the paper are essential for almost all science and engineering disciplines.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand graphs, Logic and Lattices.
2. Apply abstract concept of Predicate in design of computing machines, data structures for programming languages.
3. Apply concept of Boolean algebra in switching theory and building basic electronic circuits.
4. Apply concepts of Kruskal's algorithm to find the shortest possible distance between two objects.
5. Apply concepts of graph theory in data mining and networking.

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	02	00	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Vector space** Vector space, Linear independence of vectors, Basis and dimension of vector space, Inner product spaces and their properties.	08
2	**Matrix Algebra - I** Rank and nullity of a matrix, Determination of rank by row operation, Triangularization of matrices by Gauss-elimination process, Computing inverse of a matrix by Row operations, Consistency of system of linear equations.	08
3	**Matrix Algebra-II** Determinant and their properties, Cofactors of n×n determinant, Eigen values and eigen vector of matrix, Cayley - Hamilton theorem, Quadratic and Canonical forms, special matrices and their properties.	08
4	**Vector differential calculus** Recall the concept of vector algebra, Scalar and vector functions, gradient of a scalar point functions, Divergence and Curl of a vector point function, Physical meaning of gradient, divergence and curl, directional derivatives, Conservative vector fields, Irrotational and Solenoidal function.	10
5	**Vector Integral calculus** Line integrals, Path Independence of Line Integrals, Concept of surface integrals, Green's theorem, Stoke's theorem and Divergence theorem.	10
6	**Improper integrals** Improper integrals of type I and type – II, Convergence of Improper integrals, Beta, Gamma and error functions with properties.	10
	Total Hours	54

Suggested Text books / Reference books:

1. M. D. Weir et al: Thomas' Calculus, 11th Ed., Pearson Eduaction, 2008.
2. Stewart James: Calculus Early Transcendental, 5th Ed., Thomson India, 2007
3. Wylie & Barrett: Advanced Engineering Mathematics, McGraw-Hill pub.
4. Greenberg M D: Advanced Engineering Mathematics, 2nd ed., Pearson
5. Erwin Kreyszig , Advanced Engineering Mathematics, 9/e, John Wiley, INC
6. H. K. Dass, Advanced Engineering Mathematics, S Chand Publishing.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	30%	15%	10%	5%

Supplementary Resources:

1. http://mathworld.wolfram.com/
2. http://en.wikipedia.org/wiki/Math

Subject Code: 01EC0102

Subject Name: Digital Electronics

B. Tech. Year – I (Semester II)

Objective:

1. To understand the basic of Digital Electronic concepts required in analysis and design of digital electronic circuits and systems.
2. To understand the number system, logic gates, Boolean algebra, etc.
3. To understand Construction and operation of various digital circuits such as Adder, Subtractor, Multiplexer, Demultiplexer, Decoder, Encoder, Flip-flops, Counters, Registers and memory devices.
4. To devolve the capability to Simplify, Analyze and Design the Various Digital Electronic Circuits.

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Develop understanding of basic digital circuits like logic gates, logic families, flip flops and memory devices.
2. Use knowledge of various number systems and binary codes to solve conversion problems.
3. Apply concepts of Boolean algebra and other minimization techniques for digital circuit design.
4. Design digital circuits using different combinational and sequential logic.
5. Implement various combinational and sequential circuits using appropriate hardware/simulation.

Pre-requisite of course:

Elementary knowledge of science and mathematics

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	02	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Number Systems and Codes** Analogue versus Digital, Various Number Systems and Conversion between them, Accuracy of Conversion, Floating-Point Numbers, Various Binary Codes.	06
2	**Digital Arithmetic** Basic Rules of Binary Addition and Subtraction, Binary Addition and Subtraction using Complements, BCD Addition and Subtraction, Binary Multiplication and Division, Floating-Point Arithmetic.	04
3	**Logic Gates and Related Device** Positive and Negative Logic, Various Logics Gates with IEEE/ANSI symbols, Boolean equations, truth table and IC Details. Universal Gates, Gates with Open Collector/Drain output, Tristate Gates, AND-OR-INVERT Gates, Schmitt Gates, Special Output Gates, Fan-Out of Logic Gates, Buffers and Transceivers	04
4	**Logic Families** Significance of Families, Characteristic Parameters, Types of Logic Families: TTL, ECL, CMOS, Bi-CMOS, NMOS and PMOS, Comparison between various logic families. Interfacing between CMOS and TTL logic families	03
5	**Boolean Algebra and Simplification Techniques** Introduction, Postulates and Theorems, Various types of Boolean expressions, Simplification Techniques - Karnaugh Map Method and Tabulation Method	04
6	**Combinational Logic Circuits** Combinational Circuits and its implementations, Arithmetic Circuits - Adders and Subtractors, BCD Adder, Look-Ahead Carry Generator, ALU, Multiplier, Magnitude comparator. Multiplexer, Encoders, Demultiplexers and Decoders, Parity Generation and Checking.	08
7	**Sequential Logic Circuits** R-S and D Flip-flop, Level Triggered and Edge-Triggered Flip-flops, J-K and T Flip-flop, Synchronous and Asynchronous Input, Flip-flop Timing Parameters, Application of Flip-flop. Ripple Counter, Synchronous Counter, Modulus Counter, Binary Ripple Counter, Synchronous Counters, UP/Down Counters, Decade and BCD Counters, Presettable Counters, Decoding Counter, Cascading Counter, Designing Counter with Arbitrary Sequences, Shift Register, Shift Register Counters, IEEE/ANSI Symbols for counters and Registers.	10
8	**Memory Devices** Anatomy of Computer, A computer Systems, Computer Memory, RAM and ROM, Expanding Memory Capacity	03
	Total Hours	42

Suggested Text books / Reference books:

1. Anil K. Maini, "Digital Electronics: Principles, Devices and Applications" Wiley-India Pvt. Ltd, 1st Edition, 2008
2. David J. Comer "Digital Logic & State Machine Design", 3rd Indian Edition, Oxford University Press.
3. M Morris Mano, "Digital Logic and Computer Design", 4th Edition, 2009, Pearson, LPE, R.P.Jain, "Modern Digital Electronics", McGraw-Hill, 4th ed. 2010.
4. Malvino & Leach "Digital Principles and Applications", 7th Edition, McGraw-Hill Education

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
15%	20%	30%	20%	10%	5%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Study data sheet of various digital logic circuits and see how to test these circuits using Digital IC Tester.
2. Study of Digital IC Testers, Logic State Analyzer and Digital Pattern Generators.
3. Verify the truth tables of various Digital Logic Gates.
4. Verify the application of NAND and NOR logic gates as universal gates.
5. Implementation of Boolean Logic Functions using logic gate ICs.
6. Design and implement digital logic for given case study.
7. Measure digital logic gate specifications such as propagation delay, noise margin, fan in and fan out.
8. Implement various combinational logic circuits such as adder, subtractor, decoder, encoder, multiplexers, demultiplexer, etc.
9. Design any one code converter and implement using discrete ICs on the bread board.
10. Verify operation of SR and JK flipflop.
11. Verify operation of D latch and edge triggered D flipflop.
12. Verify the operation of shift registers.
13. Verify the operation of synchronous counter.
14. Verify the operation of asynchronous counter.
15. Design and Implementation of combinational lock circuit with varying number of bits (For example 4, 8 …..)

16. Design and Implementation of visitor counter for Shopping Mall.
17. Design and Implementation of 4 bit Arithmetic and Logic Unit with minimum 4 functions using digital integrated circuits.
18. Design and Implementation of a scrolling display.
19. Design and Implement a digital dice which will generate any random number from 1 to 6.
20. Note: A student and faculty may choose any other such problem which includes the concept used in the course.

Supplementary Resources:

1. https://www.javatpoint.com/digital-electronics
2. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
3. https://www.tutorialspoint.com/digital_circuits/index.htm
4. https://www.coursera.org/learn/digital-systems

Subject Code: 01ME0105

Subject Name: Engineering Drawing and Computer Aided Design

B. Tech. Year – I (Semester II)

Objective:
Engineering Drawing is an effective language of engineers. It is the Foundation block which strengthens the engineering & technological structure. Moreover, it is the transmitting link between ideas and realization.

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Interpret engineering drawings using fundamental technical mathematics.
2. Construct basic and intermediate geometry.
3. To improve their visualization skills so that they can apply these skills in developing new products.
4. To improve their technical communication skill in the form of communicative drawings.
5. To sketch engineering objects in freehand mode.
6. To create 3D computer model and its realization using FDM based 3D printing.

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
02	00	04	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to Engineering Drawing & Sketching** Drawing instruments and accessories, BIS –SP 46 and Use of Plane Scale. construction of different polygon, divide the line and angle in parts.	06
2	**Orthographic Projections** Fundamental of projection along with classification, Projections from the pictorial view of the object on the principal planes for view from front, top and sides using first angle projection method and third angle projection method, full sectional view.	08
3	**Isometric Projections and Isometric View or Drawing** Isometric Scale, Conversion of orthographic views into isometric projection, isometric view or drawing.	08
4	**Perspective Sketching** Introduction to perspective drawing, concept of Horizon, vanishing point and eye level, 1-Point, 2-Point perspective sketching, looking Up/Down/Straight ahead, Illumination source and shadow, Perspective distortion, perspective sketching by observation, perspective sketching by imagination, Basics of 3-Point perspective (Bird's eye view)	18
5	**Basics of CAD & 3-D printing** Introduction of CAD tools, Mesh, sketching, extruding using CAD tools, Basics of FDM based rapid prototyping.	12
	Total Hours	52

Suggested Text books / Reference books:

1. Engineering Graphics by Dr. R.L.Jhala- Mc Graw Hill Education Publication, New Delhi.
2. A Text Book of Engineering Graphics by P.J.Shah S.Chand & Company Ltd., New Delhi
3. A text book of Engineering Drawing by R.K.Dhawan, S.Chand & Company Ltd., New Delhi
4. A text book of Engineering Drawing by P.S.Gill, S.K.Kataria & sons, Delhi.
5. Perspective Drawing Handbook by Joseph DÁmelio, Dover Publication
6. Perspective Drawing for Beginners by Len A. Doust, Dover Publication
7. Perspective Made Easy by Ernest Norling, Dover Publication

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
14%	22%	22%	14%	14%	14%

Suggested List of Activities:

1. Practice sheet (which includes dimensioning methods, different types of line, construction of different polygon, divide the line and angle in parts)
2. Orthographic projection.
3. Isometric projection.
4. Freehand sketching with 1-Point perspective by observation and imagination.
5. Freehand sketching with 2-Point perspective by observation and imagination.
6. Freehand sketching with 3-Point perspective by observation and imagination.
7. Incorporating shadow and reflection in perspective sketching.
8. CAD tool-based design of simple 3D solid geometry.
9. Design project including Ideation, Visualization, Sketching, CAD modelling and 3D Printing.

Supplementary Resources:

1. https://www.designtechcadacademy.com/knowledge-base/introduction-to-cad
2. https://fractory.com/engineering-drawing-basics/
3. https://www.autodesk.in/solutions/technical-drawing
4. https://ocw.mit.edu/courses/mechanical-engineering/2-007-design-and-manufacturing-i-spring-2009/related-resources/drawing_and_sketching/

Subject Code: 01CT0105

Subject Name: Object Oriented Programming

B. Tech. Year – I (Semester II)

Objective:

1. To gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc.
2. To understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handling mechanisms
3. To understand the principles of inheritance, packages and interfaces
4. To understand Multithreading and I/O files in Java
5. To understand the fundamental of AWT, SWING and Graphics based window
6. To understands Collection of classes and basic java utensils packages

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Use Object Oriented Programming concepts for problem solving.
2. Apply OOP principles to create java application programs and proper program structuring.
3. Ensure design stability for various applications- by applying exception handling and inheritance
4. Implement multithreading, Interfaces and class collection with the help of Utensils package and Construct GUI and I/O based window application.
5. Analyze the various techniques of OOP to reduce programming complexity.

Pre-requisite of course:
Basic knowledge of C

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	02	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to object-oriented programming** Object oriented paradigm, object and classes, data abstraction and encapsulation, inheritance, polymorphism, dynamic binding, benefits and application of OOP.	03
2	**Java evaluation and overview** Java evaluation: Java History, Java features, difference with other language, java with internet, www and web browsers, Java environment, JDK Java overview: Java program structure, java program implementation on various IDE's like NetBeans and Eclipse, Byte Code and JVM.	02
3	**Strings** String class, String Buffer class, Operations on string, Command line argument, Use of Wrapper Class.	02
4	**Object, Classes and Methods** Introduction to class, objects, members data and member functions, declaration of fields and methods, accessing class members, constructors and destructors, method overloading, static members, Inheritance, method overriding, final variable, final member, final class, finalizer methods, Abstract method and class, Visibility modifiers in classes.	06
5	**Interfaces (Multiple Inheritance)** Introduction to interface, declaration of interface, extending interface, implementing interface, accessing interface variables.	04
6	**Java Packages** Introduction and declaration of Packages in Java, creating and accessing package, adding class to a package, static import.	02
7	**Errors and Exception Handling in Java** Types of Errors, Exceptions, syntax of exception handling code, single and multiple catch statements, importance and execution of throws and Finally statement, Built in Exception, Custom exception, Throwable Class.	04
8	**Collection Framework** Collection Framework, Collection interface, Set and List interfaces, Map interface Generics in the Collection Framework	03
9	**Multithreaded Programming** Introduction to thread, Creating and Extending thread class, stopping and blocking thread class, Life cycle of thread, thread exception, thread priority, Synchronization, implementing "Runnable" interface, Introduction to JavaBeans and Network Programming	05
10	**Managing I/O file in Java** Concept of Stream and Stream classes, Byte Stream, Input/output Stream, Characters Stream, Reader Stream, Writer Stream, File Class, File Input	03

	Stream, File Output Stream, Input Stream Reader, Output Stream Writer	
11	**GUI** Comparing AWT and swing features, AWT Components, Overview of the AWT components, Component properties, Graphics context, Containers, Container class, Layout Managers, Top-level containers, Window class, Decorated windows Frame and Dialog, Panel class, Events, Event Delegation Model, AWT Events, Adapter classes, Swing and MVC, J component, J option Pane, Showing Message, Confirm and Input Dialogs	08
	Total Hours	42

Suggested Text books / Reference books:

1. Programming with Java A Primer, E.Balaguruswamy, Fourthedition, Mc Grawhill.
2. The Complete Reference, Java 2, Herbert Schild, Tata McGraw-Hill
3. Java Fundamentals A comprehensive introduction, Herbert Schildt, Dale Skrien, McGraw Hill Education.
4. Object Oriented Modeling and Design with UML, Michael Blaha and James Rambaugh, Pearson

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
15%	15%	30%	15%	10%	15%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Use eclipse or Netbean platform and acquaint with the various menus, create a test project, add a test class and run it see how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
2. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.
3. Develop an applet that displays a simple message
4. Develop an Applet that receives an integer in one text field & compute its factorial value & returns it in another text filed when the button "Compute" is clicked
5. Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and

Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box

6. Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
7. Write a java program that connects to a database using JDBC and does add, deletes, modify and retrieve operations
8. Write a java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with “stop” or “ready” or “go” should appear above the buttons in a selected color. Initially there is no message shown.
9. Write a java program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea( ) that prints the area of the given shape.
10. Suppose that a table named Table.txt is stored in a text file. The first line in the file header and the remaining lines correspond to row in the table. The elements are separated by commas. Write a Java program to display the table using labels in grid layout.
11. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. (Use adapter classes)
12. Write a java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t).it takes a name or phone number as input and prints the corresponding other value from the hash table(hint: use hash tables)
13. Implement the above program with database instead of a text file.
14. Write a java program that takes tab separated data (one record per line) from a text file and inserts them into a database
15. Write a java program that prints the meta-data of a given table.
16. Write a Java program that prints all real solutions to the quadratic equation ax 2 +bx+c = 0. Read in a, b, c and use the quadratic formula. If the discriminate b2 -4ac is negative, display a message stating that there are no real solutions?
17. The Fibonacci sequence is defined by the following rule. The first 2 values in the sequence are 1, 1. Every subsequent value is the sum of the 2 values preceding it. Write a Java program that uses both recursive and non-recursive functions to print the nth value of the Fibonacci sequence?
18. Write a Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer?
19. Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome?

20. Write a Java program for sorting a given list of names in ascending order?
21. Write a Java program to multiply two given matrices?
22. Write a Java program that reads a line of integers and then displays each integer and the sum of all integers. (use StringTokenizer class)?
23. Write a Java program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes?
24. Write a Java program that reads a file and displays the file on the screen, with a line number before each line?
25. Write a Java program that displays the number of characters, lines and words in a text.

Supplementary Resources:

1. https://ocw.mit.edu/courses/electrical...and.../6...programming.../lecture-14/
2. https://beginnersbook.com/2013/04/oops-concepts/
3. www.oracle.com/technetwork/java/oo-140949.html
4. nptel.ac.in/courses/106106147/3

Subject Code: 01EN0101

Subject Name: Basics of Environmental Studies

B. Tech. Year – I (Semester II)

Objective:
Students should gain basic understanding of Environmental Engineering

Credits Earned: 02 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand and realize the multidisciplinary nature of Environment & its components.
2. Know the importance of natural resources for the sustainable development of life.
3. Understand the effect of growing population on the Environment.
4. Classify the different types of pollution and measure to control pollution
5. Learn about the Environmental issues faced globally and various steps taken globally to solve such Environmental issues.

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
02	00	00	02	50	30	20	00	00	100

Contents:

Unit	Topics	Hours
1	**Introduction and Ecology** Introduction to Environment, Ecology, Ecosystem	04
2	**Population and Environment** Factors Affecting Human Settlement, Define Over Population & Explain the Cause, Effect on Environment & Control of it, Methods of Population forecasting	05
3	**Environmental Resources** Forest resources, Energy resources, Water Resources and Land Resources	07
4	**Environmental Pollution** Water pollution, Air & Noise Pollution, Environmental sinks, solid and hazardous waste, E-waste & Biomedical waste, Introduction to Green chemistry	07
5	**Global Environmental Issues** Greenhouse Effect, Global warming, ozone layer depletion, Climate change, Acid Rain, Global Efforts to control issues	03
6	**Governmental bodies for Environmental protection**	02
	Total Hours	28

Suggested Text books / Reference books:

1. Basics of Environmental Studies by U K Khare, 2011 Published by Tata McGraw Hill
2. Environmental Science A Global Concern by William P. Cunningham and Mary Ann Cunningham Published by Tata Mc Graw Hill

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
30%	25%	25%	5%	5%	10%

Subject Code: 01CT0106

Subject Name: Introduction to R and R Studio

B. Tech. Year – I (Semester II)

Objective:
R Programming will help graduates to be competent in Data Manipulation with R programming, Data visualization, advance analytics topics like regressions, data mining using R Studio. You will work on real life projects and assignments to master data analytics.

Credits Earned: 01 Credit

Course Outcomes: After completion of this course, student will be able to:

1. Learn Data Science concepts of R and functioning of R-Calculator
2. Learn to create Pie charts, plots and vectors
3. Performing sorting, analyze variance and the cluster
4. ODBC Tables reading, linear and logistic regression
5. Understand database connectivity
6. Understand the applications of machine learning and various prediction models using R

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
00	00	02	01	00	00	00	25	25	50

Contents:

Unit	Topics	Hours
1	**Introduction to R and R Studio** Evolution of R, Features of R, R environment set up, installation of R Studio, Introduction to R Studio	02
2	**Basics of R language** Basic Syntax of R, R command Prompt, R script file, comments, R-data types, vectors, Lists, Matrices, Arrays, Factors, Data Frames, Variables	02
3	**Operators in R** Arithmetic Operators, Logical Operators, Relational Operators, Assignment Operators, Miscellaneous Operators	02
4	**R-Decision and Control Loop Statements** if condition, if else condition, switch condition, repeat loop, while loop, for loop, break statement, Next statement	02
5	**Flavors in R** Functions in R, R-Strings, String Manipulations, R-vectors, R-Lists, R-Matrices, R-arrays, R-factors, R-data frames, R-Packages, R-Data Reshaping, R-Excel Files	04
6	**Data Representation using R** R-Pie Chart, R-Bar Chart, R-Histograms R-Line Graphs, R-Scatterplots	03
7	**Statistical Analysis using R** Mean, median and Mode, Linear Regression, Multiple Regression, Logistic Regression, Normal Distribution, Binomial Distribution, Poisson Distribution, Analysis of Covariance, Time Series Analysis, R-Decision Tree, R-Random Forest	09
	Total Hours	24

Suggested Text books / Reference books:

1. R Cookbook, Paul Teetor, Pub: Penram International.
2. The Art of R Programming: A Tour of Statistical Software Design, Norman Matloff
3. R for Data Science, Garrett Grolemund and Hadley Wickham
4. Hands-On Programming with R: Write Your Own Functions and Simulations, Garrett Grolemund

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	15%	20%	20%	15%	20%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Installation of R studio and understand different sections
2. Explore various Data types in R
3. Explorer various data structures vectors, Lists, Matrices, Arrays, Factors and Data Frames in R
4. Understand distinct Arithmetic Operators, Logical Operators and Relational Operators
5. Use Assignment Operators and Miscellaneous Operators for various types of operations
6. Understand and apply conditional statements in R
7. Use different types of loops for various operations
8. Create functions for given requirements
9. Learn additional special functions for arrays, factors, data frames, and Data Reshaping
10. Understand package and install it with various methods
11. Read data file like csv, xls and access and modify data
12. Plot various types of graphs for various data set
13. Calculate various statistical parameters like mean, median and mode for data
14. Understand Normal Distribution, Binomial Distribution and Poisson Distribution and identify it for data
15. Advance topics like Time Series Analysis, Decision Tree, and Random Forest

Supplementary Resources:

1. https://www.r-project.org/about.html
2. https://www.tutorialspoint.com/r/index.htm
3. https://www.computerworld.com/article/2497143/business-intelligence/business-intelligence- beginner-s-guide-to-r-introduction.html
4. https://www.udemy.com/r-basics/learn/v4/overview
5. https://intellipaat.com/r-programming-certification-training/#course-content

Subject Code: 01CR0103

Subject Name: Value Education

B. Tech. Year – I (Semester II)

Objective:
This course shall enrich students' value system, creativity, competence and confidence. It will enhance the softer aspects of life skills of students through the games, activities, group interactions and videos.

Credits Earned: 02 Credits

Course Outcomes: After completion of this course, student will be able to:

7. Understand importance of role of Values in developing self
8. Inculcate right values, ethics, attitudes, manners and behaviours for life
9. Respond and relate with expectations, competitions and power of networking

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
02	00	00	02	00	00	00	50	50	100

Contents:

Unit	Topics	Hours
1	**Personality Attributes** Experiencing worth of important personality attributes i.e Taking Initiatives, Thinking on the feet etc through Games	02
2	**Values of Honesty and Integrity as corner stone in one's career and Life** Experiencing incidence and case studies related to Honesty, Integrity and Human Values in work set up.	02
3	**Value of Creativity in one's career and Life** Building an attitude of creativity, thinking out of the box and inculcate virtue of exploration and innovation in various aspects of life.	02

4	**Values to self-sustenance in difficult times and failures** To Understand failure as stepping stone towards success, its inevitability and earning life lessons which makes an individual well equipped to deal with uncertainties of life.	02
5	**Role of emotions in one's professional life** Importance of building sound EQ with IQ, Understanding the causes and effects of emotions in life.	02
6	**Workplace values 1 – Manners** Understanding workplace as a second home and source of livelihood, inculcate spirit of belongingness towards work and exhibit sound manners that projects work place with dignity	02
7	**Workplace values 2 – People, Policy and organization** Understanding the importance of policies and people, ideal code of conduct at Workplace, building rapport with colleagues, sound behaviors with various stakeholders within the organization	02
8	**Value for students' life 1 - Power of Positivity** Importance of optimism in life, developing right kind of attitude towards self-career and others. Power of generating right kind of thoughts that translates in right actions and behaviors.	02
9	**Value for students' life 2 - Healthy Lifestyle** Importance of fitness in life and career. Importance of regular exercising an taking up a sport. Focusing upon eating and sleeping habits that result in physical performance as body is considered to be the temple of soul.	02
10	**Value for students' life 3 – Create First Impression** Understanding the importance of making right impressions while in public, how to speak/introduce self, basic understanding of dress code, voice tone and body language	02
11	**Understanding hazards of Social Networking sites** Developing sound habits, breaking bad habits, understanding hazards of bad habits and excess of social media in life.	02
12	**Creating Value through Social Networking sites (Linked-In and Quora)** To ensure that technology is used to build bridges and not the barriers, focusing upon the career and importance of associating with right content in the virtual world. (LinkedIn, Quora, GD communities, India Bix, Bodhi Booster)	02
13	**Performance Values 1- How to avoid Procrastination** Value and Importance of Time, Cause and effect of procrastination, How to maximize the day, Importance of setting up to –do lists and task lists	02
14	**Performance Values 2- How to manage Pressure Situations (Exams and Evaluations)** **Handling anxi**ety, Value of planning and smart work, ensuring right state of mind and tips for a successful show.	02
	Total Hours	28

Suggested Text books / Reference books:

8. Creating Values in Life: Personal, Moral, Spiritual, Family and Social Values – By Ashok Gulla
9. Teaching Your Children Values – By Linda and Richard Eyre
10. The Book of Virtues for Young People – William J. Bennett
11. The Monk who sold His Ferrari – By Robin Sharma
12. Seven habits of Highly Effective People – By Dr. Stephen R Covey
13. Stop Worrying & Start Living – By Dale Carnegie
14. Eat that Frog – By Brian Tracy

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	30%	15%	10%	5%

Marwadi University

Faculty of Technology

B. Tech. in Information and Communication Technology

Semester III

Subject Code: 01MA0231

Subject Name: Discrete Mathematics and Graph Theory

B. Tech. Year – II (Semester III)

Objective:
Engineering Mathematics is one of the very useful tool for learning Technology, Engineering and Sciences. In this course Learners will come across a number of standard concepts which helps them to solve core real world problems. This course is aimed to cover a variety of different concepts in Graph Theory. Theorems will be stated and proved formally using various Mathematical rules. Various graphs algorithms will also be discussed along with detail analysis.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand graphs, Logic and Lattices.
2. Apply abstract concept of Predicate in design of computing machines, data structures for programming languages.
3. Apply concept of Boolean algebra in switching theory and building basic electronic circuits.
4. Apply concepts of Kruskal's algorithm to find the shortest possible distance between two objects.
5. Apply concepts of graph theory in data mining and networking.

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	02	00	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Logic and Predicates** Introduction, Logical expressions and Operators, Predicates, Rules of quantifiers, Rules of Inference for predicates and propositions.	08
2	**Lattices** Different types of Relations, Partially ordered set, Hasse diagram, Lattice as Partially ordered set, Properties of lattices, Lattice as an algebraic system, Concept of Duality	09
3	**Boolean Algebra** Introduction to Boolean algebra and properties, Sub-Boolean algebra, Atoms and anti-atoms, Boolean Expression and It's equivalences, Minterms and Maxterms, Values of Boolean expressions, Canonical forms, Karnaugh map	09
4	**Graphs and Trees** Introduction to graph theory, degree and incidence, walks, paths, circuits, Reachability in Graphs , Hamilton Graphs and Euler Graphs, Introduction to Acyclic Graph(Tree) and its properties, Binary tree, Spanning Tree and Minimal Spanning Tree.	09
5	**Representation Graph using Matrix** Edge and vertex connectivity, Separability, Fundamental cycles and cut sets Graph Isomorphism : 1-Isomorphic and 2-Isomorphic Graphs, Matrix form of graphs, Adjacency and Incidence matrix, Dijkstra's Algorithm.	08
6	**Planar and Non-planar Graphs** Planar and Non-planar Graphs, Stereographic Graph embedding on a sphere, Kurtowski's first and second graphs, Euler's formula, Detection of planarity and elementary reduction.	09
	Total Hours	52

Suggested Text books / Reference books:

1. Rosen Kenneth: Discrete Mathematics and its Applications. McGraw Hill Publication- New Delhi.
2. Stanat and McAlister: Discrete Mathematics for Computer Science, PHI
3. Narsingh Deo: Graph Theory with Applications to Engineering and Computer Science, PHI, 1974.
4. B.Kolman and R.C. Busby: Discrete Mathematical Structures for Computer Science, Prantice Hall, New-Delhi.
5. J.P. Tremblay and Manohar: Discrete Mathematical Structures with Application to Computer Science, McGraw Hill Publication- New Delhi.
6. S. Malik and M. K. Sen: Discrete Mathematics, Cengage Learning India Pvt. Ltd.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	30%	15%	10%	5%

Supplementary Resources:

1. www.tutorialspoint.com/graph_theory
2. www.ied.edu.hk/has/phys/de/de-ba.htm

Subject Code: 01CT0301

Subject Name: Computer Organization and Architecture

B. Tech. Year – II (Semester III)

Objective:
To conceptualize the concepts of organizational and architectural issues of a digital computer. Further, analyze performance issues in processor and memory design of a digital computer. Also, understanding various data transfer techniques in digital computer and to analyze processor performance improvement using instruction level parallelism.

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. To apply knowledge of the processor's internal registers and operations by use of a PC based microprocessor simulator.
2. Understand and describe the basics of various architectural units of the Computer System.
3. Apply the knowledge of combinational and sequential logical circuits to mimica simple computer architecture.
4. List and specify the various features of microprocessor, memory and I/O devices including concepts of system bus.
5. To write assembly language programs and download the machine code that will provide solutions to real-world control problems.
6. Recognize the importance of parallelism and stall in computer architecture.

Pre-requisite of course:
Digital Electronics

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	02	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to Computer Architecture** Basic computer data types, Instruction codes, Instruction cycle, Computer registers, computer instructions, Timing and Control, Memory-Reference Instructions, Input-output and interrupt, Complete computer description, Design of Basic computer	06
2	**Introduction to Computer Organization** Instruction codes, Computer registers, Computer instructions, Timing and Control, Instruction cycle, Memory-Reference Instructions, Input-output and interrupt, Complete computer description.	05
3	**Fundamentals of Micro programmed Control** Control Memory, Address sequencing, Micro program Example, design of control Unit	04
4	**Concepts of Central Processing Unit** Introduction, General Register Organization, Stack Organization, Instruction format, Addressing Modes, data transfer and manipulation, Program Control, Reduced Instruction Set Computer (RISC)	07
5	**Computer Arithmetic** Introduction, Addition and subtraction, Multiplication Algorithms (Booth Multiplication Algorithm), Division Algorithms, Floating Point Arithmetic operations, Decimal Arithmetic Unit.	07
6	**Introduction to Pipeline** Flynn's taxonomy, Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction, Pipeline, RISC Pipeline	04
7	**Input-Output Organization** Input-Output Interface, Asynchronous Data Transfer, Modes Of Transfer, DMA, Input-Output Processor (IOP), Priority Interrupt, CPUIOP Communication, Serial Communication.	05
8	**Memory Organization** Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.	04
	Total Hours	42

Suggested Text books / Reference books:

1. M. Morris Mano, Computer System Architecture, Pearson
2. Andrew S. Tanenbaum and Todd Austin, Structured Computer Organization, Sixth Edition, PHI
3. M. Murdocca & V. Heuring, Computer Architecture & Organization, WILEY
4. John Hayes, Computer Architecture and Organization, McGraw Hill

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	30%	15%	10%	5%

Suggested List of Experiments:

1 Introduction to 8085 Microprocessor Trainer board with explanation of necessary hardware connection with microprocessor.

2 Data Transfer (Copy) Operations

A. Write the data 41h into register C and copy it to Accumulator
B. Load Register H with 34h and Register L with ABh.
C. Copy 32h in all the Registers.
D. Load accumulator with the content of memory whose address is D000h using three different techniques.

Exchange the content of memory location D000h and D001h using direct addressing and indirect addressing.

3 Arithmetic Operations

A. .Load Register B and C with 55h and 66h. Add Register B, C and store the result in Register D.
B. Add two 16 bit numbers with and without using DAD.
   a. (HL+BC and store the answer in HL)
C. Add the content of memory location D000h, D001h and store the result at memory locations D040h and D041H.
D. Transfer the array(3 byte) of data starting from D000h to the locations starting from D050h by memory pointer with and without LDA/STA.
E. Subtract two 16 bit numbers. (HL-BC and store answer in HL)

4 A. 1.Assume register B holds 93h and the accumulator holds 15h.illustrate the result of instruction ORA B, XRA B and CMA.
B. 2.Load the data byte 8EH in register D and F7H in register E. Mask the higher order bits (D7-D4) from both the data bytes.

5 Write an assembly language program to generate time delay using following three different approaches.

No need to generate specific delay. You can load the value of your choice.

A. 1.Using a simple Register
B. 2.Using Register Pair
C. 3.Using loop within a loop

6 Write an assembly language program to count from 0 to 9(modulo 10 counter) with

some delay between each count. Also display the count at output port 00H. At the count of 9 the counter should reset to 0 and repeat the sequence continuously.

7 Write an assembly language program to clear all the flag bits in flag register. Use the concept of PUSH and POP instruction to demonstrate this task.
Load the accumulator with 00H. Logically OR the accumulator with itself to set zero flag and display flag bits on port 01H.

8 Write an assembly language program to convert a BCD number into Binary.
Assume any two digit number of your choice as an input BCD number.

9 Write an assembly language program to convert a binary number into un-packed BCD number.
Assume any binary number available in memory.

10 Write an assembly language program to convert a packed BCD number into seven segment code and display. Use common cathode type seven segment display. Assume the packed BCD number is available in memory.

11 Write an assembly language program to
   A. Multiply two 8-bit numbers stored in Register A & Register B.
   B. Divide two 8-bit numbers stored in Register A & Register B.

12 Write an assembly language program to
   A. Find out largest number from given array stored at 5 consecutive memory locations starting from C030H and store the result to memory location C040h.
   B. Find out smallest number from given array stored at 5 consecutive memory locations starting from C030H and store the result to memory location C040h.

Supplementary Resources:

1. https://www.javatpoint.com/computer-organization-and-architecture-tutorial
2. https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/
3. https://nptel.ac.in/courses/106/103/106103068/
4. https://tutorialspoint.dev/computer-science/computer-organization-and-architecture
5. https://www.studytonight.com/computer-architecture/

Subject Code: 01CT0302

Subject Name: Signals and Systems

B. Tech. Year – II (Semester III)

Objective:

1. To understand classification of signals and systems
2. To learn applications of mathematical tools like Laplace Transform, Fourier Transform and Z-Transform in analysis of signals and systems
3. To understand the importance of different domain representation of signals and systems

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand about various types of signals, classify them, analyze them, and perform various operations on them.
2. Understand about various types of systems, classify them, analyze them and understand their response behaviour.
3. Appreciate use of transforms in analysis of signals and system.
4. Carry simulation on signals and systems for observing effects of applying various properties and operations.
5. Create strong foundation of signal processing to be studied in the subsequent semester

Pre-requisite of course:

Basic knowledge of differentiation, integration, differential equations and difference equations

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	02	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Continuous time and discrete time signals and systems** Signal Definition and Examples, Classification of Signals, Signal Operations, Elementary Signals, Sampling of continuous time signals, Sampling theorem, Reconstruction of a signal from its samples, Aliasing , Concept of quantization and quantization error, Concept of Analog to Digital Conversion and Digital to Analog conversion, System Definition, Classification, Examples, Signal processing concept.	09
2	**Analysis of Continuous Time Signals and Systems** Time domain representation and convolution integral of continuous time LTI systems, Unit impulse response, Properties of continuous time LTI systems, Stability and causality, Linear constant co-efficient of differential equation, Review of Laplace Transform.	08
3	**Analysis of discrete time signals and systems** Time domain representation and convolution sum of discrete time LTI systems, Unit impulse (sample) response, Computation of convolution sum and unit impulse response, Interconnections and Properties of discrete time LTI systems, Linear constant co-efficient difference equation representation, Homogeneous and particular solution, Z-transform, region of convergence (ROC), properties of ROC, Properties of z-transform, Poles and Zeros, Inverse z-transform -Power Series expansion and Partial fraction expansion, Solution of difference equation using Z-transform, Convolution and LTI system analysis using Z-transform.	14
4	**Frequency domain analysis** Determination of Fourier series representation of continuous time periodic signals – Trigonometric and Complex Exponential Fourier series representation. Important properties of Fourier series. Continuous time Fourier transform with examples, Properties of the continuous time Fourier transform, Parseval's relation, Convolution in time and frequency domains. Application to analysis of continuous time LTI systems, Relationship between Laplace and continuous time Fourier transform, Fourier series representation of discrete time periodic signals and important properties, Discrete Time Fourier Transform, Properties of Discrete Time Fourier Transform, Discrete time system analysis using Discrete Time Fourier Transform, Frequency response of discrete time systems, Effect of periodicity and discretization on spectra.	11
	Total Hours	42

Suggested Text books / Reference books:

1. AlanV.Oppenheim, Alan S.Willsky with S.HamidNawab, Signals & Systems, Pearson Education.
2. John G.Proakis and DimitrisG.Manolakis, Digital Signal Processing, Principles, Algorithms and Applications, PHI.
3. Signal and Systems By Anand Kumar, 3rd Edition, PHI
4. M.J.Roberts, Signals and Systems Analysis using Transform method and MATLAB, TMH.
5. B. P. Lathi, "Signal Processing and Linear System", Berkeley Cambridge Press.
6. Matthew N. O. Sadiku, Warsame Hassan Ali, "Signals and Systems: A Primer with MATLAB", CRC Press.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	35%	15%	5%	5%

Suggested List of Experiments:

Minimum experiments to be performed during the semester

1. Introduction to MATLAB and Generation of Elementary signals .
2. Generation of discrete time signals and plot them in MATLAB.
3. Observing the effects of sampling rate conversion (lower sampling rate and higher sampling rate) on signal .
4. Discretization using different sampling rate and observing aliasing effect.
5. Performing various operations on the signal using computational software.
6. Write a program to analyze discrete time LTI System.
7. Find Poles, Zeros and gain from a given transfer function and plot it in Z-domain using software tool.
8. Find the Fourier series representation of a periodic signal and observe Gibbs phenomenon .
9. Observe frequency domain analysis of discrete time signal using software tool.
10. Check linearity of continuous time LTI system.
11. Check Time variance/Time invariance property of LTI system.
12. Obtain impulse response of system by Simulink.
13. Design of sample and hold circuits.
14. Design of anti-aliasing filter.
15. Write a MATLAB code to compress/expand image.
16. Design of FIR filter

Supplementary Resources:

1. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011
2. https://www.tutorialspoint.com/signals_and_systems/index.htm
3. https://nptel.ac.in/courses/117/101/117101055

Subject Code: 01CR0302

Subject Name: Professional Ethics

B. Tech. Year – II (Semester III)

Objective:
This course will enable the budding engineers and managers to effectively resolve the ethical issues they will face in their professional lives.

Credits Earned: 01 Credit

Course Outcomes: After completion of this course, student will be able to:

1. Express the basics of human values.
2. Articulate human values and grow as responsible human beings in the society
3. Develop ethical conduct and deliver their professional duties.
4. Analyze ethical confusions and contradictions to bring harmony at thought, behaviour and action level

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
01	00	00	01	00	00	00	50	50	100

Contents:

Unit	Topics	Hours
1	**Over view and basic concepts** The concept of terminology of morals and morality, ethics, values, spirituality and stakeholder will enable students to have clarity about the concepts which are important for individuals and organizations.	02
2	**Profession and Professionalism** Introduction to Profession and Professionalism will cultivate the ability to relate to ethical concepts and ethical problems in specific professions and professionalism	02
3	**Ethical Theories** Understand variety of Moral Issues and Examples of Moral Dilemmas and Resolving Moral Dilemmas Conflict to enable the students to differentiate between right and wrong.	02
4	**Responsibilities and rights of professional.** Professional Rights & Responsibilities will impart clarity on Loyalty, Confidentiality, Respect for Authority, Accountability and its importance. Issues related to Pride of Profession, Pride of Employer, Gifts and Bribes, Whistle-blowing, Discrimination, Vishakha Guidelines and Sexual Harassment of Women at Workplace (Prevention, Prohibition And Redressal) Act 2013	03
5	**Ethics in Engineering Profession** Ethics in Engineering Profession will bring clarity about the Roles of Engineers such as Engineers as Managers and Other Roles Played by Engineers.	01
6	**Ethical Codes** Need for Ethical Codes will enable students to understand the prominence of ethical codes and become benchmarks against which individual and organizational performance can be measured. Codes from Other Profession-Advertising Standards Council of India, Corporate Codes-Tata Group of Companies will give them the profound knowledge of ethical codes.	01
7	**GLOBAL ISSUES** Intellectual Property Rights will bring out the broader ethical issues surrounding intellectual property rights. Roles of Media, Positive Aspects of Media, Negative Aspects of Media, Accountability of Media, Regulation of Media Factors in Media Ethics, Advertising Ethics, Corporate Social Responsibility- Concept ISO and CSR, Scenario CSR Rules in India Manufacturing and Marketing of Computers Software, Cybercrimes, Data Stealing, Embezzlement, Hacking.	03
	Total Hours	14

Suggested Text books / Reference books:

1. Professional Ethics by- R. Subramanian
2. Engineering Ethics &Human Values by: M.Govindarajan , S. Natarajan &V.S.Senthilkumar PHI Learning Pvt. Ltd.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	35%	10%	10%	5%

Supplementary Resources:

1. https://ethics.iit.edu/teaching/professional-ethics
2. https://harappa.education/harappa-diaries/professional-ethics-and-professionalism
3. https://www.physio-pedia.com/Professional_Ethics_Course
4. https://onlinecourses.swayam2.ac.in/ntr19_ge06/preview
5. https://www.udemy.com/course/value-education-and-professional-ethics/
6. https://www.coursera.org/learn/ethics-technology-engineering

Subject Code: 01CT0303

Subject Name: Introduction to Communication Engineering

B. Tech. Year – II (Semester III)

Objective:
This course explores the fundamentals of electronic communication systems it provides the basic knowledge of Analog and Digital transmission, multiplexing, Transmission medium and reception. It also provides a brief overview of satellite and fiber optics communication.

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand various concepts of Signals, data communication, networking, switching techniques, transmission media and communication systems
2. Compare various analog to analog, analog to digital, digital to analog and digital to digital modulation techniques
3. Analyze various concepts and methods for enhancement of channel capacity
4. Analyze performance parameters of radio receiver
5. Understand concepts of optical and satellite communication system

Pre-requisite of course:
Basic electronics, Digital Electronics, and Basic Mathematics

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	02	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to Electronic Communication** Significance of Human Communication, Communication systems, Types of electronic Communication, Modulation and Multiplexing, The electromagnetic Spectrum, A survey of Communication Applications.	04
2	**Introduction to Data Communication** Data Communication, Networks, The internet, Protocols and Standards.	02
3	**Data and Signals** Analog and Digital, Periodic analog signals, Digital Signals, Transmission Impairment, Data rate limits, Performance.	04
4	**Digital and Analog Transmission** Digital to Digital conversion, Analog to Digital conversion, Transmission modes, Digital to Analog conversion, Analog to Analog conversion.	04
5	**Multiplexing and Spreading** Frequency division multiplexing, Wavelength division multiplexing, Time division multiplexing Spread Spectrum.	04
6	**Radio Receiver** Tuned circuit, Filters, Classification of Noise, Functions of radio receivers, Types of Receiver, working of super heterodyne radio receivers, tuning ranges, tracking, sensitivity and gain, image rejection, spurious responses, Adjacent channel selectivity, Automatic gain control, Automatic Frequency control.	07
7	**Transmission Media** Guided media- Twisted Pair Cable, Co-axial cable, Fiber optic cable, Unguided media- Radio waves, Microwaves, Infrared	03
8	**Switching Network** Circuit switched network, Datagram networks, Virtual circuit networks.	03
9	**Introduction to telecommunication system** Telephone network, Dial-up modems, Digital subscriber line, Cable TV networks.	03
10	**Introduction to satellite communication system** Satellite orbits, Three categories of satellite, Satellite communication systems, Satellite application, Global Positioning System (GPS).	05
11	**Introduction to Optical Communication** Optical Principles, Optical Communication systems, Advantages and application of optical fiber.	03
	Total Hours	42

Suggested Text books / Reference books:

1. Principles of Electronic Communication Systems by Louis E. Frenzel (3rd Edition), Tata-McGraw Hill.
2. Data Communication and Networking by Behrouz A Forouzan (4th Edition), Tata-McGraw Hill.
3. Introduction to Data and Network Communications by Michael A. Miller, Cengage Learning.
4. Satellite Communication, by Dennis Roddy, TataMcGraw Hill.
5. Optical Fiber Communication by John M. Senior (PHI/Pearson)

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
15%	30%	25%	20%	5%	5%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. To obtain Frequency response of Series tuned circuit.
2. To obtain Frequency response of Parallel tuned circuit.
3. To obtain Frequency response of High pass filter.
4. To obtain Frequency response of Low pass filter.
5. To obtain Frequency response of Band passes filter.
6. To obtain Frequency response of Band stop filter.
7. To perform voice and Data communication using satellite communication.
8. To setting up analog and digital link using fiber optic trainer.
9. To perform AM reception using superheterodyne receiver.
10. To build and test FM receiver.
11. Fourier analysis of Sinusoidal, Square and Triangular wave.
12. To perform various line codes for a given digital bit stream.
13. To observe the structure of various wired medium and give comparative analysis for the same.
14. To perform TDM of analog signals.

Supplementary Resources:

1. www.mhhe.com/frenzel/ecs3e
2. https://nptel.ac.in/courses/117/102/117102059/
3. https://www.tutorialspoint.com/principles_of_communication/principles_of_communication_introduction.htm

Subject Code: 01CT0307

Subject Name: Data Structure and Algorithm

B. Tech. Year – II (Semester III)

Objective:

6. To teach efficient storage mechanisms of data for an easy access.
7. To design and implementation of various basic and advanced data structures.
8. To introduce various techniques for representation of the data in the real world.
9. To develop application using data structures.
10. To teach the concept of protection and management of data.
11. To improve the logical ability

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

10. Differentiate linear and non-linear data structures like stacks, queues, linked list etc
11. Choose appropriate data structure as applied to specified problem definition.
12. Demonstrate operations like searching, insertion, deletion, traversing mechanism etc. on various data structures through programming
13. Select appropriate sorting and searching algorithm based on problem definition in order to get optimum solution
14. Compare and contrast the benefits of dynamic and static data structures implementations

Pre-requisite of course:

Basic knowledge of C language

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to data structure** Types of Data Structure, Arrays, Strings, Recursion, ADT (Abstract Data type), Concept of Files, Operations with files, types of files	05
2	**Linked List** Linked List as an ADT, Linked List Vs. Arrays, and Memory Allocation & De-allocation for a Linked List, Linked List operations, Types of Linked List, Implementation of Linked List, Application of Linked List polynomial, sparse matrix	10
3	**Stack** The Stack as an ADT, Stack operation, Array Representation of Stack, Link Representation of Stack, Application of stack – Recursion, Polish Notation	08
4	**Queues** The Queue as an ADT, Queue operation, Array Representation of Queue, Linked Representation of Queue, Circular Queue, Priority Queue, & Dequeue, Application of Queues – Johnsons Algorithm, Simulation	08
5	**Trees** Basic trees concept, Binary tree representation, Binary tree operation, Binary tree traversal, Binary search tree implementation, Thread Binary tree, The Huffman Algorithm, Expression tree, Introduction to Multiway search tree and its creation (AVL, B-tree, B+ tree)	09
6	**Graphs** Basic concepts, Graph Representation, Graph traversal (DFS & BFS)	04
7	**Sorting** Sort Concept, Shell Sort, Radix sort, Insertion Sort, Quick Sort, Merge sort, Heap Sort,	06
8	**Searching** List Search, Linear Index Search, Index Sequential Search Hashed List Search, Hashing Methods, Collision Resolution (One way and Two way); AVL tree balancing; B-tree; Application of trees.	06
	Total Hours	56

Suggested Text books / Reference books:

15. Data Structures A Pseudocode Approach with C, Richard F. Gilberg & Behrouz A. Forouzan, second edition, CENGAGE Learning.
16. Data Structures using C, Reema Thareja, Oxford University press.
17. Introduction to Data Structure and its Applications Jean-Paul Tremblay, P. G. Sorenson
18. Data Structures Using C & C++, Rajesh K. Shukla, Wiley- India.
19. Data Structures Using C, ISRD Group, Second Edition, Tata McGraw-Hill

20. Data Structure Using C, Balagurusamy
21. C & Data Structures, Prof. P.S. Deshpande, Prof. O.G. Kakde, Dreamtech press.
22. Data Structures, Adapted by: GAV PAI, Schaum's Outlines

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
15%	20%	25%	15%	15%	10%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

12. Implementations of Linked Lists menu driven program.
13. Implementation of different operations on linked list – copy, concatenate, split, reverse, count no. of nodes etc.
14. Representation of Sparse matrix using multilinked structure. Implementation of sparse matrix multiplication.
15. Implementation of polynomials operations (addition, subtraction) using Linked List.
16. Implementations of Linked Lists menu driven program (stack and queue)
17. Implementations of Double ended queue using Linked Lists.
18. Implementation of Priority queue program using Linked Lis
19. Implementations of stack menu driven program
20. Implementation of multitask in one array.
21. Implementations of Infix to Postfix Transformation and its evaluation program.
22. Implementations of Infix to Prefix Transformation and its evaluation program.
23. Simulation of recursion
24. Implementations of circular queue menu driven program
25. Implementations of double ended queue menu driven program
26. Implementations of queue menu driven program
27. Implementation of Priority queue program using array.
28. Implementation of Johnsons Algorithm
29. Implementation of Simulation Problem
30. Implementations of Binary Tree menu driven program
31. Implementation of Binary Tree Traversal program.
32. Implementation of construction of expression tree using postfix expression.
33. Implementations of Huffman code construction
34. Implementations of BST program
35. Implementation of various operations on tree like – copying tree, mirroring a tree,

36. counting the number of nodes in the tree, counting only leaf nodes in the tree.
37. Implementations of B-tree menu driven program
38. Implementations of B+ tree program
39. Implementation of Preorder traversal of a threaded binary tree.
40. Implementations of AVL Tree menu driven program
41. Implementations of Shell sort, Radix sort and Insertion sort menu driven program
42. Implementations of Quick Sort, Merge sort and Heap Sort menu driven program
43. Implementations of searching methods (Index Sequential, Interpolation Search) menu driven program
44. Implementation of hashing functions with different collision resolution techniques
45. Implementations of Graph menu driven program (DFS & BSF)

Supplementary Resources:

3. http://www.nptelvideos.in/2012/11/programming-and-data-structure.html
4. http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html
5. http://www.geeksforgeeks.org/data-structures/
6. https://www.hackerrank.com/domains/data-structures/arrays

Subject Code: 01CT0306

Subject Name: Design Engineering

B. Tech. Year – II (Semester III)

Objective:
The main objective of this course is to introduce students with design thinking and immerse them towards innovation in systematic approach to find solutions to real time engineering problems available in our society/industry. This will evolve the thought process amongst the students, inculcate interdisciplinary skills and develop background for their project work in upcoming semesters.

Credits Earned: 01 Credit

Course Outcomes: After completion of this course, student will be able to:

1. Understand the broad scope of Design engineering
2. Apply concepts and methods of design engineering to identify real world problems.
3. Apply creativity to explore various solution of real-world problem.
4. Demonstrate communication skill, presentation skill and information handling ability through various structured activities of design engineering

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
00	00	02	01	00	00	00	25	25	50

Contents:

Unit	Topics	Hours
1	Introduction to design thinking, Importance and relevance of design thinking in engineering, Essential features of design, Design thinking process, Tools for design thinking, Design thinking in practice-case studies from present design innovation practices	04
2	Team formation, Domain selection, Log book and documentation strategy, SCAMPER, Reverse engineering in detail-dissemble existing products/components/processes or system to learn technical aspects and design details	04
3	Observation: through AEIOU frame work (what/how and where to observe, observations from field visit if required, learn ethnographic tools, Solution's impact analysis, clearly understand user context), Immerse via role playing, Formal and informal interviews, Log book exercises, Preparation of mind map and empathy map	06
4	Define problem statement: Prior art search/secondary search, verification by stake holders, Ideation: Preparation of ideation canvas, brainstorming, context, objects, opportunity mapping, sketching mock concepts in log book, prioritizing and finalizing Idea	06
5	Preparation of product development canvas: Product experience, features, functions, components, user reevaluation, refinement	04
6	Preparation of learning matrix, Preparation of prototype, Final report	04
	Total Hours	28

Suggested Text books / Reference books:

1. H. S. Fogler and S. E. LeBlanc, Strategies for Creative Problem Solving, 2nd edition, Pearson, Upper Saddle River, NJ, 2008.
2. A. Whimbey and J. Lochhead, Problem Solving & Comprehension, 6th edition, Lawrence Erlbaum, Mahwah, NJ, 1999.
3. M. Levine, Effective Problem Solving, 2nd edition, Prentice Hall, Upper Saddle River, NJ,1994
4. V. Kumar, 101 Design Methods, Wiley
5. J. Liedtka, T. Ogilvie, Designing for Growth, Columbia University Press

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	10%	20%	30%	20%	10%

Supplementary Resources:

1. https://www.coursera.org/learn/uva-darden-design-thinking-innovation
2. https://www.coursera.org/learn/innovation-through-design
3. https://www.coursera.org/learn/design-thinking-innovation
4. http://www.cs.odu.edu/~cs381/cs381content/problem_solving/problem_solving.html
5. https://ryanstutorials.net/problem-solving-skills/
6. https://www.ideo.com/

Marwadi University

Faculty of Technology

B. Tech. in Information and Communication Technology

Semester IV

Subject Code: 01CT0401

Subject Name: Probability and Statistics

B. Tech. Year – II (Semester IV)

Objective:
To provide a foundation in probability theory and statistical method in order to solve applied problems and to prepare for more advanced courses in probability and statistics.

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand the needs of probability and distribution
2. Apply the mathematical treatment for random variable and joint probability distribution
3. Draw various graphs for the descriptive statistical analysis for the given data set and develop basic inference sense from it.
4. Apply appropriate probability distribution model, central limit for the given test cases.
5. Perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases also Learn non-parametric test such as the Chi-Square test for Independence as well as Goodness of Fit.
6. Perform Statistical analysis study like descriptive statistics, correlation and regression using professional software.

Pre-requisite of course:
Differential and Integral Calculus and Basic Integration

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	02	00	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to Probability** Classical and axiomatic definitions of probability, sample space, probability of an event, addition rule and conditional probability, multiplication rule, total probability, Bayes' theorem and independence.	06
2	**Random variable** Introduction to the concept, Discrete and continuous random variable: definitions and examples, Probability density function and cumulative distribution functions of continuous random variables, Probability mass function of discrete random variables, expected values and variance of discrete random variable.	08
3	**Probability distribution** Moments, probability and moment generating functions, Some special probability distributions: Uniform, Exponential, Poisson, geometric, Binomial and Normal distribution.	06
4	**Two – dimensional random variable** Joint distributions – Marginal and Conditional distributions, Covariance, regression, correlation, Independence of random variables.	06
5	**Transformation** Transformation of random variables of two dimensions, Central limit theorem (for independent and identically distributed random variables), convergence in probability. Introduction to statistics, Measure of central tendency (mean, median, mode) and measures of dispersion (standard deviation, mean deviation, range, variance etc.)	04
6	**Estimation** Consistency, Unbiasedness, the method of moments and the method of maximum likelihood estimation, confidence intervals for proportions, confidence intervals for parameters in one sample and two sample problems of normal populations.	06
7	**Testing of Hypotheses** Null and alternative hypotheses, the critical and acceptance regions, two types of error, power of the test, tests for one sample and two sample problems for normal populations, tests for proportions the most powerful test and Neyman- Pearson Fundamental Lemma, Chi square goodness of fit test and its applications.	06
	Total Hours	42

Suggested Text books / Reference books:

1. Introduction to Probability and Statistics for Engineers and Scientists, S. M. Ross, Academic Press, 2009.
2. Introduction to Probability and Statistics, J.S. Milton & J. C. Arnold, Cengage Learning, 2008
3. A First Course in Probability, S.M. Ross, Prentice Hall, 2001.
4. Introduction to Probability Theory and Statistical Inference, H.J. Larson, Wiley, 1982.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	30%	15%	10%	5%

Suggested List of Tutorial:

1. Plot different graph using excel.
2. Plot different graph using R and Python.
3. Write a program to generate random numbers for given range and find mean, median and mode using R/Python.
4. Calculation of deviation, variance, correlation coefficient and code for it.
5. Calculation on basics of probability concepts.
6. Examples on moment, Probability distributions.
7. Calculation of Binomial, Poisson, and Hyper Geometric.
8. Calculation of Gaussian, Standard, Normal distribution, Confidence interval and P test.
9. Simulation for continuous and discrete distributions.
10. Calculation on central limit theorem (with simulation).
11. Calculation on hypothesis problems (with simulation).
12. Calculation on chi square goodness fit test.

Supplementary Resources:

1. https://www.mathsisfun.com/data/
2. https://nptel.ac.in/courses/111/105/111105041/
3. https://www.coursera.org/browse/data-science/probability-and-statistics
4. https://ocw.mit.edu/courses/mathematics/18-05-introduction-to-probability-and-statistics-spring-2014/

Subject Code: 01CT0402

Subject Name: Problem Solving Using Python

B. Tech. Year – II (Semester IV)

Objective:
Obtaining efficient algorithms is very important in modern computer engineering as the world wants applications to be time and space and energy efficient. This course enables to understand and analyze efficient algorithms for various applications.

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Compare various algorithm design techniques for developing algorithms by evaluating the asymptotic complexities and time-space trade-off.
2. Develop different algorithms using various methods like dynamic and Greedy methods.
3. Select appropriate pattern matching algorithm to develop model for substring, subsequence, DNA matching, etc.
4. Evaluate various graph algorithms for sparse and dense network structures
5. Distinguish between Polynomial, Non-Polynomial complete and Hard problems

Pre-requisite of course:
Data Structure and proficiency in programming language, knowledge of Mathematical functions like logarithms, graphs etc

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	02	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to Design and Analysis of Algorithms** What is an algorithm, Mathematics for Algorithmic Sets, Functions and Relations, Vectors and Matrices, Linear Inequalities and Linear Equations.	02
2	**Analysis of Algorithm and Review of Basic Python** Review of basic python, data types, Control flow and Statements. The efficient algorithm, Average, Best and worst case analysis, Amortized analysis , Asymptotic Notations(Big Oh, Big Theta, Big Omega), Master Method, Sorting Algorithms and analysis: Bubble sort, Selection sort, Insertion sort, Shell sort, Heap sort, Sorting in linear time : Bucket sort, Radix sort and Counting sort	06
3	**Divide and Conquer** Introduction, Recurrence and different methods to solve recurrence, Multiplying large Integers Problem, Problem Solving using divide and conquer algorithm - Binary Search, Max-Min problem, Sorting (Merge Sort, Quick Sort), Matrix Multiplication, Exponential.	06
4	**Dynamic Programming** Introduction, Elements of Dynamic Programming, The Principle of Optimality, Problem Solving using Dynamic Programming – Calculating the Binomial Coefficient, Making Change Problem, Assembly Line-Scheduling, Knapsack problem, Matrix chain multiplication, Longest Common Subsequence.	06
5	**Greedy Algorithm** General Characteristics of greedy algorithms, Elements of greedy strategy, Problem solving using - Activity selection problem, Fractional Knapsack Problem, Job Scheduling Problem.	04
6	**Graph Algorithms** Representation of Undirected & Directed Graph, Traversing Graphs, Depth First Search, Breath First Search, Topological sort, Strongly Connected components. Single pair shortest path and Minimum Spanning trees (Kruskal's algorithm, Prim's algorithm) using greedy approach, All Points Shortest path using Dynamic Programming,	06
7	**Backtracking and Branch and Bound** Introduction, The Eight queens problem, Knapsack problem, Travelling Salesman problem, Minimax principle.	04
8	**String Matching** Introduction, The naive string matching algorithm, The Rabin-Karp algorithm, String Matching with finite automata, The Knuth-Morris-Pratt algorithm.	04
9	**Introduction to NP-Completeness** The class P and NP, Polynomial reduction, 2-CNF Satisfiability, 3- CNF Satisfiability, NP- Completeness Problem, NP-Hard Problems. Travelling Salesman problem, Hamiltonian problem.	04
	Total Hours	42

Suggested Text books / Reference books:

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, PHI.
2. Learning Python: Powerful Object-Oriented Programming, Mark Lutz, O'Reilly Media
3. Fundamental of Algorithms by Gills Brassard, Paul Bratley, PHI.
4. Introduction to Design and Analysis of Algorithms, Anany Levitin, Pearson.
5. Foundations of Algorithms, Shailesh R Sathe, Penram
6. Programming in Python 3: A Complete Introduction to the Python Language, Mark Summerfield, Addison Wesley
7. Design and Analysis of Algorithms, Dave and Dave, Pearson.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	10%	40%	20%	10%	10%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Introduction to Python programming, Creating Hello world Program using Python and understanding various steps for compiling and Running python codes.
2. Implementation and Time analysis of sorting algorithms
3. Bubble sort, Selection sort, Insertion sort, Merge sort and Quicksort
4. Implementation and Time analysis of linear and binary search algorithm.
5. Implementation of max-heap sort algorithm
6. Implementation and Time analysis of factorial program using iterative and recursive method
7. Implementation of a knapsack problem using dynamic programming.
8. Implementation of chain matrix multiplication using dynamic programming.
9. Implementation of making a change problem using dynamic programming
10. Implementation of a knapsack problem using greedy algorithm
11. Implementation of Graph and Searching (DFS and BFS).
12. Implement prim's algorithm.
13. Implement Kruskal's algorithm.
14. Implement LCS problem.
15. To implement following string matching algorithms and analyze time complexities:

    a. Naïve
    b. Rabin Karp
    c. Knuth Morris Pratt
16. Write a program for Floyd-Warshal algorithm.
17. Write a program for travelling salesman problem.
18. Write a program for Hamiltonian cycle problem.
19. To implement Huffman coding and analyze its time complexity.
20. Write a program for Strassen's Matrix Multiplication.

Supplementary Resources:

1. http://interactivepython.org/runestone/static/pythonds/index.html
2. http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html
3. http://nptel.ac.in/courses/106101060/
4. http://www.comp.nus.edu.sg/~cs5234/Links/Course-Links.htm
5. https://www.coursera.org/learn/algorithm-design-analysis
6. http://www.codeskulptor.org/docs.htmlhttp://www.geeksforgeeks.org
7. http://www.algolist.net
8. http://www.cprogramming.com
9. http://www.codingunit.com

Subject Code: 01CT0403

Subject Name: Microcontroller and Interfacing

B. Tech. Year – II (Semester IV)

Objective:
This course introduces the architecture, assembly language and C language programming of ATmega32 AVR family microcontroller. It gives a hands-on training of interfacing external sensors and actuators with microcontroller. The course objective is to introduce the basic concepts of small and medium scale embedded system design using microcontroller and to develop assembly and C language programming skills for real time applications of Microcontroller.

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Acquire basic knowledge of microcontroller and utilize real time software and hardware for embedded systems using AVR Atmega-32 microcontroller.
2. Understand architecture of Atmega-32, its pin configuration, data-types, instruction set, addressing modes and advance communication protocols like SPI, I2C etc.
3. Develop assembly and C language programs for ADC, EEPROM, PWM and Timer by applying various instructions like data transfer, ALU, Branch, subroutine etc.
4. Analyse I/O peripherals like LCD, Keyboard, Relay, Sensor, Motor etc. by interfacing it with AVR microcontroller.
5. Evaluate minor microcontroller-based projects that solves real world problems.

Pre-requisite of course:
Basics of Digital Logic Design, Microprocessor architecture and basics of C programming

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	02	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to microcontroller** Microprocessor and Microcontroller difference, RISC and CISC programmer's model, Criterial for selecting microcontroller	04
2	**Introduction to AVR microcontroller** Overview of AVR family, AVR Microcontroller architecture, status register, Special function registers, RAM, ROM & EEPROM space, On-Chip peripherals, ATmega32 pin configuration & function of each pin, Fuse bits of AVR.	07
3	**AVR assembly language programming** AVR data types and assembler directives, addressing modes of AVR, Data transfer, Arithmetic, Logic and Compare, Rotate and Shift, Branch and Call instructions, AVR studio setup for assembly language programming, AVR I/O Port Programming, Time delay loop, Look-up table, Bit addressability, MACROs, Intel HEX file.	08
4	**AVR programming in C** AVR Data types, AVR I/O port programming, Timer programming, Input capture and Wave Generator, PWM programming External Interrupt programming, ADC programming, EEPROM programming.	08
5	**Serial communication protocols** UART protocol, I2C protocol, SPI protocol, Serial Port programming using polling and interrupt, I2C Programming, SPI Programming	07
6	**Peripheral interfacing** LCD and Keyboard Interfacing, Relay interfacing, Stepper and DC Motor control, DS1307 RTC Interfacing, LM35 Temperature sensor interfacing, MAX7219 display controller interfacing,	08
	Total Hours	42

Suggested Text books / Reference books:

1. The AVR Microcontroller and Embedded Systems Using Assembly and C, By Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi, Pearson Education.
2. Programming and Customizing the AVR Microcontroller, By Dhananjay Gadre, McGraw Hill Education
3. AVR ATmega32 data sheet

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
25%	20%	30%	5%	5%	15%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Installation of AVR STUDIO and familiarization of ATMega32 AVR Development Board.
2. Hands-on experimentation of ATMega32 GPIO programming in Assembly and C.
3. Hands-on experimentation of ATMega32 Timer to generate accurate delay using polling in Assembly and C.
4. Hands-on experimentation of ATMega32 Timer to generate accurate delay using Interrupt in Assembly and C.
5. Hands-on experimentation of ATMega32 Timer to generate waveforms in Assembly and C
6. Hands-on experimentation of Seven Segment Display interfacing with ATMega32 in Assembly and C.
7. Hands-on experimentation of 16x2 LCD interfacing with ATMega32 in Assembly and C.
8. Hands-on experimentation of ATMega32 UART programming in Assembly and C.
9. Hands-on experimentation of 4x4 matrix keyboard interfacing with ATMega32 in Assembly and C
10. Hands-on experimentation of ATMega32 on-chip ADC for interfacing analog sensors in C.
11. Hands-on experimentation of DC motor interfacing and speed/direction control with ATMega32 in C.
12. Hands-on experimentation of Stepper motor interfacing with ATMega32 in C.
13. Hands-on experimentation of DS1307 RTC Interfacing with ATMega32 in C using I2C protocol.
14. Hands-on experimentation of MAX7219 LED matrix driver Interfacing with ATMega32 in C using SPI protocol.
15. Design Frequency Counter which displays frequency of unknown pulse on 16x2 LCD using ATMega32 on-chip Timer.
16. Design Pulse period meter which displays ON-time of unknown pulse on 16x2 LCD using ATMega32 on-chip Timer

17. Design Bluetooth controlled 2-ch variable frequency square wave generator using ATMega32 UART and on-chip Timer.
18. Design 4 Channel Data Logger which measures Voltage between 0-5V on 4 ADC Channels of ATMega32 and transmit it to Host PC at every 1 second where it stored in excel sheet with timestamp for future analysis.

Supplementary Resources:

1. http://nptel.ac.in/courses/106108100/7
2. http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/microcontrollers/micro/ui/TOC.htm
3. https://swayam.gov.in/course/4446-microprocessors-and-microcontrollers
4. https://www.coursera.org/courses?languages=en&query=microcontroller
5. http://www.study-hub.com/avr-microcontroller-programming.html

Subject Code: 01CT0404

Subject Name: Analog and Digital Communication

B. Tech. Year – II (Semester IV)

Objective:
This course explores the fundamentals of electronic communication systems it provides the knowledge of various analog and digital modulation and demodulation techniques used in communication system. Comparison of various techniques will enable the student to select most appropriate technique for the application

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. To understand basics of analog and digital communication techniques.
2. To learn working of AM-FM Transmitters and receivers.
3. To facilitate the understanding of the baseband and carrier modulation.
4. To understand the effect and performance of communication systems in presence of noise.
5. Analyze Communication System based on different Modulation & Demodulation Techniques and analyze performance.

Pre-requisite of course:
Basic electronics, Digital Electronics, Basic Mathematics and Introduction to communication engineering

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	02	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Linear Modulation: Amplitude modulation** Concept of amplitude modulation, Double Sideband suppressed carrier modulation, Single side band suppressed carrier modulation, Generation of AM- Chopper circuit, Balanced modulator, Modulation by multitone modulating signal. Independent Side band, Theme example- VSB transmission of Analog and Digital Television.	07
2	**Angle modulation** Concept of instantaneous frequency and phase modulation, sinusoidal FM and its time domain representation, spectral components of angle modulated signals, power in sinusoidal FM and modulation index, Carson's rule, Multitone wideband FM, Generation of Wideband FM from Narrow band FM , Generation of WBFM by Armstrong method.	05
3	**Noise in communication systems** Classification of noise, Signal to noise ratio (SNR), Noise factor and noise figure, Equivalent input noise generators, Noise temperature, Narrow band noise, PSD of in-phase and quadrature noise, Noise performance in AM, FM, Digital baseband and carrier communication systems, Concept of optimum threshold detection, matched filter, correlation receiver, optimum binary receiver, bit error rate (BER).	04
4	**Base Band Modulation** Base band system, sampling theorem, Sampling and signal reconstruction, Aliasing, Types of sampling, Quantization, PCM, Companding, DPCM, ADPCM, Delta modulation, Adaptive delta modulation. Theme Example- Digitization of video and MPEG.	09
5	**Digital Modulation Techniques** Modulation techniques for ASK, QASK, FSK, M-ary FSK, BPSK, DPSK, QPSK, M-ary PSK, QAM. Comparison of Noise performance of various PSK and FSK systems. Theme Example- Orthogonal Frequency Division Multiplexing (OFDM).	09
6	**Linear Modulation: Amplitude modulation** Concept of amplitude modulation, Double Sideband suppressed carrier modulation, Single side band suppressed carrier modulation, Generation of AM- Chopper circuit, Balanced modulator, Modulation by multitone modulating signal. Independent Side band, Theme example- VSB transmission of Analog and Digital Television.	08
	Total Hours	42

Suggested Text books / Reference books:

1. Electronic Communications by Kennedy McGraw Hill Publication.
2. Electronic Communications by Dennis Roddy & John Coolen IV Edition PHI.

3. Communication Systems: Analog and Digital by R. P. Singh and B. D. Sapre, Tata-McGraw Hill
4. Modern Digital and Analog Communication Systems, B. P. Lathi, (3rd Edition), Oxford Publication
5. Principles of Communication Systems, Taub & Schilling, (2nd Edition), Tata McGraw Hill Publication.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	25%	25%	20%	10%	10%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. To observe amplitude modulation waveforms for different modulation index.
2. To observe frequency modulation waveform and to measure peak frequency deviation.
3. To observe frequency spectrum of AM and FM waveforms.
4. To understand block diagram of AM receiver and observe signals at different stages.
5. To understand block diagram of FM receiver and observe signals at different stages.
6. To Study and Perform sampling theorem and reconstruction.
7. To perform TDM-PCM Transmission and Reception.
8. Experiment on Companding techniques
9. To study Delta Modulation.
10. To transmit and receive digital signal using Amplitude shift keying.
11. To transmit and receive digital signal using Frequency Shift Keying.
12. 12 To transmit and receive digital signal using Phase Shift Keying (BPSK and QPSK)
13. Simulation of various analog and digital modulation and demodulation techniques
14. Simulation of effect of noise in communication systems

Supplementary Resources:

1. https://www.tutorialspoint.com/digital_communication/digital_communication_analog_to_digital.html
2. https://www.classcentral.com/course/swayam-analog-communication-13893
3. https://www.udemy.com/course/analog-communication/

Subject Code: 01CT0405

Subject Name: Engineering Electrodynamics

B. Tech. Year – II (Semester IV)

Objective:

1. Understand basics of electromagnetic theories.
2. Understand the antenna parameters and its various applications.
3. Understand the basic of microwave engineering theories for wave propagation.
4. Apply the electromagnetic theory for antenna design.
5. Understand the advance optical antenna concepts and its applications.
6. Design various types of antenna for different communication application

Credits Earned: 03 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Build up a basic understanding in several applied electromagnetic topic and to gain knowledge in cutting-edge research areas in electrodynamics.
2. Build up a basic understanding in electromagnetics and antenna theories.
3. Create basic antenna structures for various applications
4. Understand the advance optical antenna concepts and its application.

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	00	04	50	30	20	00	00	100

Contents:

Unit	Topics	Hours
1	**Fundamental of electrodynamics** Maxwell's equations, boundary conditions, vector and scalar potentials, reciprocity theorem, Huygens' principle, polarization, snell's law, Brewster angle, total internal reflection, constitutive equations, Drude dispersion model, group/phase velocity	14
2	**Antenna theory and design** Antenna parameters, directivity, gain, input impedance, wire antennas, monopoles dipoles helices, aperture theory, horns and reflector antennas, phased arrays, Friis transmission formula, receiving properties of antenna.	09
3	**Microwave engineering** Parallel plate / rectangular waveguides, attenuation of modes, waveguide excitation waveguide dispersion, transmission lines, microwave circuit.	09
4	**Computational Electromagnetics.** Finite difference time domain, absorbing boundary condition, perfectly matched layers, periodic boundaries, finite element method.	05
5	**Graphene and Plasmonics Nano Antenna** Graphene and other 2D materials, Fundamentals of optical nano antenna, Linear antennas, Nonlinear antennas, Application	05
	Total Hours	42

Suggested Text books / Reference books:

1. Antenna Theory: Analysis and Design, by C.A. Balanis, 3rd edition, WILEY Interscience.
2. Antennas and Wave Propagation by J D Kraus, 5th edition, McGraw Hill Education.
3. Microwave Engineering by David. M Pozar, 4th edition, Wiley.
4. Principles of Electromagnetics by Matthew N.O. Sadiku, 6th Edition, Oxford University Press.
5. Optical Antennas by Mario Agio, 1st editions, Cambridge University Press.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
30%	30%	15%	5%	5%	15%

Suggested Hands-on workshops:

1. Design and simulate Rectangular waveguide for GHz frequency.
2. Design and simulate 90-degree rectangular waveguide for GHz frequency.
3. Design and simulate Hybrid Tee for GHz frequency.
4. Design and simulate Microstrip patch antenna.
5. Design and simulate Spiral patch antenna.
6. Perform the experiment for deriving radiation pattern and S parameter for Wire antennas.
7. Perform the experiment for deriving radiation pattern and S parameter for Yagi uda antennas.
8. Perform the experiment for deriving radiation pattern and S parameter for dipole antennas.
9. Prove the reciprocity theorem for antenna.

Supplementary Resources:

1. Design and simulate 1D FDTD simulation code with perfectly matched layer.
2. Identify the design of the antenna for your mobile phone. Design and simulate the same antenna for fulfilling the communication task of mobile communication.
3. Design and simulate 2D FDTD simulation code with perfectly matched layer and verify it with any professional software.

Subject Code: 01CE0401

Subject Name: Operating System

B. Tech. Year – II (Semester IV)

Objective:
Student will understand Modern Operating System and their principles. The course will cover theory as well as practice aspects of a subject through scheduled lectures and labs, course will cover details of processes, CPU scheduling, memory management, file system, storage subsystem, and input/output management.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understanding the role of operating system with its function and services
2. Compare Various Algorithm used for CPU Scheduling, Memory management and Disk Scheduling Algorithm.
3. Apply Various Concepts related with Deadlock to solve Problems.
4. Analyze Protection and Security Mechanism in Operating System.

Pre-requisite of course:
Data structures like stack, queue, linked list, tree, graph, hashing, file structures, any structured programming language

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Operating Systems** Operating Systems Overview- Overview and Functions of operating systems, protection and security, distributed systems, operating systems structures, services, system calls and their working. History and generation of operating system.	04
2	**Process and Threads** Process and Threads - Process concepts, threads, scheduling-criteria,	08

	algorithms, and their evaluation. Process Scheduling, Thread scheduling, case studies UNIX. Linux. Windows	
3	**Concurrency Control (IPC)** Process synchronization, critical- section problem. classic problems of synchronization, Software Solutions for synchronization problem. Hardware Solutions for synchronization problem. Synchronization and their applications. [Understanding of Semaphore – Mutex – Monitor – Event Counters]	10
4	**Memory Management** Memory: Swapping, contiguous memory allocation, paging, page table, segmentation, virtual memory, demand paging, page- replacement, Allocation of frames, Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging (Concepts only) – Page Replacement policies : Least Recently used (LRU) Optimal (OPT) , Second Chance (SC), First in First Out (FIFO), , Not recently used (NRU).	15
5	**Principles of deadlock** Deadlock - system model, deadlock and its characterization with example, deadlock prevention techniques with example, detection and avoidance of a deadlock, methods to get recovery form deadlock.	06
6	**File system Interface** File system Interface- the concept of a file, Access Methods. Directory structure. File system mounting, file protection and sharing mechanism. File System implementation- File system structure, file/directory implementation, efficiency and performance, file allocation methods, free-space management.	04
7	**Mass-storage structure & I/O systems** Mass-storage structure- RAID structure, Disk structure, disk attachment, disk scheduling, swap-space management. stable-storage implementation. overview of Mass-storage structure. Tertiary storage structure. I/O systems- Hardware, application l/o interface, kernel I/O subsystem, Transforming I/O requests to Hardware operations. STREAMS, performance.	04
8	**Protection & Security** Protection - Protection. Goals of Protection, Principles of Protection. Domain of protection Access Matrix, Implementation of Access Matrix. Access control, Revocation of Access Rights. Capability- Based systems, Language - Based Protection, Security -Problems, program threats, system and network threats cryptography as a security tool, user authentication, implementing security defenses, fire walling to protect systems and networks, computer -security classifications	03
	Total Hours	54

Suggested Text books / Reference books:

1. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne, 8th edition.
2. Operating Systems - Internals and Design Principles. Stallings, 6th Edition-2009. Pearson education.
3. Operating systems- A Concept based Approach-D.M.Dhamdhere. 3rd Edition. TMH
4. Modern Operating Systems, Andrew S Tanenbaum 3rd edition PHI.
5. Principles of Operating Systems, B.L.Stuart. Cengage learning, India Edition.
6. Operating Systems. A.S. Godboie.2nd Edition, TMH

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	25%	25%	15%	10%	5%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Hands on Activity for OS Installation.
2. Study of Basic commands to understand the system and working of Linux.
3. Write a script to reverse a number and string given by user.
4. Write a script to find the smallest of three numbers as well as largest among three numbers.
5. Write script that prints names of all sub directories present in the current directory.
6. Write a script to reverse the contents of a file.
7. Write a script to check entered string or a number is palindrome or not
8. Write a menu driven shell script for Copy a file, remove a file, Move a file in Linux
9. Shell Script to make a menu driven calculator using case in UNIX / Linux / Ubuntu.
10. Write a script to display the digits which are in odd position in a given 6 digit number in Linux
11. Write a script to translate the string from capital letters to small and small letters to capital using awk command.
12. Write a script to do the sorting of given numbers (use command line argument).
13. Write a program for process creation using C. (Use of gcc compiler).

Supplementary Resources:

1. http://williamstallings.com/OS/Animation/Animations.html
2. http://nptel.ac.in/courses/106106144/
3. http://nptel.ac.in/courses/106108101/
4. http://codex.cs.yale.edu/avi/os-book/OS9/slide-dir

Subject Code: 01CT0406

Subject Name: Technical Writing

B. Tech. Year – II (Semester IV)

Objective:
The prime focus for this course is to build the professional writing skills among the future engineers and to teach them the impact of writing in professional career.

Credits Earned: 01 Credit

Course Outcomes: After completion of this course, student will be able to:

1. Write the E-Mails in professional manner
2. Read and understand the research paper
3. Identify the keywords and elaborate the research done in the field of the identified keyword
4. Prepare a technical Presentation
5. Write a technical Research paper or document.

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
01	00	00	01	00	00	00	25	25	50

Contents:

Unit	Topics	Hours
1	Understanding the difference between the technical and non-technical writing; Writing professional E-Mails; Reading the research paper and identifying the keywords, Elaborating the depth of the keyword; Understand the importance of technical presentation, Preparing the technical presentation; Understanding the LATEX tool, understanding the ways of inserting images, tables, sections, text types, equations etc., writing a technical document and paper using LATEX tool.	14
	Total Hours	14

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	15%	20%	20%	15%	20%

Suggested List of Activities:

1. Writing a technical mail on the given topic
2. Reading a research paper and identifying the core idea and the keywords of the research paper
3. Preparing the technical presentation for the assigned research paper.
4. Presenting the ppt presentation on the research paper topic
5. Writing a two-page document for the assigned research paper

Supplementary Resources:

1. https://www.latex-tutorial.com/tutorials/
2. http://www.docs.is.ed.ac.uk/skills/documents/3722/3722-2014.pdf

Marwadi University

Faculty of Technology

B. Tech. in Information and Communication Technology

Semester V

Subject Code: 01CT0501

Subject Name: Optimization Techniques

B. Tech. Year – III (Semester V)

Objective:
The focus of the course is on convex optimization though some techniques will be covered for non-convex function optimization too. After an adequate introduction to linear algebra and probability theory, students will learn to frame engineering minima maxima problems in the framework of optimization problems.

Credits Earned: 03 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Cast engineering minima/maxima problems into optimization framework
2. Learn efficient computational procedures to solve optimization problems
3. Apply optimization concepts to deal with real world situations
4. Design the simulation model for the given case study problem

Pre-requisite of course:
Basic Programming Language, Calculus and Linear Algebra

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	00	03	50	30	20	00	00	100

Contents:

Unit	Topics	Hours
1	**Introduction to Operations Research** Origin of Operations Research, Nature of Operations Research, Impact of Operations Research, Defining Problem and Generating data, formulating a mathematical model, deriving solutions from the model, Testing the model	05
2	**Mathematical preliminaries** Linear algebra, matrices, vector space, vector calculus, eigen values, eigen vectors, eigen space analysis, probabilistic theory, elementary multivariant calculus	03
3	**Linear programming** Introduction to LP problems, formulation of LP problems, steps for solution of LP problems, graphical solution, maximization and minimization using simplex algorithm, two phase method, duality in LP, integer LP, karmakar method	05
4	**Transportation problems** Introduction to transportation problem, variant of transportation problem, methods to solve transportation problem	05
5	**Assignment problems** Introduction to assignment problems, methods to solve assignment problems	03
6	**Non-linear programming** Graphical illustration of nonlinear programming, one variable unconstrained optimization, multi variant unconstrained optimization, Quadratic programming, Separable programming, convex programming	05
7	**Network analysis** Network definition, analysis, probability of PERT analysis, project time cost tradeoff, introduction to resource allocation	04
8	**Sequencing** Sequencing needs, processing N jobs in 2 machines, processing N jobs in 3 machines, processing N jobs in m machines	05
9	**Queuing models** Introduction to queuing models, basic element of queuing model, poisson and exponential distribution, concept of birth and death process	04
10	**Stochastic Modeling and Stimulation** Essence of Stimulation, Generation of Random Numbers, Generation of Random observations from Probability Distribution	03
	Total Hours	42

Suggested Text books / Reference books:

1. Operations Research Theory and Applications, 6th Ed., J.K.Sharma, Trinity Press
2. Introduction to Operations Research, 7th. Ed. Frederick Hillier. McGraw-Hill, 2000
3. S S Rao, Engineering Optimization, New Age International
4. K Deb, Optimization for Engineering Design: Algorithms and Examples, Prentice-Hall of India
5. Discrete-Event Simulation: Modeling, Programming and Analysis, George S. Fishman. Springer- Verlag, New York, Inc., 2001

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
15%	15%	30%	35%	5%	0%

Supplementary Resources:

1. https://nptel.ac.in/courses/110/106/110106062/
2. https://nptel.ac.in/noc/courses/noc17/SEM1/noc17-mg10/
3. https://onlinecourses.nptel.ac.in/noc20_ma23/preview

Subject Code: 01CT0502

Subject Name: Database Management System

B. Tech. Year – III (Semester V)

Objective:
To know how huge data is managed by each and every application is modern technologies. To store and retrieve data in efficient manner, how query language is useful will be helpful. This course will give deep knowledge about data storage and querying functionalities used in real life applications.

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra, normalization and SQL
2. Solve the given problem using Relational Algebra, Relational Calculus, SQL and PL/SQL
3. Analyze basic data storage schemes and real-life database applications
4. Apply efficient query optimization techniques to solve different problems
5. Perform PL/SQL programming using concept of Cursor Management, Error Handling, Package and Triggers

Pre-requisite of course:
The proper understanding of data structures and algorithms will help you to understand the DBMS quickly.

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	02	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to DBMS** Introduction to Database Management Systems, Types of DBMS, Implementation of DBMS in storage and querying, Applications of DBMS	03
2	**Relational Database Management Systems**	04

	Introduction to relational model: Architecture of Relational database, Database Schema, Schema Diagram, Introduction and use of keys in schema designing. Structure Query Language (SQL): Introduction, CRUD Operations and Functions.	
3	**Database Design and E-R Model** Design Process and Introduction of E-R model, Constraints and Attributes Characteristics, Features of E-R Diagrams and Design issues, Other notations for modeling with different aspects of database design	06
4	**Functional Dependencies** Theoretical overview of types of functional dependencies: Trivial and Non-trivial, Multilevel dependencies, Algorithms for decomposition using multilevel dependencies.	05
5	**Normalization** Purpose of normalization, Introduction and definition of normalization, Normalization techniques: 1NF, 2NF, 3NF, BCNF, 4NF, Introduction and implementation of 5NF (Beyond the syllabus)	04
6	**Data Indexing and Querying** Data Indexing: Basic concepts for B+ tree index files, Multiple key access Querying: Overview, measures of query cost, selection operation, sorting, join, evaluation of expressions, transformation of relational expressions, estimating statistics of expression results, evaluation plans, materialized views	04
7	**Transactional DBMS** Introduction to transaction using DBMS, ACID properties (Atomicity, Consistency, Isolation, Durability), Isolated transactions, use of isolated transaction applications using SQL	04
8	**Concurrency and Recovery in Transaction Model** Locking mechanism, solution to concurrency related problems, deadlock, two-phase locking protocol, Deadlock, Concurrency handling protocols and schemes, Transactional Recovery Algorithms, System recovery, Two- Phase Commit protocol, Recovery and Log-based recovery, concurrent executions of transactions and related problems	04
9	**Security** Introduction, Discretionary access control, Mandatory Access Control, Data Encryption	02
10	**PL/SQL concepts** SQL Concepts: SELECT, FROM and WHERE Clause; Insert and DELETE operations, Functions; NULL functions, Aggregators, Arithmetic and Logical Operators; Joins: Inner joins, Outer Joins, Cross joins. PL SQL: Cursors, Stored Procedures, Stored Function, Database Triggers	04
11	**Emerging areas in DBMS** Introduction to parallel and distributed databases, NoSQL databases and applications.	02
	Total Hours	42

Suggested Text books / Reference books:

1. Database System Concepts, Abraham Silberschatz, Henry F. Korth & S. Sudarshan, McGraw Hill.
2. An introduction to Database Systems, C J Date, Addition-Wesley.
3. Understanding SQL by Martin Gruber, BPB
4. Oracle – The complete reference – TMH /oracle press
5. SQL – PL/SQL by Ivan Bayross

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
15%	15%	40%	10%	10%	10%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Introduction to tool [Basic information of tool
2. Database creation using SQL
3. CRUD operation in database using SQL
4. NULL functions in SQL queries
5. Query practicing for insert and delete operations on table.
6. Implementation of Mathematical operators' queries using SQL
7. Use of keys with CRUD operation.
8. Implementation of Functions and Operators in SQL.
9. Implementation of various join operations queries.
10. GROUP BY clause and relational algebraic operation implementation.
11. Implementation of Subqueries in SQL queries
12. Implementation procedures and triggers using SQL.
13. Overview of Query optimization with basic examples.
14. Transactional query processing.
15. Application based query practicing.

Supplementary Resources:

1. https://www.geeksforgeeks.org/dbms
2. http://nptel.iitm.ac.in/video.php?subjectId=106106093
3. http://holowczak.com/oracle-sqlplus-tutorial
4. http://www.roseindia.net/programming-tutorial/Database- Tutorialsiv.
5. http://www.w3schools.com/sql
6. http://beginner-sql-tutorial.com/sql.htm

Subject Code: 01CT0503

Subject Name: Computer Networks

B. Tech. Year – III (Semester V)

Objective:

1. After successful completion of this course, student will be able to understand the significance and concepts of computer networks
2. Conceptualize and appreciate the layered model for computer networking
3. Identify basic protocols and design issues for layered model.
4. design and implement protocols related to various networking layers

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand the functionality of various protocols, models and networks.
2. Analyze various flow and error control algorithms.
3. Analyze different medium access protocols and network hardware component.
4. compare various static and dynamic routing protocol.
5. Understand various transport services, protocol and application layer functionalities.
6. Built and test various network topologies and routing protocols for various networks scenarios.

Pre-requisite of course:

Introduction to Communication Engineering, Analog and Digital Communication

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	02	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction** Use of Computer Networks, Network Hardware, Network Software, OSI and TCP/IP Reference Model, Example Networks and standards.	03
2	**Data Link Layer** Types of error, Error-Detection and correction, Flow and Error Control, Elementary Data link Protocols, Sliding window Protocols, HDLC, Example of data link protocols.	07
3	**Medium Access Control Sub layer** Multiple Access Protocols, LANs Ethernet, Wireless LANs, Local Area Networks, Connecting Devices, Backbone Network, Virtual LANs.	9
4	**Network Layer** Network layer design issues, Routing Algorithms, Congestion Control Algorithms, QoS, Internetworking, Network Layer in the Internet.	9
5	**Transport Layer** The transport Service, Elements of transport protocol, congestion control, Internet transport protocol UDP, TCP.	10
6	**Application Layer** Domain Name System, E-mail, World Wide Web, Multimedia.	04
	Total Hours	42

Suggested Text books / Reference books:

1. Andrew S. Tanenbaum, Computer Networks PHI Publication
2. Computer Networking- A Top-Down approach, 5th edition, Kurose and Ross, Pearson
3. Forouzan, Data Communication Networking TMH Publication
4. Forouzan, TCP/IP Protocol suit TMH Publication
5. William Stallings, Data and computer Communication, Pearson.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
25%	20%	30%	15%	5%	5%

Suggested List of Experiments:
Minimum 12 experiments to be performed during the semester

1. Briefing of Network Simulator
    a) Introduction, Features and Network supported by NS2
    b) Platform required to run Network Simulator
    c) Backend Environment of Network Simulator
    d) Installation steps of NS-2 in Ubuntu 14.04LTS
2. To perform TCL Script using basic TCL Syntax, looping, conditional check, functions, execution of Mathematical Operations and Execution of Unix Command
3. Introduction to TCL script in which it takes number N from user and prints factorial—use function call.
4. Introduction to TCL script in which it Implement Basic Calculator operation in TCL-use function Call.
5. Simulation of Wired topology of 4 Node
6. Creating Output files for X-graph
   Analyzing and plotting received traffic from 3 nodes.
   -data rate
   -delay
   -speed of link
   -size of data
7. Creating Wireless Simulation on NS to analyze the effects error on one link v/s behavior of Sliding Window Size
8. Introduction to Cisco Packet Tracer and configuring various network devices, hosts & transmission media.
9. Configuration of DHCP Server in Packet Tracer Software and analysis of DHCP messages.
10. Configuration of HTTP Server in Packet Tracer Software and analysis of HTTP request & response messages.
11. Study of basic network commands.
12. Study of Network devices configuration commands.
13. Configure Link State Vector Routing (e.g. OSPF) in Packet Tracer Software.
14. Configure Distance Vector Routing (e.g. RIP) in Packet Tracer Software.
15. Installation of NS3 in Linux.
    Program in NS3 to connect two nodes.
    Program in NS3 for connecting three nodes considering one node as a central node.
16. Program in NS3 to implement star topology.
    Program in NS3 to implement a bus topology.

Supplementary Resources:

1. https//study-ccna.com/eigrp-overview/
2. https//www.netacad.com/
3. https//www.computernetworkingnotes.com/
4. https//www.isi.edu/nsnam/ns/

Subject Code: 01CT0504

Subject Name: Internet and Web Technology

B. Tech. Year – III (Semester V)

Objective:
To acquire knowledge and skills for creation of web site considering both client and server-side programming. To gain ability to develop responsive web applications. Increasing use of Internet and web encourage everyone to use web solution. Web technology is the bridge between end-user devices like computer/mobile communication with each other. To create dynamic web site and web portal it involves the use of web language like HTML, CSS, JavaScript and PHP with CodeIgniter framework. This subject will attempt to give you a basic understanding of various aspects of web technologies.

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand basis functioning of Internet by studying its architecture.
2. Apply different types of style sheets and their properties
3. Apply client side and server-side scripting techniques as per requirements
4. Analyze design pattern-based approaches and frameworks of PHP.
5. Create dynamic web-based solution based on user requirements.

Pre-requisite of course:
Programming Fundamentals

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	02	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Internet Basics** Introduction, Concept of Internet- History of Internet, Protocols of Internet, World Wide Web, URL, Web Server, Web Browser, Internet Connectivity, Internet Network, Services on internet, Current Trends on Internet, Concept of WWW, HTTP Response and Request, Features of Web 2.0	05
2	**HTML and CSS** Basics of HTML, HTML tags and attributes, Meta tags, Character entities, hyperlink, table, lists, images, forms, divs, XHTML, Browser Architecture and website structure, Overview and features of HTML 5, Need for CSS, basic syntax and structure, background images, colors and properties, manipulating texts, fonts, borders and boxes, margin, padding, lists, positioning using CSS, Gradients, Shadow effects, transformation, transition and animations, etc. CSS flex, media queries. Overview of CSS, CSS2 and features of CSS3.	10
3	**Java Script** Client-side scripting with JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes. Advance JavaScript: JavaScript and objects, JavaScript own objects, the DOM and web browser environments, Manipulation using DOM, forms and validations, DHTML: Combining HTML, CSS and JavaScript, Events and buttons Introduction to jQuery, jQuery syntax, selectors, events, effects, jQuery HTML, Access / Manipulate web browser elements using jQuery.	06
4	**XML** Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Using XML with application. Transforming XML using XSL and XSLT	03
5	**PHP** Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP	04
6	**PHP and MySQL** Basic commands with PHP examples, Connection, to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP my admin and database bugs	05
7	**Latest Trends in PHP** Overview of Laravel, Laravel Application Structure, Introduction to WordPress, WordPress Dashboard, Overview of Joomla, Joomla	04

	Architecture, Application of Joomla	
8	**PHP with CodeIgniter** Overview, Application Architecture, MVC Framework, Configuration, Working with Database, Libraries, File uploading, Form validation.	05
	Total Hours	42

Suggested Text books / Reference books:

1. Black Book, HTNL 5, Dreamtech Press
2. Black Book, Web Technologies, Dreatech Press
3. Ralph Moseley and M.T. Savaliya, Developing Web Applications, Wiley-India
4. Cody Lindley, jQuery Cookbook, O'Reilly Media
5. Ryan Benedetti, Roman Cranley, Head First jQuery – A Brain- Friendly Guide, O' Reilly Media

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	25%	30%	20%	10%	10%

Suggested List of Experiments:

1. Design wireframe for your semester project based on web design principles
2. Create table using HTML tags.
3. Formatting web pages with CSS [Create semester project website's inner pages]
4. Create Home Page for any Website which contains image slider, header and footer and navigation menu bar.
5. Browser interaction and form validation (Web browser environments, forms and validation, image sliders) [Image slider plugins of jQuery, Client-side validation of Registration & Login page to be created in semester project website].
6. Use the on () method to attach a click event handler to all <p> elements using jQuery.
7. Choose the correct conditional (ternary) operator to alert "Too young" if age is less than 18, otherwise alert "Old enough" using JavaScript.
8. Introduction to PHP (Starting to script on server side, Arrays, function, validations) [Server-side validations for Registration and Login of semester project website]
9. Advance PHP (Management of session and cookies) [Implement Admin login/logout functionality and cookie wherever required]
10. Create PHP Form which demonstrate Insert, Update, Delete and Select operation with database. (Take required data from user).

11. PHP with mysql connectivity (Forms, Advance PHP and database handling) [Semester Project]
12. CodeIgniter framework of PHP (Use framework in Management Portal for semester project website]

Supplementary Resources:

1. http://nptel.ac.in
2. http://www.w3schools.com/
3. http://getbootstrap.com/
4. http://www.tutorialspoint.com/
5. https://www.phptpoint.com/
6. https://www.codeigniter.com/

Subject Code: 01CT0505

Subject Name: Introduction to Single Board Computer Programming

B. Tech. Year – III (Semester V)

Objective:
Raspberry Pi is the latest low-cost computing platform that enables to create interesting applications with basic programming languages. This course is to train the students to startup with Raspberry Pi board and develop applications. Enable students to become familiar with the VI editor and be able to use it proficiently to create and modify files. To understand the basics of programming languages used on Raspberry Pi.

Credits Earned: 01 Credit

Course Outcomes: After completion of this course, student will be able to:

1. Setup raspberry pi as standalone computer with SSH remote access.
2. Use python to write and debug Raspberry pi interfaces like GPIO, Serial and I2C and interface User IO, Sensors and actuators
3. Implement MQTT client and broker on raspberry pi and test publish subscribe mechanism using python
4. Analyze QoS levels, last will, retain message and wild card topics in MQTT network by writing and testing python code
5. Use raspberry pi in designing stand-alone application for solve real world problem

Pre-requisite of course:
Basic knowledge of programming

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
00	00	02	01	00	00	00	25	25	50

Contents:

Unit	Topics	Hours
1	**Introduction to Single Board Computer** Introduction to Raspberry-Pi, pin configuration, Internal block diagram, Raspbian OS setup, headless raspberry-Pi setup using SSH over LAN/WLAN, basic Linux commands.	04
2	**Audio, Video and Networking** ALSA mixer command line interface for Audio, FFMPEG command line interface for Video, Static IP and Dynamic IP setup using command line interface	04
3	**IO Port Programming** GPIO Programming using python, Serial port programming using Python, Interfacing LED's and Switches, Interfacing 16x2 LCD, Interfacing RTC	06
4	**Socket and Rest API Programming** Python programming to send and receive UDP packets over LAN/WLAN, Sending and Receiving data from Server using HTTP get/post method as REST API, JSON parsing and un-parsing String objects.	04
5	**Shell Scripting** Writing Shell Script to execute sequence of commands, permission handling of shell script, passing arguments to the shell script, boot time execution of shell script.	04
6	**MQTT Broker/Client Setup** Basics of MQTT protocol, set-up MQTT broker on Raspberry-Pi using MQTT-Paho/Mosquitto, set-up MQTT client on Raspberry-Pi for publish and subscribe, experimentation with QoS levels, keep alive time and retention flag, set-up Open-SSL on Raspberry-Pi for TLS and SSL security, introduction to Node Red	06
	Total Hours	28

Suggested Text books / Reference books:

1. Raspberry Pi Cookbook: Software and Hardware Problems and Solutions, Simon Monk, O'Reilly Media
2. Adventures in Raspberry Pi, Carrie Anne Philbin, WILEY.
3. THE OFFICIAL Raspberry Pi Beginner's Guide How to use your new computer, Gareth Halfacree, Raspberry Pi Press

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
0%	10%	30%	15%	25%	20%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Installing Raspbian OS and Headless Setup of Raspberry Pi using SSH via LAN/WLAN.
2. Basic Unix Shell Commands practicing on Raspberry Pi.
3. Command Line Audio Setup using ALSA Mixer.
4. Command Line Video Setup using FFMPEG.
5. Command Line network setup using Static IP and Dynamic IP.
6. Write and test python Program to interface LED and Pushbutton with Raspberry Pi GPIO.
7. Write and test python Program to interface 16x2 LCD with Raspberry Pi GPIO.
8. Write and test python Program to communicate with Arduino using UART of Raspberry Pi.
9. Write and test python Program to send and receive UDP Packet on Raspberry Pi in Local Network.
10. Write and test python Program to send and receive data to/from Web Server using REST API.
11. Write and test Shell Script to execute sequence of commands automatically on demand.
12. Write and test Shell Script to execute sequence of commands automatically on Startup.
13. Setup MQTT Broker on Raspberry Pi.
14. Setup MQTT Client on Raspberry Pi and write and test python program to Publish and Subscribe.
15. Design and troubleshoot mini project using Raspberry Pi for any Real-world Application

Supplementary Resources:

1. https://www.raspberrypi.org/magpi-issues/Beginners_Guide_v1.pdf
2. https://www.raspberrypi.org/magpi/
3. http://www.betatech.in/raspberrypie.php
4. https://www.coursera.org/courses?languages=en&query=raspberry%20pi
5. https://www.raspberrypi.org/training/online/
6. http://www.instructables.com/class/Raspberry-Pi-Class/
7. http://nptel.ac.in/courses/106105166/28

Subject Code: 01CT0506

Subject Name: Human Centered Design

B. Tech. Year – III (Semester V)

Objective:
The main objective of this course is to enable students to build solutions for problems in society, understanding needs of the people, finding gaps in needs and existing technological solutions, innovating ideas, developing prototypes and implementing solutions for real world problems.

Credits Earned: 01 Credit

Course Outcomes: After completion of this course, student will be able to:

1. Demonstrate knowledge of the role of specific techniques in human centered design
2. Conduct user interviews and synthesize learnings to uncover insights and identify opportunities for innovation
3. Bring ideas to life using prototypes to test with real users and identify promising solutions to implement
4. Practice team management, leadership and project management

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
00	00	02	01	00	00	00	50	50	100

Contents:

Unit	Topics	Hours
1	**Introduction** Introduction to Human Centered Design, Human Centered Design Process, Group Discussion, Design Innovations in Practice, Preparing Mindsets: Creative Confidence, Empathy, Learn from Failures, Make it approach, Team Formation, Case Study, Activity: Mini Design Challenge	06
2	**Inspiration** Choose Your Design Challenge, Create a Project Plan, Secondary research, Buils Interview Guide, Group and Expert Interviews, Card slot exercise, Immersion, Draw solutions, Prepare resource flow	06
3	**Ideation** Share stories and learn from user research, Find themes and cluster them, Create insight Statements, Create How Might We? Questions, Create Frameworks	04
4	**Prototyping** Brainstorm, Brainstorm Rules, Bundle Ideas, Create a concept, Determine what to prototype, Storyboard, Role playing, Rapid Prototyping, Business Model Canvas, Get Feedback, Integrate feedback and iterate	06
5	**Implementation** Prepare Roadmap, Resource Assessment, Ways to grow framework, Define success, Create Action Plan, Create a Pitch, Discussion on ways to go forward	06
	Total Hours	28

Suggested Text books / Reference books:

1. "The Field Guide to Human Centered Design", DESIGN KIT
2. J. Liedtka, T. Ogilvie, "Designing for Growth", Columbia University Press
3. M. Cruz-Cunha, I. Miranda, P. Goncalves, "Handbook of Research on ICTs for Human-Centered Healthcare and Social Care Services", SCOPUS
4. Stickdorn, Marc and Jakob Schneider, "This is Service Design Thinking: Basics, Toolsand Cases", Wiley Publishing.
5. H. S. Fogler and S. E. LeBlanc, "Strategies for Creative Problem Solving", 2nd edition, Pearson, Upper Saddle River, NJ, 2008.
6. V. Kumar, "101 Design Methods", Wiley

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	15%	15%	20%	20%	20%

Supplementary Resources:

1. https://acumenacademy.org/course/design-kit-human-centered-design
2. https://www.coursera.org/learn/human-computer-interaction
3. https://www.coursera.org/learn/innovation-through-design
4. https://www.designkit.org/human-centered-design
5. https://www.ideo.com/
6. https://dschool.stanford.edu/resources/the-bootcamp-bootleg
7. https://www.coursera.org/learn/uva-darden-design-thinking-innovation
8. https://www.coursera.org/learn/design-thinking-innovation
9. http://www.cs.odu.edu/~cs381/cs381content/problem_solving/problem_solving.html
10. https://ryanstutorials.net/problem-solving-skills/

Subject Code: 01CT0507

Subject Name: Advanced Microprocessor

B. Tech. Year – III (Semester V)

Objective:
This course introduces the ARMv7 and ARMv7 CortexM architecture, Instruction set, assembly language and C language programming of ARMv7 CortexM core based TIVA-C Microcontroller. It gives a hands-on training of evaluate various on chip peripherals of TIVA-C microcontroller and interfacing external sensors and actuators with TIVA-C microcontroller. The course objective is to introduce the basic concepts medium scale embedded system design using ARMv7 CortexM based microcontroller and to develop assembly and C language programming skills for real time applications of ARMv7 CortexM based microcontroller.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand ARMv7 and ARMv7 CortexM Architecture.
2. Develop real time software and hardware for embedded systems using TIVA-C Microcontroller.
3. Write and debug C programs for TIVA-C Microcontroller.
4. Effectively utilize on chip peripherals such as timers, serial communications, analog-to-digital converters & pulse width modulation for low power applications.
5. Implement advance communication protocol like I2C and SPI on TIVA-C Microcontroller.
6. Effectively utilize ARMv7 and ARMv7 CortexM based microcontroller to solves real world problems.

Pre-requisite of course:
Basics of Digital Logic Design, Microprocessor architecture, and basics of C programming

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to embedded systems** Hardware Components of Embedded System, Instruction Set Architecture	6
2	**ARMV7 architecture** Basic architecture of the ARM7core, Registers, Current Program Status Register (CPSR), Operating States, Operating Modes, Programming Model, Interrupt and Exception Handling, ARM Instruction Set, Migration to Cortex Series, ARM architecture v7 profile, ARMv7-M architecture, Operating States and Operating Modes, Programming Model.	12
3	**ARMV7 instruction set** Instruction Set: Tables with all categories of instructions with descriptions. Load/Store instructions with addressing modes, Thumb instruction set, CMSIS.	12
4	**TIVA-C microcontroller & programming in C** TIVA-C Microcontroller Architecture and Its memory map, GPIO Programming, WDT Programming, Interrupt Programming, LPM Programming, ADC, PWM and DMA Programming	14
5	**Serial communication protocols** UART protocol, I2C protocol, SPI protocol, Serial Port Programming, I2C Programming, SPI Programming	10
	Total Hours	54

Suggested Text books / Reference books:

1. TI ARM Peripherals Programming and Interfacing Using C Language, By Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi, Pearson Education.
2. Embedded Systems: Introduction to Arm® Cortex™-M Microcontrollers, 5th edition, By Jonathan W. Valvano, ISBN: 978-1477508992.
3. Embedded System Design Using TIVA, TI University Program, Learning Material

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	30%	15%	10%	5%

Suggested List of Experiments:
Minimum 12 experiments to be performed during the semester

1. Installation of CCS and familiarization of TIVA-C Development Board.
2. Hands-on experimentation of TIVA-C GPIO programming in C.
3. Hands-on experimentation of TIVA-C Timer to generate accurate delay in C.
4. Hands-on experimentation of TIVA-C Hibernation and Wakeup by RTC programming in C.
5. Hands-on experimentation of TIVA-C ADC programming in C.
6. Hands-on experimentation of TIVA-C PWM programming in C.
7. Hands-on experimentation of TIVA-C UART Transmit programming in C.
8. Hands-on experimentation of TIVA-C UART Receive programming in C.
9. Hands-on experimentation of TIVA-C UART Transmit and Receive programming in C.
10. Hands-on experimentation of interfacing 16x2 LCD with TIVA-C and programming in C.
11. Hands-on experimentation of interfacing SIM800L GSM/GPRS with TIVA-C and programming in C.
12. Hands-on experimentation of interfacing HC-05 Serial Bluetooth with TIVA-C and programming in C.
13. Hands-on experimentation of MPU6050 Accelerometer & Gyroscope Interfacing with TIVA-C in C using I2C protocol.
14. Hands-on experimentation of MAX7219 LED matrix driver Interfacing with TIVA-C in C using SPI protocol.
15. Design Mini project based on TIVA-C Microcontroller utilizing minimum 3 on chip peripherals and minimum 2 external sensors/actuators to solve real world problem.

Supplementary Resources:

1. https://www.ti.com/seclit/ml/ssqu015/ssqu015.pdf
2. https://university.ti.com/en/faculty/teaching-materials-and-classroom-resources/embedded-learning-materials

Subject Code: 01CT0508

Subject Name: Optical Communication

B. Tech. Year – III (Semester V)

Objective:
To introduce the students to various optical fiber modes, configurations and various signal degradation factors associated with optical fiber and to study about various optical sources and optical detectors and their use in the optical communication system, optical amplifiers, fiber network elements, basic optical components, and techniques of fiber optic measurement.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. To learn basic elements of optical fiber transmission link, fiber modes and physics of fiber structure configurations and fiber losses.
2. To compare the various type of the optical source and optical detectors.
3. To analyse the optical system performance with optical transmitter, receiver, amplifier, splitter and other optical devices
4. To analyze and design optical fiber link with encapsulation of different system components and optical parameter measurement devices.
5. To analyze and integrate fiber optical network components in variety of networking schemes, SONET/ SDH and operational principles WDM.

Pre-requisite of course:
Fundamentals of signals, Modulation techniques and Fundamental concept of lights from physics

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Overview of Optical fiber Communications** Electromagnetic spectrum, Optical Spectral bands, Evolution of fiber optic system, Multiplexing Techniques, Elements of an optical fiber transmission link with the functional description of each block, WDM concepts, transmission widows, advantages of optical fiber link over conventional copper systems, applications of fiber optic transmission systems.	10
2	**Optical fibers** Structures, Waveguide and Fabrication: Optical laws and definitions, optical fiber modes and configurations, Mode theory, Step Index and Graded Index (GI) fibers, single mode and graded index fibers, Derivation for numerical aperture, V number and modes supported by step index fiber, mode field, Numerical aperture and modes supported by GI fibers, fiber materials, linearly Polarized modes fiber fabrication techniques, and mechanical properties of fibers, fiber optic cables.	12
3	**Signal Degradation in Optical Fibers** Attenuation, signal distortion in optical waveguides, pulse broadening in graded index fiber, Characteristics of Single Mode Fibers, mode coupling, International Standards for optical transmission fibers.	04
4	**Optical Sources and Detectors** Semiconductor Physics background, Light emitting diode (LEDs)-structures, materials, Figure of merits, characteristics & Modulation. Laser Diodes -Modes & threshold conditions, Diode Rate equations, resonant frequencies, structures, characteristics and figure of merits, single mode lasers, Modulation of laser diodes, Spectral width , temperature effects, and Light source linearity, Principles of operation of photodetectors , detector types, characteristics, figure of merits of detectors photodiode materials, photodetector noise, detector response time, temperature effects on gain, comparison of photodetectors	08
5	**Advance optical fiber system** Point to point link communication system, Link power budget calculation, Semiconductor optical amplifier, EDFA, Raman amplifier, WDM, DWDM, SONT/SDH, Field deployment, Undersea deployment, Typical end to end deployment including last mile, Introduction to SFP, Examples of products	09
6	**Optical Component and Fiber Optical measurement** Optical couplers, Filters, Add and drop MUX/DEMUX, waveguide grating, Circulator, Interferometer, Wavelength convertor, OTDR, Test Equipment, Attenuation and dispersion measurement, NA and EYE pattern measurement.	07
7	**Optical Access Networks** Network architecture overview, Enhanced HFC, Fiber to the Curb (FTTC), PON evaluation (BPON, GPON, EPON, WPON), RITENET WRPON, LARNET WRPON	06
	Total Hours	56

Suggested Text books / Reference books:

1. Optical Fiber Communications by Gerd Keiser, 4th Edition (Mc Graw Hill)
2. Optical Fiber Communication by John M. Senior (PHI/Pearson)
3. Fiber optic Communication Systems by G. Agrawal (John Wiley and sons)
4. Optical fiber communications: Principles and Applications by T. L. Singal (Cambridge University Press).
5. Optical Networks by Rajiv Ramaswami (Morgan Kaufmann Press)

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	30%	15%	10%	5%

Suggested List of Experiments:

1. Setting -up of Analog/ Digital Optical communication Link
2. Measurement of attenuation characteristics of an optical fiber
3. Measurement of NA of a multimode fiber
4. Measurement of Dispersion of optical fiber
5. Performance of TDM on fiber optic link
6. Setting -up of voice link on Optical communication Link.
7. Performing Experiments on the VI characteristics of the optical Sources.
8. Performing Experiments on the characteristics of the optical detectors.
9. Design directional coupler using FEM simulation technique.
10. Design split ring resonator using FEM techniques.
11. Design the 90-degree optical waveguide using photonics crystal.
12. Design the 2-dimensional optical waveguide using FEM technique.

Supplementary Resources:

1. https://www.nptel.ac.in/courses/117101054/
2. https://nptel.ac.in/courses/117101002/

Subject Code: 01CT0509

Subject Name: Linux Administration

B. Tech. Year – III (Semester V)

Objective:
To impart knowledge and skills on various practical and theoretical aspects of Linux operating system (OS) basics and Linux OS based server configuration, management and administration.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand Linux utilities to create and manage simple file processing operations and Linux boot processing.
2. Apply Command line in Linux to manage user, user groups, system management, volume management, and troubleshooting application, scheduling task and system level issue.
3. Illustrate client server applications with appropriate security.
4. Configure various services of Linux such like DNS, Apache web server, virtualization.
5. Evaluate various shell Scripting.

Pre-requisite of course:
Basics of Operating System

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction & Installation** Linux introduction and file system - Basic Features, Advantages, Installing requirement, Basic Architecture of Unix/Linux system, Kernel, Shell. Linux File system-Boot block, How Linux access files, storage files, Linux standard directories, Download, install, update, and manage software packages from Red Hat and yum package repositories.	07
2	**Management of File using Command Line** Introduction to BASH, Command-line shortcuts, File Types, Ownership and Permissions, File management and manipulation, Moving users & its directories, Miscellaneous Tools, Editors, Create and Edit text files with vim (open, edit, and save text files) Commands for files and directories cd, ls, cp, md, rm, mkdir, rmdir, pwd, file, more, less, creating and viewing files using cat, file comparisons – cmp & comm, View files, disk related commands, checking disk free spaces, regular expressions with grep	07
3	**Managing Users and Groups** Creating and managing user/s and group commands, User management Tools, Users and Access Permissions, Updating users and group attributes, PAM (Pluggable Authentication Modules)	06
4	**Booting and Shutting down** Boot Loaders, The init process, rc scripts, enabling and disabling services, Booting in recovery mode	06
5	**File Systems** Makeup of file systems, managing file systems, Adding a new disk, Volume Management, Creating file systems.	06
6	**Core System Services** The init Daemon, xinetd and inetd, The Logging Daemon, Configuring Logging Daemon, The CRON program	06
7	**Compiling the Linux Kernel** Kernel concepts, Finding Kernel Source Code, Building the Kernel, Patching the Kernel	05
8	**DNS** Installing D N S Server, Configuring DNS server, DNS records types, Setting up BIND database file, The DNS Toolbox, Configuring DNS clients.	05
9	**Apache Web Server** HTTP Protocol, Installing Apache HTTP Server, starting up and shutting down apache, Testing Apache Installation, Configuring Apache, Troubleshooting Apache	05
10	**Virtualization** Virtualization Implementation, Kernel based Virtual Machines (KVM)	03
	Total Hours	56

Suggested Text books / Reference books:

1. Steve Shah and Wale Soyinka " Linux Administration: A Begineer's Guide", 4th Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, ISBN: 978-0072262599
2. Susan Lauber, Philip Sweany, Rudolf Kastl and George Hacker, "REDHAT System Administration-1 Student Work book", REDHAT Inc. 2014

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
15%	15%	40%	10%	10%	10%

Suggested List of Experiments:

1. File Handling Commands
2. User Handling Commands
3. Group Handling Commands
4. Startup and Shutdown Commands
5. Installation and Configuration of DNS server
6. Installation and Configuration of Apache Server
7. Building and patching Linux Kernel.
8. Write a command with syntax & usage and execute the advance filters such as grep, egrep, fgrep.
9. Write a command with syntax & usage then execute the ps command, process management commands: & nohub, kill, nice.
10. Write a command with syntax & usage then execute the communication commands.
11. To execute device pattern using Meta character to match each of the following.
12. File Moment Using Command Line Arguments

Supplementary Resources:

1. https://www.tutorialspoint.com/linux_admin/index.htm
2. https://linode.com/docs/tools-reference/linux-system-administration- basics/
3. opensourceforu.com/2016/07/introduction-linux-system-administration/
4. https://www.linuxfoundation.org

Subject Code: 01CT0510

Subject Name: Applied Linear algebra

B. Tech. Year – III (Semester V)

Objective:
To learn important concepts of application of algebra, mathematical modelling, numerical methods, problem solving using computation, roots, curve fitting, flow chart and algorithm. The subject is also also focussing on to understand the importance of various methods by practical problems and their implementation using programming.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Implement various computer oriented numerical methods
2. Implement methods of roots and curve fitting
3. Apply Matrices based computational methods for various problems
4. Apply numerical integration and differentiation
5. Identify numerical solution of various equations

Pre-requisite of course:
Engineering mathematics and basic knowledge of programming

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction** Introduction of mathematical modelling, numerical methods, problem solving using computation, roots and optimization, curve fitting, flow chart and algorithm, algorithm examples, various types of equations, degree and order of difference equation	07
2	**Roots** Roots: Bracketing Methods, Open Methods	08
3	**Linear Systems** Linear Algebraic Equations and Matrices, Gauss Elimination, LU Factorization, Matrix Inverse and Condition, Iterative Methods	16
4	**Curve Fitting** Linear Regression, General Linear Least-Squares and Nonlinear Regression, Polynomial Interpolation, Splines and Piecewise Interpolation	14
5	**Integration and Differentiation** Numerical Integration Formulas, Numerical Integration of Functions, Numerical Differentiation	11
	Total Hours	56

Suggested Text books / Reference books:

1. Applied numerical methods with MATLAB, 2nd ed., Steven C Chapra, Tata McGraw-Hill
2. Computer oriented numerical methods, 3rd ed., V. Rajaraman, PHI
3. Computer oriented numerical methods, P.Thangaraj, PHI
4. Carl D. Meyer: Matrix Analysis and Applied Linear Algebra, SIAM, 2000
5. Gilbert Strang: Linear Algebra and Its Applications
6. Linear Algebra with Applications, by Steven J. Leon, Pearson-Prentice Hall, 8th Edition
7. Linear Algebra and Its Applications, Fifth edition, by David C. Lay, Steven Lay, Judy McDonald Pear-son, 2016

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	30%	15%	10%	5%

Suggested List of Experiments:
Minimum 12 experiments to be performed during the semester

1. Implement algorithm for incremental search.
2. Implement algorithm for bisection method.
3. Implement algorithm for Newton-Raphson method.
4. Implement algorithm for Brent's root-finding algorithm.
5. Implement algorithm for golden-section search.
6. Implement algorithm for naive Gauss elimination.
7. Implement algorithm for Gauss elimination with partial pivoting.
8. Implement algorithm for tridiagonal system.
9. Implement algorithm for Gauss-Seidel.
10. Implement algorithm for Newton-Raphson method for nonlinear systems of equations.
11. Implement algorithm for curve fitting.
12. Implement algorithm for Newton interpolation.
13. Implement algorithm for Lagrange interpolation.
14. Implement algorithm for composite trapezoidal rule.
15. Implement algorithm for Romberg integration.

Supplementary Resources:

1. https://www.math.ucdavis.edu/~daddel/linear_algebra_appl/Applications/applications.html
2. https://nptel.ac.in/courses/122102009/
3. https://www.udemy.com/numerical-methods/

Subject Code: 01CT0511

Subject Name: Theory of Computation

B. Tech. Year – III (Semester V)

Objective:
To understand thinking method of computer and how it computes decision are two main motives behind this course. This course also provides finite automata model to design language processing method of computer.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. To understand theory behind computer's thinking capacity
2. To understand design of model of decision-making power of computer.
3. To design automata based on given language.
4. To differentiate the given set of languages.
5. Apply this basic knowledge of Theory of Computation in the computer field to solve computational problems and in the field of compiler also.

Pre-requisite of course:
Mathematical terminologies of Computation, Data Structures

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Mathematical Terminologies for Automata Theory** Mathematical Induction, Set, Functions, Prepositions and Predicates, Proofs, relations, languages, Automata, Computability	08
2	**Automata Theory and Languages** Regular Languages, Finite Automata, Non-Regular Languages, Regular Expressions	08
3	**Grammars** Definition of Grammars, Different types of Grammars, Context-Free Grammars, Derivations using Grammars: Leftmost and Rightmost Derivations, The Languages of a Grammar, Parse Trees, Applications of Context-Free Grammars: Parsers, Ambiguity in Grammars and Languages	08
4	**Context free grammar with Push Down Automata** Definition Formal Definition of Pushdown Automata, A Graphical Notation for PDA's, Instantaneous Descriptions of a PDA, Languages of PDA, Deterministic Pushdown Automata: Definition of a Deterministic PDA, Non determinism, Non-Context free languages	08
5	**Turing Machine** Variants of Turing Machines, Definition and explanation of Church Turing Machine Algorithms	07
6	**Recursive languages and Computability** Decidability, Halting Problem, Undecidable Problems and Mapping Reducibility, Turing Reducibility and Recursion Theorem	07
7	**Complexity theory and Intractability** Time Complexity for NP and P class; Space Complexity: Savitch's Theorem, PSAPCE, L and NL completeness; Intractability theorems and Relativization techniques Advance topics: Probabilistic and Approximation Algorithms, Interactive Proof System, Parallel Computation, Cryptography	10
	Total Hours	56

Suggested Text books / Reference books:

1. Introduction to the Theory of Computation By Michael Sipser
2. An introduction to automata theory and formal languages By Adesh K. Pandey, Publisher: S.K. Kataria& Sons
3. Introduction to computer theory By Deniel I. Cohen , Joh Wiley & Sons, Inc
4. Computation: Finite and Infinite By Marvin L. Minsky Prentice-Hall
5. Compiler Design By Alfred V Aho, Addison Weslley
6. Automata Theory, Languages, and Computation By John Hopcroft, Rajeev Motowani, and Jeffrey Ullman

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
15%	25%	30%	20%	5%	5%

Suggested List of Tutorials:

Minimum 12 tutorials to be performed during the semester

Tutorial 1

Design Deterministic Finite Automata (DFA) with that accept the following Languages

1. The language over $\Sigma = \{a\}$ of any odd number of a's.
2. The language over $\Sigma = \{a,b\}$ of length exactly three.
3. The language over $\Sigma = \{a,b\}$ of length at least three.
4. The language over $\Sigma = \{a,b\}$ of length at most three.
5. The language over $\Sigma = \{a,b\}$ which starting with a and ending with b.
6. Let $L = \{w|n_a(w) mod 4 = 3\}$ (where $n_a(w)$ represents number of a^0s in string w) over $\Sigma = \{a,b\}$.
7. The language over $\Sigma = \{a,b\}$ of any even number of $a's$ and any odd number of $b's$.
8. The language over $\Sigma = \{a,b\}$, where number of $a's$ are even and number of b's are divisible by 3.
9. The language over $\Sigma = \{0,1\}$ whose decimal equivalent is an odd integer.
10. The language over $\Sigma = \{0,1\}$ whose decimal equivalent is divisible by 3.

Tutorial 2

1. Design Deterministic Finite Automata (DFA) with that accept the following set of strings over $\Sigma = \{a,b\}$

1. Containing at least one **a** or at least two **b's**.
2. Containing at least one **a** and at most one **b**.
3. Containing even number of **a's** and no adjacent **a's**.
4. Containing alternating **a's** and **b's**.
5. Containing even length strings where second symbol is **b**.
6. Containing **aba** as a substring.
7. Set of all strings other than **a** and **bb**.
8. Containing at least two **a's**.
9. Set of all strings such that no two **b's** are adjacent.

2. Design a DFA for the language $L = \{a^n b|n \geq 0\}$ over $\Sigma = \{a,b\}$. Hence, design DFA for language

1. accepting L^2.
2. accepting $L^2 - L$.
3. let D = {w — w contains even number of a's and an odd number of b's and does not contain the substring ab}. Give a DFA with five states that recognizes D with $\Sigma = \{a,b\}$.

Tutorial 3

1. Design DFA for the given NDFA $M_1 = (\{q_0,q_1,q_2\},\{a,b\},\delta,q_0,\{q_2\})$

Table 1: NDFA M_1

	a	b
→ q_0	$q0,q1$	$q2$
$q1$	$q0$	$q1$
$q2$		$q0,q1$

2. Design DFA for the given NDFA $M_2 = (\{q_0,q_1,q_2,q_3\},\{0,1\},\delta,q_0,\{q_3\})$

Table 2: NDFA $M_2 1$

	0	1
→ q_0	$q0,q1$	$q0$
$q1$	$q2$	$q1$
$q2$	$q3$	$q3$
$q3$		$q2$

3. Construct a Melay machine ($\Sigma = \{0,1\}$) which can output EVEN, ODD according as the total number of 1's encountered is even or odd.
4. Construct DFA accepting each of the following languages:

(a) $\{w \in \{a,b\}^* : \text{each } {}^0a^0 \text{ in } w \text{ is immediately preceded by a } {}^0b^0\}$.

(b) $\{w \in \{a,b\}^* : w \text{ has } abab \text{ as a substring}\}$.

(c) $\{w \in \{a,b\}^* : w \text{ has neither } aa \text{ nor } bb \text{ as a substring}\}$.

(d) $\{w \in \{a,b\}^* : w \text{ has both } ab \text{ and } ba \text{ as substrings}\}$.

5. Minimize the given FA, $M_3 = (\{q_i | i = 0,1,...,7\},\{a,b\},\delta,q_0,\{q_3\})$

Tutorial 4

Write a C program to minimize the given DFA with optimal number of states.

Table 3: FA M_3

	a	b
→ q_0	$q1$	$q0$
$q1$	$q0$	$q2$

$q2$	$q3$	$q1$
$q3$	$q3$	$q0$
$q4$	$q3$	$q5$
$q5$	$q6$	$q4$
$q6$	$q5$	$q6$
$q7$	$q6$	$q3$

Tutorial 5

1. Consider the set of strings on $\{0,1\}$ defined by the requirements below, Design RE for each of the given requirement.

(a) Every 00 is followed immediately by a 1. For example, the strings 101,0010,0010011001 are in the language, but 0001 and 00100 are not.

(b) all strings containing 00 but not 000.

(c) The leftmost symbol differs from the rightmost one.

(d) Every substring of four symbols has at most two 0's. For example, 001110 and 011001 are in language, but 10010 is not since one of its substrings, 0010 contains three zeros.

(e) All strings of length five or more in which the fourth symbol from the right end isdifferent from the leftmost symbol.

(f) All strings in which the leftmost two symbols and the rightmost two symbols areidentical.

2. Design Grammar, FA and Regular Expressions for the following over $\Sigma = \{a,b\}$: (Those who have done it in Lab 2, can skip in the this)

(a) Set of all words starting and ending with b.

(b) Set of all words with no two consecutive a's.

(c) Set of all words exactly two b's.

(d) Set of all words having even number of a's followed by odd number of b's.

(e) Set of all words with at least one a and at least one b.

Tutorial 6

1. Find a Context Free Grammar (CFG) for the set of all regular expression on the alphabet $\{a,b\}$.
2. Find CFG for the following languages (with $n \geq 0, m \geq 0$ and $k \geq 0$)

(a) $L = \{a^n b^m c^k : n = morm \leq k\}$

(b) $L = \{a^n b^m c^k : k = n + m\}$

(c) $L = \{a^n b^m c^k : k \geq 3\}$ (d) $L = \{a^n b^m c^k : k = |n - m|\}$

3. Let $L = \{a^n b^n : n \geq 0\}$.

(a) Show that L^2 is Context free.

(b) Show that L^k is Context free for any given $k \geq 1$.

4. Consider the following grammar

$S \rightarrow AB|aaB$

$A \rightarrow a|Aa$

$B \rightarrow b$

Check whether grammar is ambiguous or not. If yes, then construct equivalent unambiguous grammar.

5. Based on your knowledge on C language, write formal definition for the following constructs:

(a) if-else statement

(b) for statement

(c) variable declaration (assume only int, char, float)

Tutorial 7

1. Find minimum length string generated by the grammar.

$S \rightarrow aB$

$B \rightarrow b$

$B \rightarrow bS$

$B \rightarrow aBB$

$S \rightarrow bA$

$A \rightarrow a$

$A \rightarrow aS$

$A \rightarrow bAA$

2. Design PDA for the following language. $\{a^l b^m c^n | 2l = m + n\}$
3. Design NPDA for accepting the language L = $\{a^n b^n c^m | m,n >= 1\}$
4. Design DPDA $\{a^n b^n : n \geq 1\} U \{a\}$
5. Design DPDA $\{WcW^R : W \in \{a,b\}^*\}$
6. Construct a PDA with two states , one initial and one final state.$\{a^m b^n c^{2(m+n)} : m, n \epsilon N\}$
7. Write an algorithm to construct a CFG from a given regular expression. Note that theCFG need not be a Regular Grammar. Prove the correctness of the algorithm.
8. Find CFGs that generate the following languages

(a) $\{a^{n+1} b^2 a b^n : n \in N\}$

(b) {uawb : $u,w \in \{a,b\}^*$, $L(u) = L(w)$ }

(c) $\{a^m b^n : 1 \leq m \leq n\}$

(d) $\{a^m b^n c^k : k = |m - n|; m,n,k \in N\}$

Tutorial 8

Write a program to accept a Grammar from user, output the Language accepted by that grammar.

Here are few assumptions that you can have

1. Upper case characters are Variables of Grammar.
2. Lower case characters are Terminals of Grammar.
3. You can use : as separator instead of in the production rule.
4. Each rule is written on new line. You may also use — as separator between multiple rules ifleft part is same.

Tutorial 9

Use this Turing machine simulation environment http://morphett.info/turing/turing.html Syntax Info Understand it and you can code also. There are some inbuilt examples to work out.

Tutorial 10

Study the Grammar of C Language. Design simple grammar for take performing basic arithmetic operations.

Tutorial 11

Write a C program to find the starting and ending of comments in C file (given by user) for single line and multiline comments.

Tutorial 12

Write a C program to find the starting and ending of loop statements (nested too) in input C file.

Supplementary Resources:

1. https://nptel.ac.in/courses/106104028/

Subject Code: 01GS0501

Subject Name: Cognitive Aptitude 1

B. Tech. Year – III (Semester V)

Objective:
This course shall enrich students' preparedness for the upcoming competitive exams, entrance test, and/or placements. It will enhance the numerical skills of the students through the group interactions, practice sessions, and videos.

Credits Earned: 00 Credit

Course Outcomes: After completion of this course, student will be able to:

1. Develop thinking skills by practicing on complex numerical computations
2. Inculcate smart approach in numerical problem solving
3. Apply the concepts in both competitive exams and placement drives
4. Solve real-life problems requiring interpretation and comparison of complex numeric summaries
5. Create and use visual displays of data

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
02	00	00	00	00	00	00	00	00	00

Contents:

Unit	Topics	Hours
1	Introduction of Quantitative Aptitude	01
2	**Simplification (Word Problems)** Expressions and Equations, Tactics of solutions, Linear Equations, Solving Linear Equations, Word Problems	02
3	**HCF & LCM** Calculation of HCF and LCM , Find smallest & largest numbers divisible by given numbers, Common remainder & difference between number and remainder type, Calculation of LCM & HCF of Fraction Numbers	02
4	Class Test 1 and doubt solving session	01

5	**Average** Simple average calculation, Related examples, Combined mean & weighted average, Corrected mean & New mean	02
6	**Ratio and Proportion** Ratio & Proportion, Ratio concept and rules & distributing amount in ratio	02
7	Class Test 2 and doubt solving session	01
8	**Partnership** Partnership, Partnership ratio and profit distribution	01
9	**Mixture and Allegation** Rule of allegation, Concept of Replacement	02
10	Class Test 3 and doubt solving session	01
11	**Percentage** Reciprocals & equivalent percentage, Speed techniques of calculating percentage, Change of base concept, Multiplying factor concept	02
12	**Profit, Loss & Discount** Explanation of basic terms, Simple profit & loss concept, Discount & multiple discount concept, Faulty balance & wrong measurement , discount or mark up or mixing impurities, Other combined examples	01
13	Class Test 4 and doubt solving session	01
14	**Simple Interest** Important formulae & Calculation, Calculation of missing value concept, Difference between SI and CI for various years, Comparison of SI and CI investment concept	01
15	**Compound Interest** Difference between SI and CI for various years, Comparison of SI and CI investment concept	01
16	Class Test 5 and doubt solving session	01
17	**Data Interpretation** Study of various charts and Problem related to charts	02
18	**Data Sufficiency** Yes / No Questions, Value Questions	01
19	Class Test 6 and doubt solving session	01
20	Post Assessment Test and doubt solving session	02
	Total Hours	28

Suggested Text books / Reference books:

1. Quantitative Aptitude – By Dr. R. S. Agarwal, S. Chand
2. Quantitative Aptitude – By Abhijit Guha, MC Graw Hills
3. Magical Book On Quicker Maths – By M. Tyra, BSC Publishing Co. Pvt. Ltd.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
25%	25%	25%	25%	0%	0%

Supplementary Resources:

1. www.indiabix.com
2. www.careerbless.com
3. www.sawaal.com
4. www.allindiaexams.com
5. www.freshersworld.com

Faculty of Technology

B. Tech. in Information and Communication Technology

Semester VI

Subject Code: 01CT0601

Subject Name: Digital Signal Processing

B. Tech. Year – III (Semester VI)

Objective:
The purpose of this course is to provide an understanding of Digital Signal Processing. Topics include: Introduction to digital signal processing and application, discrete time signals and systems; Analysis of LTI systems; Structures of discrete time systems; Filter designing techniques; DFT and FFT; Architecture of DSP Processors, and Multi-rate Signal Processing and applications.

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand Digital Signal Processing using concepts of Discrete time signals and systems.
2. Analyse the signals in both time and frequency domain
3. Implement various realisation structures of FIR and IIR filters.
4. Interpret design method of FIR and IIR Filters.
5. Apply signal processing to various areas such as speech and audio processing, image Processing, biomedical signal processing.

Pre-requisite of course:
Signals and Systems, Analog and Digital Electronics

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	02	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Overview of Discrete Time Signals and Systems** Introduction to Digital Signal Processing, A review of Continuous Time and Discrete Time Signals, Sampling Theorem, Z-transform, Poles and Zeros, Convolution, Stability and Causality of LTI systems, Discrete Time Fourier Transform (DTFT) and Important Properties, Frequency Response of Discrete Time Systems.	08
2	**Frequency Transformations** Introduction to DFT, Properties of DFT, Circular Convolution FFT Algorithms Decimation – in – time Algorithms, Decimation – in – frequency Algorithms – Use of FFT in Linear Filtering.	06
3	**Structures for Discrete Time Systems** Block Diagram and signal flow diagram representations of Linear Constant-Coefficient Difference equations, Basic Structures of IIR Systems, lattice and lattice-ladder structures, Transposed forms, Direct and cascade form Structures for FIR Systems, Linear Phase FIR structure, Effects of Co-efficient quantization	08
4	**IIR Filter Design** Structures of IIR, Analog filter design, Discrete time IIR filter from analog filter, IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives ,Filter design using frequency translation.	08
5	**FIR Filter Design** Structures of FIR – Linear phase FIR filter – Fourier Series – Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques	08
6	**Architecture of DSP Processors & applications** Harvard architecture, pipelining, Multiplier-accumulator (MAC) hardware, architectures of fixed and floating point DSP processors. Applications	04
	Total Hours	42

Suggested Text books / Reference books:

1. Proakis and Manolakis, Digital Signal Processing: Principles, Algorithm & Application, Pearson.
2. Digital Time Signal Processing Oppenheim Schafer, Buck Pearson education
3. S.Salivahanan, A.Vallavaraj, C.Gnapriya, Digital Signal Processing, TMH.
4. Understanding Digital Signal Processing by Richard G.Lyons, Third edition, Pearson.
5. B.Venkatramani, M Bhaskar, Digital Signal Processors, Architecture, programming and applications, Mc-Graw Hill.

6. Sen M. Kuo, Woon-Seng S. Gan, Digital Signal Processors: Architectures, Implementations, and Applications, Pearson education India.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	20%	40%	15%	10%	5%

Suggested List of Experiments:

1. Simulation of basic signal generation and operation on signal.
2. Simulation of Linear convolution and Circular convolution.
3. Write a program to demonstrate sampling and aliasing effect.
4. Simulation of discrete correlation.
5. To Perform Z- transform and find Poles, Zeros and gain from a given Z-Transform using software tool.
6. Simulation of DFT and IDFT.
7. To design FIR filter by windows technique.
8. Simulation of various filter structures on DSP software and hardware platforms.
9. Simulation of IIR filter for given design specifications.
10. Application of different filters on Speech and Image signals.
11. Simulation of Equalizer
12. Architecture of Digital Signal Processor of TMS 320C6000

Supplementary Resources:

1. https://nptel.ac.in/courses/108105055
2. https://ocw.mit.edu/resources/res-6-008-digital-signal-processing-spring-2011/video-lectures/

Subject Code: 01CT0602

Subject Name: Wireless Communication and Mobile Computing

B. Tech. Year – III (Semester VI)

Objective:
Wireless Communication and Mobile computing focus on fundamentals of wireless systems, cellular mobile concepts, fading, diversity techniques, various wireless systems like GSM, GPRS, CDMA, Bluetooth, Wi-Fi, Wi-Max, ZigBee along with mobile computing. Development of android applications to work with wireless modules available on mobiles.

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Illustrate the fundamentals of cellular architecture and channel capacity.
2. Summarize the principles and architecture of wireless systems and standards.
3. Analyze the mobile radio propagation, diversity, fading and the channel modelling.
4. Analyze Multiuser systems like CDMA, FDMA, TDMA, WCDMA and OFDM concepts.
5. Create mobile app by implementing concepts of mobile computing for IoT field using android platform.

Pre-requisite of course:
Knowledge of digital and analog Communication, Signals & Systems, Electromagnetic theory, Probability & Random processes, algorithm and data structures and object programming

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	02	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to Wireless Communication System** Evolution of mobile communications, Mobile Radio System around the world, Types of Wireless communication System, Comparison of Common wireless system, Trend in Cellular radio and personal communication. Second generation Cellular Networks, Third Generation (3G) Wireless Networks, Wireless Local Loop WLL), Wireless Local Area network (WLAN), Bluetooth and Personal Area Networks.	07
2	**Cellular Communications** The Cellular Engineering Fundamentals: Introduction, Cell, Frequency Re-use, Channel Assignment Strategies, Fixed and Dynamic Channel Assignment Strategies, Handoff Process, Factors affecting Handoff Process, Handoff Strategies, Few practical cases of Handoff Scenario, Interference and System Capacity, Co-channel Interference (CCI), Adjacent Channel Interference (ACI), Cell Splitting, Sectoring, Microcell Zone concept, Repeaters.	07
3	**Wireless Communications and Diversity** Types of Fading: fast fading vs. slow fading, flat fading vs. selective fading, Fading Channels: AWGN, Rayleigh, Rician, BER performance for various fading conditions, Types of Diversity – Frequency, Time, Space, Angle and Polarization, Diversity combining techniques, BER performance improvement with diversity	07
4	**Wireless Systems** GSM system architecture, Radio interface, Protocols, Localization and calling, Handover, Authentication and security in GSM, GSM speech coding, Concept of spread spectrum, Architecture of IS-95 CDMA system, Air interface, CDMA forward channels, CDMA reverse channels, Soft handoff, CDMA features, Power control in CDMA, Performance of CDMA System, RAKE Receiver, CDMA2000 cellular technology, GPRS system architecture.	08
5	**Recent Trends** Introduction to Wi-Fi, WiMAX, ZigBee Networks, Software Defined Radio, UWB Radio, Wireless Adhoc Network and Mobile Portability, Security issues and challenges in a Wireless network	06
6	**Mobile Application Development** Android platform: virtual machine, development tools, packages, emulators, services, Structure and lifecycle of an application for Android system, Graphical User Interface, Processing of application resources, content providers, filesystem, Data persistence: backups, databases, Application security and permissions, Network communication and internet applications, Wi-Fi connections, Multimedia processing, Geographical location, Bluetooth communication, Application deployment	07
	Total Hours	42

Suggested Text books / Reference books:

1. Theodore S. Rappaport, "Wireless Communications: Principles and Practices", 2nd edition, Prentice Hall
2. Vijay Garg, "Wireless Communications and Networking", Elsevier
3. C. K. Toh, “Ad hoc Mobile Networks”, Pearson
4. William Stallings, " Wireless Communications and Networking ", 2nd edition, Pearson
5. Asoke K. Telukar, Roopa R. Yavagal, “Mobile Computing: Technology, Applications and Service Creation”, TMH
6. Raj Kamal, “Mobile Computing”, Oxford
7. Dr. Sunilkumar S. Manvi, Dr. Mahabaleshwar S.Kakkasageri, “Wireless and mobile networks”, WILEY
8. Steele J, “The Android Developer's Cookbook: Building Applications with the Android SDK”, Addison-Wesley Professional, 2010
9. Charlie Collins, Michael Galpin, Matthias Kappler, “Android in Practice”, Manning Publications 2012
10. Burnette E, “Hello, Android: Introducing Google's Mobile Development Platform”, Pragmatic Bookshelf , 2010

Suggested Theory distribution:

The suggested theory distribution as per Bloom’s taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	30%	15%	10%	5%

Suggested List of Experiments:

1. Introduction to Android Integrated Development Environment. Develop an app that displays “Hello World !!!” message.
2. Create a login Activity. It asks “username” and “password” from user. If username and password are valid, it displays Welcome message using new activity.
3. Develop calculator android application.
4. Develop an app for multimedia processing.
5. Developing an app for data persistance.
6. Develop an app to establish http connection and toast notification.
7. Develop an app that auto sends received SMS.
8. Develop an app that identifies the Bluetooth devices in the wireless range.
9. Develop an app for text communication using Bluetooth.

10. Develop an app that prints the signal strength of Wi-Fi connection
11. Develop an app that marks present location of device on google map.
12. Develop an app that demonstrate use of any built-in sensor.

Supplementary Resources:

1. https://nptel.ac.in/courses/117/102/117102062/
2. https://nptel.ac.in/courses/106/106/106106147/
3. https://www.coursera.org/learn/wireless-communications

Subject Code: 01IT0601

Subject Name: Software Engineering

B. Tech. Year – III (Semester VI)

Objective:
To understand and apply various software project management techniques based on Software Engineering guidelines and Principles.

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand various software engineering principles and their application
2. Demonstrate use of various Agile methodologies for software development
3. Apply various modelling techniques for designing system requirement
4. Identify different types of risk and evaluate its impact on software system
5. Distinguish different testing strategies and Create test cases
6. Able to understand and apply the basic project management practices in real life projects

Pre-requisite of course:
Object Oriented Programming fundamental

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	02	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction** Software engineering, Dual role of software, Software Crisis history, Various Myths Associated with Software, Different Software Process Models, The Linear Sequential Model, The Prototyping Model, The RAD Model, Evolutionary Process Models, Component-Based Development, Process, Product and Process.	04

2	**Agile Development** SDLC: Agile Method, Manifesto, Various Agile Modeling Techniques, Scrum, Scrum Reference Card, LSS (Large Scale Scrum), XP, ASD, Crystal.	04
3	**Project Management Concepts, Requirement Engineering & Metrics** The Management Spectrum, 4P's (The People, The Project, The Product), The W5HH Principle. Basic concept of Requirement (Functional & Non-Functional), Requirement Modeling and Analysis. Software Process and Project Metrics, Measures, Metrics, and Indicators, Metrics in the Process and Project Domains, Software Measurement, Metrics for Software Quality.	05
4	**Project Planning Scheduling & Tracking** Software Scope, Feasibility Analysis, Empirical Estimation Models, defining a Task Set for the Software Project, Defining a Task Network, Scheduling	03
5	**Risk Analysis and Management** Reactive versus Proactive Risk Strategies, Risk Management Process, Risk Identification, Risk Projection, Risk Refinement, RMMM Plans, Safety Risks and Hazards.	04
6	**Software Quality & Configuration Management** Quality Concepts and Software Quality Assurance, Quality principles and Attributes, Quality Audits. Software Reviews, Formal Technical Reviews, The SQA Plan, Software Reliability, The Quality Standards: ISO 9000, CMM, Six Sigma for SE, Software Versioning and Change Control.	05
7	**Software Analysis and Design Modeling** The Elements of the Analysis Model, Data Modeling, Functional Modeling and Information Flow, Behavioral Modeling, Software Design and Software Engineering, The Golden Rules, Design Principles and Design Concepts (Abstraction, Refinement, Modularity, Software Architecture, Control Hierarchy, Structural Partitioning, Data Structure, Software Procedure, Information Hiding), Effective Modular Design (Functional Independence, Cohesion, Coupling), Design Documentation.	08
8	**Software Coding & Testing** Coding standards & Coding Guidelines, Code Review, Abstraction, Refinement, Modularity, Software Architecture, Control Hierarchy, Software Testing Techniques, Software Testing Fundamentals, and White Box Testing Techniques in detail and Black Box Testing Techniques in detail.	05
9	**Advance Topics** Clean Room Software Engineering, Web Engineering, Re-Engineering, Computer Aided Software Engineering, Software as a Service, SaaS Architecture, Emergency Trends in Software Engineering, Client/Server Software Engineering.	04
	Total Hours	42

Suggested Text books / Reference books:

1. Roger S.Pressman, Software engineering- A practitioner's Approach, McGraw-Hill International Editions
2. Ian Sommerville, Software engineering, Pearson education Asia
3. Pankaj Jalote, Software Engineering – A Precise Approach Wiley
4. Software Engineering Fundamentals by Ali Behhforoz & Frederick Hudson OXFORD
5. Rajib Mall, Fundamentals of software Engineering, Prentice Hall of India.
6. Engineering Software as a Service and Agile Software Approach, Armando Fox and David Patterson
7. John M Nicolas, Project Management for Business, Engineering and Technology, Elsevier.
8. Nageswara Rao Pusuluri, Software Testing Concepts and Tools, DreamTech
9. Sanjay Mohapatra, Software Project Management, Cengage Learning

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	20%	10%	30%	20%	10%

Suggested List of Experiments:

1. Introduction to GIT and account creation on GIT.
2. Introduction to Team Foundation server tool.
3. Study of Various Testing Tool:
    a. Win Runner 8.0: Checkpoints in Winrunner, Data Driven and Batch Testing. Load Runner 8.0: VuserScript Creation, Execution and Result using Load Runner. Test Director 8.0: Site Administrator, Understanding Test Director.
4. Prepare SRS document for considering any specific Social Project in detail

Detail of Report / Chapter wise:

1. Introduction
    a. Project Summary – Key to a good summary is the FIRST sentence, which MUST contain the most essential information that you wish to convey
    b. Purpose: Goals & Objectives
    c. Scope (Scope – what it can do and can't do)
    d. Technology and Literature Review of Past Work/System
2. Project Management
    a. Project Planning and scheduling
        i. Project Development Approach (Process Paradigm) and Justification

ii. Project Plan including Milestones, Deliverables, Roles, Responsibilities and Dependencies
iii. Schedule Representation

b. Risk Management
   i. Risk Identification (it is concerned with discovering possible risk to the project)
   ii. Risk Analysis (each identified risk is considered in turn and a judgment made about the probability and the seriousness of the risk)
   iii. Risk Planning (Identify strategies to manage the risk)
   Note: Discuss the risks associated with your project or system only.

c. Estimation
   i. Effort Estimation
   ii. Cost Analysis (Total cost of the project including resources and labors. Labor cost should be broken down into the areas of design, analysis, prototype construction, software development, hardware- software integration, testing, design modifications and documentation. A cost analysis is NOT a tabulation of your expenditure)

3. System Requirements Study
   a. User Characteristics (Type of users who is dealing with the system)
   b. Hardware and Software Requirements (minimum requirements to run your system)
   c. Constraints
      i. (It includes Regulatory Policies, Hardware Limitations, Interfaces to Other Applications, Parallel Operations, Higher Order Language Requirements, Reliability Requirements, Criticality of the Application, Safety and Security Consideration, Assumptions and Dependencies or any other constraints related to your system).

4. System Analysis
   a. Study of Current System
   b. Problem and Weaknesses of Current System
   c. Requirements of New System
      i. Mention all functional and non- functional including user and system requirements)
   d. Feasibility Study
      i. (In this section, does feasibility analysis by finding answers of the questions like Does the system contribute to the overall objectives of the organization? Can the system be implemented using the current technology and within the given cost and schedule constraints? Can the system be integrated with other systems which are already in place? etc.)
   e. Requirements Validation (is concerned with showing that the requirements actually define the system which the customer wants)
   f. Functions of System
      i. Use Cases, event trace or scenario

g. Data Modeling
    i. Class Diagram/ E-R diagrams
    ii. System Activity or Object interaction Diagram
    iii. Data Dictionary
h. Functional and Behavioral Modeling
    i. Context Diagram
    ii. Data Flow Diagram (0 and 1 level)
    iii. Process Specification and Decision Table
    iv. Control flow diagram
i. Main Modules of New System
j. Selection of Hardware and Software and Justification

Note: Prepare System Requirement Specification (SRS) after analysis phase. Choose appropriate guideline for your system.

5. System Design
    a. Database Design/Data Structure Design
        i. Mapping objects/classes to tables (if non OO languages)
        ii. Tables and Relationship
        iii. Logical Description of Data
    b. System Procedural Design
        i. Designing Pseudo code or algorithm for Method or operations
        ii. Flow chart or activity design
    c. Input / Output and Interface Design
        i. Samples of Forms, Reports and Interface
        ii. Access Control and Security
        iii. State-Transition Diagram
    d. System Architecture Design
        i. (Transformation of DFD into structural chart/Hierarchical Charts which shows control hierarchy of modules or sub-systems)

        NOTE: If your criteria do not match with above design then refer various CASE Tools for your application and find suitable design. Don't blindly select these designs. Do find appropriate Design Style suitable to your project work.
6. Implementation Planning and details
    a. Implementation Environment (Single vs Multiuser, GUI vs Non-GUI)
    b. Program/Modules Specification
    c. Security Features
    d. Coding Standards
    e. Sample Coding
7. Testing (choose appropriate testing strategy or techniques suitable to your system)
    a. Testing Plan
    b. Testing Strategy
    c. Testing Methods
    d. Test Cases (Purpose, required output, Expected Result)
8. Screen shots and User manual

9. Limitation and Future Enhancement
10. Conclusion and Discussion

Supplementary Resources:

1. http://nptel.ac.in/courses/106101061/
2. https://www.joelonsoftware.com/
3. http://www.codesimplicity.com/
4. http://www.sparxsystems.com/products/ea/index.html
5. http://www.smartdraw.com
6. http://viu.eng.rpi.edu
7. www.en.wikipedia.org/wiki/Software_engineering
8. www.win.tue.nl
9. www.rspa.com/spi
10. www.onesmartclick.com/engsineering/software-engineering.html
11. www.sei.cmu.edus
12. https://www.edx.org/school/uc-berkeleyx

Subject Code: 01CT0603

Subject Name: Reverse Engineering

B. Tech. Year – III (Semester VI)

Objective:
Reverse engineering is the process of extracting knowledge from anything and reproducing something based on identified information. The process often involves disassembling a computer program or electronic device and analyzing its components & working in detail. Objective of this course is to make students capable and confident in analysis skill.

Credits Earned: 01 Credit

Course Outcomes: After completion of this course, student will be able to:

1. Understand method of analysis of already existing systems
2. Distribute the system in small functional units and analyse the system in detail
3. Identify possible improvements and solutions to decrease development cost or timings associated with development and improved functionality or usability
4. Suggest required change/es in existing system to make it more efficient with prototype, schematic plan or dirty mock-ups

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
00	00	02	01	00	00	00	50	50	100

Contents:

Unit	Topics	Hours
1	**Introduction to reverse engineering** Important reasons for executing reverse engineering, methodologies for reverse engineering, understanding of reverse engineering through examples, process for reverse engineering, various phases, difficulties in reverse engineering, levels of abstraction: application level, functional level and structural level	06
2	**Reverse engineering methodology** Detailed study of reverse engineering for branch specific learnings, dissemble the existing selected software, artefact, product, component, process or system to study technical aspects and design detail, importance of reverse engineering in various computer software and electronics hardware, case studies	06
3	**Reverse engineering analysis techniques and tools** Reverse engineering of software and hardware, binary reverse engineering, binary software techniques, software classification, source code, number of UML tools, reverse Engineering of protocols, circuit reverse engineering, circuit testing and analysis techniques, circuits classification, disassembler, debuggers, hex editors, portable executable & resource viewer, multimeter, DSO, spectrum analyzer	08
4	**Proof of concept** First prototype / schematic plan / Dirty Mock-ups	08
	Total Hours	28

Suggested Text books / Reference books:

1. Eldad Eilam , “Reversing: Secret of Reverse Engineering”,Wiley Publishing
2. Reverse Engineering, Wills, Linda M., Newcomb, Philip (Eds.), Springer, 1996
3. Practical Reverse Engineering: x86, x64, ARM, Windows® Kernel, Reversing Tools, and Obfuscation, Bruce Dang, Alexandre Gazet, Elias Bachaalany, John Wiley & Sons
4. Bruce Dang, AlexandreGazet, Elias Bachaalany and SebastienJosse, Practical Reverse Engineering, First Edition, Wiley Publishers, 2014.
5. EldadEilam, Reversing: Secrets of Reverse Engineering, Wiley Publishers, 2005.

Suggested Theory distribution:

The suggested theory distribution as per Bloom’s taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
00%	10%	20%	40%	20%	10%

Supplementary Resources:

1. http://opensecuritytraining.info/IntroductionToReverseEngineering.html
2. https://github.com/wtsxDev/reverse-engineering
3. https://www.iisecurity.in/courses/reverse-engineering-training.php

Subject Code: 01CT0604

Subject Name: Embedded System Design

B. Tech. Year – III (Semester VI)

Objective:
This course introduces the basic concepts of Embedded System Design and Real time systems and RTOS, further this course also introduce porting, developing and debugging Real Time Embedded systems using ARM CortexM based microcontroller and FreeRTOS.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Get insight of design metrics of Embedded systems to design real time applications to match recent trends in technology.
2. Understand Real time systems concepts.
3. Get to know the hardware – software co design issues and testing methodology for Embedded system.
4. Develop RTOS based embedded application.
5. Debug RTOS based embedded application using trace tool.
6. Effectively utilize ARM CortexM based microcontroller and RTOS to solves real world problems.

Pre-requisite of course:
ARM Cortex M Architecture and Embedded C programming

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to Embedded System Design** Introduction to Embedded Systems, Architecture, Classification and characteristics of Embedded System, Design Process, Design Metrics and optimization of various parameters of embedded system. Embedded processor technology, IC technology, Design technology. Software development life cycle. Various models like waterfall, spiral, V, Rapid Prototyping models and Comparison.	8
2	**Realtime Systems Concepts** Real Time Systems, Characteristics of RTOS, Misconceptions about RTOS, Classification of RTOS, Critical section of code, Resource, Shared resource, multitasking, Task, Context switch, Kernel, Scheduler, Non-Preemptive Kernel , Preemptive Kernel, Reentrancy, Round robin scheduling, Task Priorities, Static & Dynamic Priority, Priority Inversion, Assigning task priorities, Mutual Exclusion, Deadlock, Clock Tick, Memory requirements, Advantages & disadvantages of real time kernels.	16
3	**Free RTOS** FreeRTOS Introduction, FreeRTOS Port distribution and configuration, Task management, Heap memory management, Queue management, Semaphore and mutex, Interrupt management, FreeRTOS Trace.	16
4	**Embedded Software Development & Testing Tools** Embedded Software development process and tools, Host and Target Machines, linking and Locating Software, Getting Embedded Software into the Target System, Issues in Harware Software Design and Co-design. Testing on Host Machine, Simulators, Laboratory Tools. Case study of Embedded system like Automatic Chocolate Vending Machine, Mobile Phone.	14
	Total Hours	54

Suggested Text books / Reference books:

1. “Embedded Systems – Architecture, Programming and Design” 2nd edition, by Raj Kamal, McGraw Hill.
2. “Embedded System Design – A Unified hardware/ Software introduction” 3rd edition, by Frank Vahid and Tony Givargis, Wiley.
3. Mastering the FreeRTOS™ Real Time Kernel, A Hands-On Tutorial Guide, By Richard Barry, © Real Time Engineers Ltd. 2016
4. The FreeRTOS™ Reference Manual API Functions and Configuration Options Amazon Web Services, © Real Time Engineers Ltd. 2016

Suggested Theory distribution:
The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
25%	20%	30%	5%	5%	15%

Suggested List of Experiments:
Minimum 12 experiments to be performed during the semester

1. Installation of Keil MDK-ARM IDE and ST CubeMX tool for developing Embedded Application using STM32 ARM Cortex-M based microcontroller.
2. Hands-on experimentation of Multitasking in FreeRTOS.
3. Hands-on experimentation of Cooperative and preemptive priority driven scheduling in FreeRTOS.
4. Hands-on experimentation of Binary Semaphore in FreeRTOS for task synchronization.
5. Hands-on experimentation of Binary Semaphore in FreeRTOS for ISR.
6. Hands-on experimentation of Counting Semaphore in FreeRTOS for resource management.
7. Hands-on experimentation of Mutex in FreeRTOS for resource management.
8. Hands-on experimentation of priority inversion scenario in FreeRTOS.
9. Hands-on experimentation of priority inheritance scenario in FreeRTOS.
10. Hands-on experimentation of Heap Memory management in FreeRTOS.
11. Hands-on experimentation of using Trace tool to real time debug RTOS Application via JTAG.
12. Hands-on experimentation of porting FreeRTOS for any ARM Cortex-M based microcontroller.
13. Design Mini project based on STM32 ARM Cortex-M Microcontroller and FreeRTOS to solve real world problem.

Supplementary Resources:
1. https://freertos.org/
2. https://www.st.com/en/evaluation-tools/nucleo-l476rg.html

Subject Code: 01CT0605

Subject Name: RF and Microwave Communication

B. Tech. Year – III (Semester VI)

Objective:
This course is designed to understand and analyses various components used in RF and Microwave communications like transmission lines, waveguides, microwave components etc. It also focuses on various methods and tools used to analyses various circuit designs. Subject is extended to the design of strip lines and micro strip lines, MIC, MMIC

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand applications, concepts and design aspects of transmission lines and waveguides
2. Apply scattering and other parameters in microwave circuit analysis and design
3. Measure various parameters using smith chart
4. Understand design and analyse various microwave components, tubes and circuits
5. Design of microwave strip and integrated Circuits

Pre-requisite of course:
Basic understanding of electrodynamics

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction** Spectrum of RF and microwave frequencies, Frequency bands and regions of spectrum allocations, Decibel for power ratios, representation of Power-Voltages dBm, dBW, dBμV/m, Modeling lumped and distributed components at radio frequencies, Propagation of EM waves, Application of RF and microwaves	08
2	**Transmission lines and distributed systems** Introduction to transmission lines and familiar examples, Lumped and distributed systems, Telegraph equations and the waves solution, Wave equation, Characteristic impedance and propagation velocity, Load effect on the reflected wave, Types of transmission lines (coaxial, conductor-pair, printed – microstrip, stripline), Standing-wave in a transmission-line, Reflection coefficient and voltage-standing-wave-ratio (VSWR), Efficiency of power-transfer, Short, open, and matched loads' impedance as viewed at the end of a variable-length transmission line, Reflection parameters, Transmission parameters, Wave representation of two-port and the s-parameters, Phase velocity and group velocity, Dispersion	16
3	**The Smith Chart and Impedance Matching** Smith chart – impedance on the reflection plane, Review of transmission lines and normalized impedances, Display of smith chart – constant resistance and reactance circles, Presenting admittance in the smith chart, Technique for impudence matching, Fixed SWR circles, Finding the impedance seen into a loaded reactive circuit, Impedance matching – L, π, T, sections, transmission lines and stubs, Bandwidth of matching networks, Quarter wavelength transformer	12
4	**Microwave Components** Wave-guide tees, Magic tee, Directional couples, Circulars and isolators, Corners, Bends, Twists, Flanges, Matched termination, Coupling probes, Loops	08
5	**Microwave Tubes and Circuits** Limitations of conventional tubes at UHF & Microwave, Klystrons, Velocity modulation, Multi cavity klystron, Reflex klystron, Traveling wave tube, Magnetron.	07
6	**Micro Strip & Integrated Circuits** Strip lines and micro strip lines, MIC, MMIC	05
	Total Hours	56

Suggested Text books / Reference books:

1. Samuel Liao, Microwave Devices and Circuits, PHI
2. David Pozar, Microwave Engineering, Wiley
3. Dennis Roddy, Microwave Technology, PHI
4. Annapurna Das, Sisir K.Das, Microwave Engineering, TMG
5. Microstrip Circuit Analysis - David H. Schrader, Prentice Hall PTR, New Jersey
6. Devendra K. Misra, Radio-Frequency and Microwave Communication Circuits, John Wiley & Sons
7. Kai Chang, Inder Bahl, Vijay Nair, RF and Microwave Circuit and Component Design for Wireless Systems

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	30%	15%	10%	5%

Suggested List of Experiments:

1. Introduction to HFSS Software.
2. To Understand 3D Modeling, Properties, Commands & Attributes for Antenna Design.
3. To Apply Wave Port Excitation, Radiation Setup & Analysis to antenna using HFSS.
4. To create, simulate, and analyze a UHF probe using the Ansoft HFSS Design Environment.
5. To create, simulate, and analyze a Monopole and Dipole Antenna using the Ansoft HFSS Design Environment.
6. To create, simulate, and analyze a waveguide horn Antennas using the Ansoft HFSS Design Environment.
7. To create, simulate, and analyze Horn Antenna using the Ansoft HFSS Design Environment.
8. To create, simulate, and analyze Helix Antenna using the Ansoft HFSS Design Environment.
9. To create, simulate, and analyze Array Antenna using the Ansoft HFSS Design Environment.
10. To create, simulate, and analyze Probe Feed Patch Antenna using the Ansoft HFSS Design Environment.
11. To create, simulate, and analyze Slot Coupled Patch Antenna using the Ansoft HFSS Design Environment.

12. To create, simulate, and analyze Corner Reflector using the Ansoft HFSS Design Environment.

Supplementary Resources:

1. http://www.ni.com/product-documentation/3992/en
2. https://www.keysight.com/main/editorial.jspx?cc=IN&lc=eng&ckey=2129625&id=2129625&cmpid=zzfindrfresource
3. https://www.udemy.com/rf-microwave-radio-transmission-theory-online-course-rahsoft-rahch200
4. https://rfandwireless.com/tutorials
5. https://www.qsl.net/va3iul/Files/RF_courses_lectures.htm
6. https://nptel.ac.in/courses/108101112

Subject Code: 01CT0606

Subject Name: Advanced Computer Networks

B. Tech. Year – III (Semester VI)

Objective:
Introduction of primary networking concepts and technologies is prime objective of this course. This course specifically make student able to develop the skills required to plan and implement small networks across a variety of networking applications.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand concepts of scaling networks and wireless LAN
2. Analyze OSPF operations, configuration and troubleshoot
3. Analyze EIGRP operations, configuration and troubleshoot
4. Analyze PPP operations, configuration and troubleshoot
5. Implement ACL for IPv4 and IPv6 with advance configuration

Pre-requisite of course:
Basics of Computer Networks

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to Scaling Networks** Introduction to Scaling Networks, implementing a network design, selecting network devices, LAN redundancy, spanning tree concepts, variety of spanning tree protocols, spanning tree configuration, first hop redundancy protocol (FHRP), Link aggregation concepts and configuration	06
2	**Wireless LAN** Wireless concepts, Wireless LAN operations, Wireless LAN security, Wireless LAN configurations	06
3	**OSPF** Advanced Single-Area OSPF concepts and configuration, Advanced Single-Area OSPF implementation and troubleshooting, Multiarea OSPF operations, Multiarea OSPF configuration	06
4	**EIGRP** Characteristics of EIGRP, EIGRP configuration for IPv4, EIGRP operations, EIGRP configuration for IPv6, Advanced EIGRP configurations, EIGRP troubleshooting	08
5	**Connecting Networks** WAN concepts, Overview and selection of WAN technologies, Concepts of point-to-point connections, Serial Point-to-Point Overview, PPP Operation and Implementation, PPP troubleshooting	06
6	**Branch Connections** Remote Access Connections, PPPoE, VPNs, GRE, eBGP	05
7	**ACL** Standard ACL Operation and Configuration, Extended IPv4 ACLs, IPv6 ACLs, Troubleshoot ACLs	05
8	**Network Security and Monitoring** LAN Security, SNMP, Switch Port Analyzer (SPAN), QoS Overview, QoS Mechanisms	07
9	**Network Evolution** Internet of Things, Cloud and Virtualization, Network Programming	07
	Total Hours	56

Suggested Text books / Reference books:

1. CCENT/CCNA ICND1 100-105 Official Cert Guide, 1st Edition by Wendell Odom, Cisco publication
2. CCNA Routing and Switching ICND2 200-105 Official Cert Guide 1st Edition by Wendell Odom, Cisco publication
3. CCENT ICND1 Study Guide: Exam 100-105 3rd Edition by Todd Lammle, Cisco publication

Suggested Theory distribution:

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Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	30%	15%	10%	5%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Implementation of Single-Area and Multiarea OSPF operations, configuration and troubleshooting.
2. Propagating a Default Route in EIGRP for IPv4 and IPv6 Instructions
3. Configuring Advanced EIGRP for IPv4 Features
4. Troubleshooting Advanced EIGRP
5. Implementation of PPP operations, configuration and troubleshooting.
6. Implementation of ACL operations, configuration and troubleshooting.
7. Configuring an ACL on VTY Lines Instructions
8. Configuring Extended ACLs - Scenario 2 Instructions
9. Configuring and Verifying IPv6 ACLs
10. Implementation of Spanning Tree Protocol
11. Wireless LAN configuration and security
12. Implementation and Troubleshooting of VTP and DTP
13. Configuring IPv4 Static and Default Routes
14. Configuring IPv6 Static and Default Routes

Supplementary Resources:

1. http://www.ciscopress.com/store/scaling-networks-companion-guide-9781587133282
2. https://www.netacad.com/courses/ccna/
3. https://learningnetwork.cisco.com/community/connections
4. https://www.cisco.com/c/en/us/td/docs/net_mgmt/cisco_network_assistant/version5_0/quick/guide/English/gsg_en/install.html

Subject Code: 01CT0607

Subject Name: Machine learning

B. Tech. Year – III (Semester VI)

Objective:
Machine Intelligence concern with designing and developing of algorithms that allow machines, essentially computers, to evolve realistic or human like behavior based on the empirical data available. This course aims to discuss the building blocks of machine intelligence. The focus would be on how to develop algorithms that can automatically learn and recognize the complex pattern from the available date to make an intelligent decision which will be accepted to the users. Students are expected to learn the fundamental issues involved in designing algorithms for machine intelligence and pursue more insight towards understanding various machine learning algorithms.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Apply the fundamentals of probability theory and algebra to perceive the gist of supervised machine learning algorithms
2. Understand and apply unsupervised algorithm for clustering
3. Apply the concepts of dimensionality reduction, regularization and optimization in different real-world problems
4. Evaluate various machine learning algorithms with appropriate evaluation metrices
5. Demonstrate training and testing of basic neural network models like CNN, RNN, LSTM, etc.
6. Implement appropriate machine learning algorithms for the given case study

Pre-requisite of course:
Programming using Python, Linear Algebra, Probability

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to machine learning** Machine Learning Languages, Types, and Examples, Applications of Machine Learning, Machine Learning vs Statistical Modelling, Supervised vs Unsupervised Learning, Difference between Detection, Prediction and Generation	06
2	**Performance measures** Importance of performance measurement, confusion matrix, Training Data Set, Testing Data Set, Validation Data Set, Overfitting, Underfitting, Bias, Variance	03
3	**Supervised Learning Techniques** Linear Regression, Logistic Regression, K-Nearest Neighbors, Decision Tree, Random Forest, Support Vector Machine, Linear Discriminant Analysis, naïve Bayes	12
4	**Unsupervised Learning Techniques** K-Means Clustering, Hierarchical Clustering, Density-Based Clustering	07
5	**Dimensionality Reduction & Collaborative Filtering** Advantages of dimensionality reduction, Feature Extraction and Selection, Dimensionality Reduction using PCA, LDA techniques, Collaborative Filtering & Its Challenges	06
6	**Introduction to Artificial Neural Networks** Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN, Connectivity, Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Single Layer and Multi-Layer Feed Forward Networks	10
7	**Introduction to Deep Learning** Basic building blocks of deep neural network, Convolutional Neural Network, Recurrent Neural Network, Deep Belief Network	08
	Total Hours	52

Suggested Text books / Reference books:

1. Introduction to Machine Learning, E Alpaydin, MIT Press, 2010.
2. Machine Learning: A Probabilistic Perspective, Kevin P. Murphy, MITpress, 2012.
3. Machine Learning: an algorithmic perspective, S. Marsland, CRC Press, 2009
4. Pattern Classification, R. O. Duda, P. E. Hart and D. G. Stork, John Wiley, New York, 2001.
5. Pattern Recognition: A Statistical Approach, P. A. Devijver and J. Kittler, Prentice Hall, 1982.
6. Deep Learning (Adaptive Computation and Machine Learning Series) by Ian Goodfellow, Yoshua Bengio and Aaron Courville

Suggested Theory distribution:

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Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
15%	20%	30%	20%	10%	5%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. To perform Single Variable Linear Regression
2. To perform Multiple Variable Linear Regression
3. To perform Logistic Regression
4. To perform SVM
5. To perform KNN
6. To perform naïve Bayesian Algorithm
7. To perform Decision Tree Algorithm
8. To perform Hierarchical Algorithm for Clustering
9. To perform K-Means Algorithm for Clustering
10. To perform DBSCAN Algorithm for Clustering
11. To perform Dimensionality Reduction using PCA
12. To Perform Visualization of Various Activation Function used in ANN
13. To Train and Test CNN
14. To perform the LSTM algorithm on recurrent neural network

Supplementary Resources:

1. https://www.coursera.org/learn/machine-learning
2. https://in.udacity.com/course/machine-learning--ud262
3. https://www.udemy.com/machinelearning/
4. https://cognitiveclass.ai/courses/machine-learning-with-python/
5. https://cognitiveclass.ai/courses/machine-learning-r/
6. https://www.edx.org/learn/machine-learning

Subject Code: 01CT0608

Subject Name: Compiler Design

B. Tech. Year – III (Semester VI)

Objective:
The purposive of this course is intended to teach the students about the basic techniques, theory and tools underlie the practice and act of Compiler Construction. This Course introduce the major concept areas of language translation and compiler design.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand compiler and different phases. Using this translate program from source code to executable code and files.
2. Explain lexical analysis phase and their connection to language definition through regular expressions and grammars.
3. Explain the syntax analysis phase and differentiate among various parsing techniques and grammar transformation techniques.
4. Use formal attributed grammars for specifying the syntax and semantics of programming languages.
5. Identify the effectiveness of optimization and differences between machine dependent and independent translation.
6. Use the powerful compiler generation tools such as Lex and YACC.

Pre-requisite of course:
Basic syntax and semantics of programming languages like object-oriented programming, Data Structure and Theory of Computation

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to Compiler** Translators-Compilation and Compiler, Interpreter and Assembler, overview of linker and loader -Language processors -The Phases of Compiler-Errors Encountered in Different Phases-The Grouping of Phases-Compiler Construction Tools - Programming Language basics, pass structure.	08
2	**Scanner** Need and Role of Lexical Analyzer-Lexical Errors-Expressing Tokens by Regular Expressions-Recognition of Tokens, A Language for Specifying Lexical Analyzer, Finite Automata from Regular Expression, Converting Regular Expression to DFA- Minimization of DFA-Language for Specifying Lexical Analyzers-LEX- Design of Lexical Analyzer for a sample Language**.**	10
3	**Parsing** Top-down Parsing, Predictive parsing, non recursive predictive parsing, First and Follow set, LL(1) grammar, error handling for LL(1), Bottom-up parsing, handle pruning, shift reduce parsing, operator precedence parser, LR(0) parser, SLR(1) Parser, Canonical LR(1) Parser, LALR(1) Parser, error detection and recovery in LR Parser, Parser generators (Yacc & Lex)	10
4	**Intermediate Code Generation** Introduction, Intermediate Languages, Types of intermediate forms, Three Address Statements, Syntax Directed Translation Attributes and Mechanism, Directed Acyclic Graph, Static Single Assignment	06
5	**Memory Management** Introduction, Importance of Memory Management, organization for storage purpose, static allocation, stack allocation, dynamic allocation, different methods of parameter passing, activation record, symbol table	06
6	**Code Optimization** Introduction of Code Optimization, Advantage of code optimization, Types of Code Optimization, Block and Loop Optimization, Global Data Flow Analysis	06
	Total Hours	46

Suggested Text books / Reference books:

1. Aho, Lam, Sethi, and Ullman, Compilers: Principles, Techniques and Tools,Second Edition, Pearson, 2014
2. D. M. Dhamdhere: Systerm Programming, Mc Graw Hill Publication
3. Dick Grune, Henri E. Bal, Jacob, Langendoen: Modern Compiler Design, Wiley India Publication

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	20%	30%	15%	15%	10%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. WAP to remove Left Recursion from the grammar.
2. WAP to remove Left Factoring from the grammar.
3. WAP to verify that the given input is valid identifier or keyword.
4. WAP to compute FIRST and FOLLOW Set of the given grammar.
5. WAP to implement Operator precedence parser.
6. Prepare report for Lex, Flex and Yet Another Compiler Compiler Tool.
7. WAP with the help of Lex and Yacc file to implement Calculator which performs basic operations like addition, subtraction, multiplication and division.
8. WA Lex Program to count words, characters, lines, Vowels and consonants from given input.
9. WA Lex Program to generate string which is ending with zeros.
10. WA Lex Program to check given string is simple or compound string.
11. WA Lex Program to count the total number of printf and scanf statement in given C file. Also convert it into readf and write out respectively to another file.
12. WAP to check given number is positive negative or zero.
13. WA Lex Program to print HTML tags of given file.
14. WA YACC Program to generate Calculator.

Supplementary Resources:

1. https://nptel.ac.in/courses/106/104/106104123/
2. https://nptel.ac.in/courses/106/108/106108113/
3. https://onlinecourses.nptel.ac.in/noc21_cs07/preview

Subject Code: 01CT0609

Subject Name: VLSI Designs

B. Tech. Year – III (Semester VI)

Objective:
The objective of this course is to introduce students with various concepts and methods of digital system design techniques. To acquire knowledge of MOS Transistor, understand CMOS Fabrication process and learn the design of CMOS Logic circuits and subsystems. To design digital system using Hardware Description Language. Learning this course would improve the employment potential of students in VLSI and Semiconductor industry.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Acquire basics of VLSI design flow, its designing methodologies, its hierarchical structure and testability concepts of digital logic design.
2. Develop fundamentals for CMOS fabrication methods and analyze static and switching characteristics of MOS inverter.
3. Apply lambda-based design rules for subsystem combinational and sequential circuit design.
4. Design an application with concepts of modeling a digital system using Hardware Description Language.
5. Create layout of simple MOS circuits using lambda-based design rules.

Pre-requisite of course:
Elementary knowledge about Electronics including some experience of circuit designing and logic development. Fundamentals of Computer Programming & Utilization. Basic knowledge of digital electronics and real-life digital systems

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction** Overview of VLSI design methodology, VLSI design flow, Design hierarchy, Concept of regularity, Modularity, and Locality, VLSI design style, Design quality, package technology, introduction to FPGA and CPLD, computer aided design technology.	06
2	**Fabrication of MOSFET** Introduction, Fabrication Process flow: Basic steps, C-MOS n-Well Process, Layout Design rules, full custom mask layout design.	05
3	**Verilog HDL** VLSI design flow, Hierarchical modeling concepts, Basic Concepts: Data types, Modules and ports, Gate Level Modeling, Data Flow Modeling, Behavioral Modeling, Switch level Modeling, Task and Function	07
4	**MOS Transistor Theory** Introduction and I-V Characteristics, Non ideal I-V effects: Velocity saturation, mobility degradation and Channel length modulation. Non ideal I-V effects: Body Effect, Sub threshold conduction, Junction leakage and Geometry Dependence. CMOS Inverter DC characteristics. Scaling: Transistor scaling, Interconnect scaling and Impacts on design, Static and dynamic power dissipation. Implementation of complex logic gates/expressions using CMOS logic	10
5	**CMOS Processing Technology** Introduction to IC Technology. CMOS Technologies: Wafer formation, Photolithography, Gate oxide, gate and drain formation and Contacts and Metallization. NMOS Fabrication. CMOS Fabrication: p-well, n-well and Twin- tub fabrication process. Latch up in CMOS Circuits. Layout Design rules. Stick diagrams. Interconnects: Resistance and capacitance	04
6	**Combinational and Sequential CMOS Logic Circuits** Static CMOS. Ratioed circuits. Dynamic circuits, Domino logic. Pass transistor circuits. CMOS with Transmission gate. Conventional CMOS latches and flip-flops.	09
7	**Subsystem Design** Carry Look Ahead Adder. Carry skip adder. Carry select adder. Design of Multipliers, Braun array multiplier. Wallace tree Multiplier. Booth multiplier. Barrel Shifter	04
8	**Chip I/P and O/P Circuits** On chip Clock Generation and Distribution, Latch –Up and its Prevention	03
9	**Design for Testability** Introduction, Fault types and models, Controllability and observability, Ad Hoc Testable design techniques, Scan –based techniques, built-in Self-Test (BIST) techniques, Current monitoring IDDQ test	06
	Total Hours	54

Suggested Text books / Reference books:

1. Neil H.E.Weste, David Harris, "CMOS VLSI Design", Pearson,3rd Edition. 2005, Reprint, 2012.
2. Samir Palnitkar, "Verilog HDL Guide to Digital Design and synthesis", 2rd Edition, Pearson Education, 2003.
3. Douglas A.Pucknell, Kamran Eshraghian,"Basic VLSI Design", Prentice Hall of India, 3rdEdition, Reprint 2009.
4. Sung Mo Kang,Yusuf Leblebici, "CMOS Digital Integrated Circuits Analysis and Design", Tata McGraw Hill, 3rd Edition, 2003.
5. John P. Uyemura, "Introduction to VLSI circuits and systems", Wiley, 2rd Edition 2002, Reprint 2014.
6. Samir Palnitkar, "Verilog HDL Guide to Digital Design and synthesis", 2rd Edition, Pearson, Education 2003.
7. Michael D. Ciletti, "Advanced Digital Design with the Verilog HDL", 2rd Edition, Prentice Hall Higher Education, 2010.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
15%	15%	40%	10%	10%	10%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Introduction to programmable devices (FPGA, CPLD), Hardware Description Language (VHDL), and the use programming tool.
2. Design of basic logic gates and its testing.
3. Design of adder circuits and its testing.
4. Design 4 to 1 multiplexer and its testing.
5. Design of 3 to 8 decoder and its testing.
6. Design of 8 to 3 priority encoder and its testing.
7. Design of J-K and D Flip Flops and its testing.
8. Design of sequential adder and its testing.
9. Design of BCD counter and its testing.
10. Design of two 8-bit multiplier circuit and its testing.
11. Simulation of CMOS Inverter using SPICE for transfer characteristic.
12. Simulation and Verification of two input CMOS NOR gate using SPICE.
13. Design and simulation of given logic function using dynamic logic.
14. To generate layout for CMOS Inverter circuit and simulate it for verification.

15. To prepare layout for given logic function and verify it with simulations.
16. To measure IDS – VGS and IDS – VDS characteristics of given n-channel and p-channel MOSFETs.
17. To measure propagation delay of a given CMOS Inverter circuit.
18. Design and verify CMOS Inverter circuit.
19. Write and verify VHDL/Verilog program for practical applications of your choice (e. g. lift controller).
20. Design and verify dynamic CMOS circuit.

Supplementary Resources:

1. https://www.tutorialspoint.com/vlsi_design/vlsi_design_digital_system.htm
2. http://ece-research.unm.edu/jimp/vlsi
3. https://nptel.ac.in/courses/117/101/117101004

Subject Code: 01CT0610

Subject Name: Satellite Communication

B. Tech. Year – III (Semester VI)

Objective:
The goal of the course is to introduce students to the fundamentals of satellite Communication. The course enables analysis and design of satellite links for various types of services and familiarity with terms and techniques related to performance evaluation and the availability of such links. It also uses to enable the students to become familiar with satellites and satellite services.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand principle, working and operation of various sub systems of satellite as well as the earth station.
2. Apply various communication techniques for satellite communication.
3. Analyze and design satellite communication link
4. Analyze the various methods of satellite access.
5. Interpret role of satellite in various applications.

Pre-requisite of course:
Electronics Communication, Digital Communication

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to Satellite Communication** Historical background, Basic concepts of Satellite Communications, Communication Networks and Services, Growth of Satellite communications. Satellite in Networks.	05
2	**Satellite Orbits** Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits – Look Angle Determination- Limits of visibility –eclipse-Sub satellite point –Sun transit outage-Launching Procedures – launch vehicles and propulsion.	10
3	**Space Segment** Introduction, The Power Supply, Attitude Control, Spinning satellite stabilization, Momentum wheel stabilization, Station Keeping, Thermal Control, TT&C Subsystem, Transponders: The wideband receiver, The input demultiplexer, The power amplifier, The Antenna Subsystem.	06
4	**Earth Segment** Introduction – Receive – Only home TV systems – Outdoor unit – Indoor unit for analog (FM) TV – Master antenna TV system – Community antenna TV system – Transmit – Receive earth stations.	06
5	**The Space Link** Introduction, Equivalent Isotropic Radiated Power, Transmission Losses: Free-space transmission, Feeder losses, Antenna misalignment losses, Fixed atmospheric and ionospheric losses, The Link-Power Budget Equation, System Noise, Carrier-to-Noise Ratio, The Uplink: Saturation flux density, Input backoff, Downlink, Output back-off, Satellite TWTA output, Combined Uplink and Downlink C/N Ratio. Inter-satellite Link.	06
6	**Satellite Access** Introduction, Single Access, Preassigned FDMA, Demand-Assigned FDMA, Spade System, TDMA, Preassigned TDMA, Demand-assigned TDMA, Satellite-Switched TDMA, Code-Division Multiple Access.	06
7	**Satellite Applications** INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- World space services, Business TV(BTV), GRAMSAT, Specialized services – E –mail, Video conferencing.	09
8	**Advances in Satellite Communication** Satellite based societal application for national development, Disaster management, Microwave remote sensors, Digital signal processing for microwave sensors, Optical and infrared remote sensing.	08
	Total Hours	56

Suggested Text books / Reference books:

1. Satellite Communications, by Dennis Roddy(Fourth edition),McGraw Hill.
2. Satellite Communication, by Timothy Pratt, Charles Bostian, Jeremy Allnutt(Second Edition),
3. John Wiley & Sons
4. B. Elbert, Introduction to Satellite Communications, 2nd ed., Artech House, 1999.
5. Bruce R. Elbert,"The Satellite Communication Applications: Hand Book", Artech House Bostan, London.
6. Myron Kyton, Walfred Fried, Avionics Navigation systems, 2nd edition, John Willy & Sons, 1997.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	20%	30%	25%	10%	5%

Suggested List of Experiments:

1. Understanding the basic concepts of satellite communication
2. To setup a communication link between uplink transmitter and downlink receiver using Satellite.
3. To setup an Active satellite communication link and demonstrate link fail operation
4. To communicate voice & Video signal through satellite link
5. Observe the effect of Different combinations of uplink and downlink frequencies on satellite link.
6. To transmit and receive three separate signals (Audio, Video ,Tone) simultaneously through satellite link
7. To study radiation pattern and beam width of patch antenna.
8. To transmit and receive function generator signals through satellite link.
9. To measure the signal parameters in an analog FM/FDM TV satellite link.
10. To transmit digital waveforms through a satellite communication link.
11. To Calculate Bit Error Rate in a satellite communication link.
12. To write a program to observe the variations in the antenna look angles for the earth station antennas.

Supplementary Resources:

1. https://nptel.ac.in/courses/117105131/
2. https://ocw.mit.edu/search/ocwsearch.htm?q=satellite%20communication
3. www.radio-electronics.com

Subject Code: 01CT0611

Subject Name: Cloud Computing

B. Tech. Year – III (Semester VI)

Objective:
This course is intended to analyse the basics of cloud computing, and make aware students with diversified technologies working for cloud architecture. Course will be focusing on architecture, service models, privacy & security in cloud.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, various management and other distinguish services of AWS.
2. Apply the fundamental concepts in datacenters to understand the trade-offs in power, efficiency and cost by the Load balancing approach and instances.
3. Illustrate the fundamental concepts of cloud storage and demonstrate their use in storage systems such as Amazon S3 and Database.
4. Analyze various clouds Service models and apply them to solve problems on the cloud.
5. Deploy applications over commercial cloud computing infrastructures such as AWS

Pre-requisite of course:
Operating System and Computer Networks

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction of Cloud & Amazon Web Service** Introduction of cloud computing, how it works Types of cloud, what is Virtualization, Advantages of Cloud, AWS history, Dashboard, AWS Overview, Architecture	05
2	**Cloud Service Models** Software as a Service (SaaS): Introduction, Challenges in SaaS models: Model, SaaS Integration Services, Advantages and Disadvantages, Infrastructure As a Services (IaaS): Introduction, Virtual Machines, VM Migration Services, Advantages and Disadvantages. Platform As a service (PaaS): Introduction, Integration of Private, and Public Cloud, Advantages and Disadvantages.	08
3	**Identity & Access Management** IAM Overview and Policies, IAM Users, Groups, Access Key & Secret Access Key, MFA, Report	06
4	**Elastic Cloud Computing (EC2)** Amazon EC2 Overview, Elastic Block Storage (EBS), Amazon Machine Image (AMI), Instance Purchasing Options, Introduction to EC2 Instance Types Security Group Elastic, Public & private IP Overview, Amazon EBS & Snapshot, AWS CLI, Bootstrap Script, Elastic Load Balancing (ELB), Auto Scaling	08
5	**Virtual Private Cloud (VPC)** Amazon Virtual Private Cloud (VPC), Amazon VPC and Subnets, Route Table, Internet Gateway	06
6	**Amazon Simple Storage Service (S3)** Simple Storage Service (S3), S3 Object Storage and Buckets, Security on bucket, Web Hosting, Logging & event, Glacier, Versioning & Lifecycle Policy, Cross region replication	08
7	**Route 53** DNS Records, Website Hosting, Routing Policy, Health Check	04
8	**Databases** Relation Database System, DB engine & Instance details, Security, Parameter group, Monitoring Resourcing, DynamoDB, Elasticache	06
9	**CloudWatch & Monitoring** Cloud Watch, Matrices, Alarm & notification, Log & billing Monitoring Other AWS monitoring	05
	Total Hours	56

Suggested Text books / Reference books:

1. Judith Hurwitz, R Bloor, M.Kanfman, F.Halper "Cloud Computing for Dummies", Wiley India Edition, First Edition
2. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", Wiley Publication,2011
3. Tim Mather, SubraKumara swamy, Shahed Latif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", O'ReillyMedia Inc, 2009
4. Mickey Iqbal 2010, " IT Virtualization Best Practices: A Lean, Green Virtualized Data Center Approach", MC Press
5. Frank H. P. Fitzek, Marcos D. Katz, "Mobile Clouds: Exploiting Distributed Resources in Wireless, Mobile and Social Networks", Wiley Publications, ISBN: 978-0-470-97389-9, Jan 2014.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	15%	20%	20%	20%	20%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Setup Windows Instance in AWS Cloud using EC2 service and install IIS
2. Setup Linux Instance in AWS Cloud using EC2 service and install Apache(httpd)
3. Add and modify features in Existing Windows Instance
4. Build Your Virtual Private Cloud (VPC) and Launch a Web Server
5. Working with Amazon Elastic Block Store (EBS)
6. Introduction to AWS Identity and Access Management (IAM)
7. Deploy a Web Application on AWS
8. Using Auto Scaling with AWS Lambda and Lifecycle Hooks
9. Implementing a Serverless Architecture with AWS Managed Service
10. Launching EC2 Spot Instances with Auto Scaling and Amazon CloudWatch
11. Create Static Website Using S3
12. Crease S3 Bucket and Upload and Download file
13. Create Lifecycle Policy using S3
14. Setup Versioning & Configure Cross Region Replication in S3
15. Create Load Balancer using EC2 Service
16. RDS : Create Database & Connect
17. Create Autoscaling Group and Configure Multi Factor Authentication

Supplementary Resources:

1. https://onlinecourses.nptel.ac.in/noc17_cs23/preview
2. https://www.edx.org/micromasters/cloud-computing
3. https://aws.amazon.com/training/awsacademy/cloud-computing-architecture
4. https://www.coursera.org/specializations/cloud-computing

Subject Code: 01CT0612

Subject Name: Data warehousing and Data Mining

B. Tech. Year – III (Semester VI)

Objective:
The objective of this course is to introduce the student to various Data Mining and Data Warehousing concepts and techniques. To apply decision making rules in real life business department, this subject provide algorithms to implement for various datasets. Learning this course would improve the employment potential of students in the information management sector.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand data warehouse concepts, architecture, business analysis and tools
2. Apply data pre-processing and data visualization techniques
3. Evaluate algorithms for finding hidden and interesting patterns in data
4. Apply various classification and clustering techniques using tools.
5. To evaluate different scenarios where we can implement different data mining and warehousing techniques and finding hidden and interesting patterns in real dataset.

Pre-requisite of course:
DBMS

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction** Introduction and Importance of Data Mining, Data warehouse concept, Patterns: Clustering, outliers, Mining Frequent Patterns, Association, Correlation; Technologies for Mining, Applications and Issues	05
2	**Data Description and Preprocessing** Objects, Attribute Types: Nominal Attributes, Binary Attributes, Ordinal	06

	Attributes, Numeric Attributes, Techniques of data visualizations, Similarity measurement Preprocessing: Overview, Data Cleaning, Data Integration, Data Reduction and its types, Techniques of Data Transformation and Data Discretization	
3	**Data Warehousing and OLAP** Overview of Data warehouse, Differences between Operational Database Systems and Data Warehouses, Data warehouse models: Enterprise Warehouse, Data Mart, and Virtual Warehouse; Data warehouse Modelling: Data cube, OLAP, Usage and Design of Data warehousing, Data Warehouse Implementation, Data Generalization: Efficient Methods for Data Cube Computation, Further Development of Data Cube and OLAP Technology	08
4	**Data Mining Techniques** Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods: Apriori Algorithm, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining	07
5	**Classification** Basic Concepts, Decision tree concept and induction, Methods: Bayes and Rule based Classification, Metrics to improve classifier performance, Other Classification Methods: Genetic Algorithms, Rough Set Approach, Fuzzy Set Approaches	07
6	**Cluster Analysis** Overview, Requirements of Cluster Analysis, Partitioning methods: K-Means, k-Medoids; Hierarchical Methods, Density Based Methods, Grid Based Methods, Evaluation	05
7	**Outliers** Introduction, Analysis and Detection methods, Statistical and Proximity based approach, Challenges	05
8	**Advance trends** Mining Complex Data Types, Statistical Data Mining Views on Data Mining Foundations Visual and Audio Data Mining, Data Mining Applications	05
9	**Data Mining Tools** Available Tools : XLMiner, WEKA , Basic of WEKA Installing WEKA, WEKA data file format, Data visualization in WEKA, Data filtering, Using the concepts of data mining with WEKA	06
	Total Hours	54

Suggested Text books / Reference books:

1. J. Han, M. Kamber, “Data Mining Concepts and Techniques”, Morgan Kaufmann
2. M. Kantardzic, “Data mining: Concepts, models, methods and algorithms, John Wiley &Sons Inc.
3. Paulraj Ponnian, “Data Warehousing Fundamentals”, John Willey.
4. M. Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education.

5. G. Shmueli, N.R. Patel, P.C. Bruce, “Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner”, Wiley India.

Suggested Theory distribution:

The suggested theory distribution as per Bloom’s taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	20%	25%	25%	10%	10%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Understand Data Pre-processing
2. Understand Data Exploration
3. Study of WEKA Tool
4. Explore Classification using WEKA tool.
5. Explore Clustering using WEKA tool.
6. Explore Analysis and Detection methods
7. Apply filters on the dataset using WEKA.
8. Implement Pre-processing in WEKA Tool.
9. Demonstrate performing Regression on data sets
10. Demonstration of Weka Explorer
11. Demonstration of data Mining techniques
12. Demonstration of Attribute Relation File Format (ARFF)
13. Explore XLMiner tool
14. Apply various techniques on given data set

Supplementary Resources:

1. http://www.tutorialspoint.com/data_mining/
2. https://www.javatpoint.com/data-mining-cluster-vs-data-warehousing

Subject Code: 01CT0613

Subject Name: .Net Technology

B. Tech. Year – III (Semester VI)

Objective:
.Net Technologies are blend of technologies supported by Microsoft .Net Framework, that allows user to create various applications. Students will be able to work with various technologies provided by Microsoft .NET platform.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand the use of C# basics, Objects and Types, Inheritance and .NET framework developed by Microsoft.
2. Develop and implement applications with C#.
3. Analyze the Component Services, Threading, Remoting, Windows services, web services.
4. Apply the concepts of Object oriented programming and C# to make console and windows applications.
5. Design the functional web application using the concepts of ADO .NET, various server controls, State management and MVC Architecture.

Pre-requisite of course:
Object oriented concepts, Programming fundamentals

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction To .Net Framework** Introduction to .NET Framework Architecture, Program Execution in .NET, CLR structure, MSIL, CLS, CTS, Namespaces, Assemblies the Common Language Implementation, Creating strong named assemblies, putting DDL in GAC, Garbage Collection, DLL Hell, Side by Side Execution, Debugging.	02

2	**The Basics and Console Applications in C#** Basic data types, declaring variables and constants, Type, Conversion, Boxing and Unboxing, Array, Structure, String Manipulation, String Builder, Decision making statements, Conditional Loops, Switch Case., Name Spaces - Constructor and Destructors, Function Overloading & Inheritance, Operator Overloading, Modifiers - Property and Indexers, Attributes & Reflection API, when to use Console Applications - Generating Console Output, Processing Console Input	06
3	**Advance C#** Attributes, Reflection, Delegates, Events, Threading, Collections, File IO	04
4	**Building GUI with C#** Working with C# windows applications, Working with common form controls. Visual Inheritance, Creating MDI Form, Event Handling	08
5	**ADO.NET** Benefits of ADO.NET, ADO.NET compared to classic ADO -, Datasets, Managed Providers -, Data Binding: Introducing Data, Source Controls -, Reading and Write Data Using the SQL Data Source Control	06
6	**Windows Forms and Controls in details** The Windows Forms Model, Creating Windows Forms Windows Forms Properties and Events, Windows Form Controls, Menus - Dialogs – ToolTips	04
7	**ASP.NET** Introduction to ASP.NET, Working with Web and HTML Controls, Using Rich Server Controls, Login controls, Overview of ASP.NET Validation Controls, Using the Simple Validations, Using the Complex Validators Accessing Data using ADO.NET, Using the Complex Validators Accessing Data using ADO.NET, Configuration Overview	04
8	**Themes and Master Pages** Creating a Consistent Web Site, ASP.NET 2.0 Themes - Master Pages, Displaying Data with the Grid View Control Introducing the Grid View Control, Filter Data in the Grid View Control, Allow Users to Select from a Dropdown List in the Grid, add a Hyperlink to the Grid, Deleting a Row and Handling Errors	04
9	**Managing State** Preserving State in Web Applications and Page-Level State, Using Cookies to Preserve State, ASP.NET Session State, Storing Objects in Session State, Configuring Session State, Setting Up an Out-of-Process State Server, Storing Session State in SQL Server, Using Cookie less Session IDs, Application State Using the Data List and Repeater Controls, Overview of List-Bound Controls, Creating a Repeater Control and Data List Control	04
10	**ASP.NET MVC** Controller, Model, View, Razor Language, Entity Framework or Hibernate	12
	Total Hours	54

Suggested Text books / Reference books:

1. Christian Nagel, Professional C# .Net, Wrox Publication
2. Matthew Macdonald and Robert Standefer, ASP.NET Complete Reference, TMH
3. Vijay Mukhi, C# The Basics, BPB Publications

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	20%	25%	25%	10%	10%

Suggested List of Experiments:

1. Create a windows form with the following controls Textbox, Radio button, Check box, Command Button
2. Write a program for Menu option.
3. Create a program to connect with database and manipulate the records in the database using ADO .NET
4. Create a program to implement the concepts of OOPS for creating class, inheritance
5. Create a program to perform input validation using procedure.
6. Write a program to open a file and using I/O operations write contents into a file and read the contents from the file.
7. Create a window form using HTML controls.
8. Create a program to perform validation using validation controls.
9. Create a program in ASP .NET to connect with the database using ADODB connectivity and manipulate the records.
10. Write a program to store the employee details using class and methods in C# .NET
11. Write a program to Handle Exceptions
12. Write a program to create a form with Basic controls. In c#. NET.

Supplementary Resources:

1. http://www.c-sharpcorner.com
2. http://www.csharphelp.com/index.html
3. http://www.codeproject.com
4. http://telerikacademy.com
5. https://msdn.microsoft.com

Subject Code: 01GS0601

Subject Name: Cognitive Aptitude 2

B. Tech. Year – III (Semester VI)

Objective:
This course shall enrich students' preparedness for the upcoming competitive exams, entrance test, and/or placements. This course will also enhance students' logical and verbal reasoning skills, decision making skill, and comprehension skill.

Credits Earned: 00 Credit

Course Outcomes: After completion of this course, student will be able to:

1. Inculcate smart approach in logical problem solving
2. Comprehend text of varying difficulty levels and types
3. Analyze logical and verbal problems to arrive at a solution/conclusion.
4. Use logical deductions to make effective decisions
5. Apply the concepts in both competitive exams and placement drives

Pre-requisite of course:
Basic Knowledge of English Language

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
02	00	00	00	00	00	00	00	00	00

Contents:

Unit	Topics (Logical Reasoning)	Hours
1	**Blood Relation** Word-problem simple and complex type, Coded blood relation	01
2	**Direction Sense** Identifying Distance / Direction, Degree related questions, Coded distance/ direction	01
3	**Coding-Decoding** Word coding, Numeric coding, Symbolic coding, Sentence coding	01
4	Class Test 1 and doubt solving session	01
5	**Analytic Reasoning** Ranking, Seating-Arrangement, Combination	03
6	Class Test 2 and doubt solving session	01
7	**Series** Number Series, Letter series	02
8	**Cubes & Dices**	01
9	**Clock** Calculation of angle between minute hand and hour hand, Calculation of minute between a given time when a particular angle is formed Gaining & Losing examples, Mirror time	01
10	**Calendar** Calculation of day of week on a given date, Calculate day of week based on another date given	01
11	Class Test 3 and doubt solving session	01
	Total Hours	14

Suggested Text books / Reference books:

1. Analytic Reasoning – By M K Pandey, BSC Publishing Co. Pvt. Ltd.
2. A Modern Approach to Logical Reasoning – By Agarwala Vikas and R.S. Aggarwal.

Unit	Topics (Logical Reasoning)	Hours
1	**Statement and its variants** Statement and Conclusion, Statement and Argument, Statement and Assumption, Statement and Course of Action	03
2	**Odd one Out** People, Groups, Object, Phobias, Place, Others	01
3	**Logical Consistency** Logical relationships between items in the data set objects in the data set are maintained	02
4	**Para Jumbles** 4/5 sentences are given in a random order and you have to un-jumble all of them, Opening sentence + 4/5 Sentences + Closing Sentence are given	01
5	**Syllogism**	02
6	**Analogy** Opposites or antonyms, Synonyms or words with identical or similar meetings , Near synonyms /antonyms with variations by degree, Part to whole, Uses, Places, Users, Measurement, Product to Producer, Degree of intensity, Symbol/Representation, Object to Function, Professional to Skills. Others	01
7	**Reading Comprehension** Focused reading. Strategies to improve Reading Comprehension, Different question types, Paraphrasing and Summarizing	03
8	**Diagnostic Test**	01
	Total Hours	14

Suggested Text books / Reference books:

1. How To Prepare For The Verbal Ability & Reading Comprehension For The CAT by Arun Sharma and Meenakshi Upadhyay
2. A Modern Approach to Verbal & Non-Verbal Reasoning - R.S. Aggarwal
3. www.wordpandit.com – A Comprehensive Website for Campus and Competitive exams
4. http://iim-cat-questions-answers.2iim.com/- 2IIM's Guide to Preparing for the CAT | Free CAT Level Questions
5. Analytic Reasoning – By M K Pandey**,** BSC Publishing Co. Pvt. Ltd.
6. A Modern Approach to Logical Reasoning – By Agarwala Vikas and R.S. Aggarwal.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
25%	25%	25%	25%	0%	0%

Supplementary Resources:

1. www.englishteststore.net
2. https://online.2iim.com/cat-exam/blogs/bharaths-curated-reading-list-for-cat-exam/
3. https://www.vocabulary.com/
4. www.indiabix.com
5. www.careerbless.com
6. www.sawaal.com
7. www.allindiaexams.com
8. www.freshersworld.com

Marwadi University

Faculty of Technology

B. Tech. in Information and Communication Technology

Semester VII

Subject Code: 01CT0701

Subject Name: Cryptography and Network Security

B. Tech. Year – IV (Semester VII)

Objective:
Cryptography is an indispensable tool for protecting information in computer systems. It deals with the algorithmic and mathematical perspective of information and network security. In this course you will learn the inner workings of cryptographic systems and how to correctly use them in real-world applications.

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Compare Various Cryptanalysis Techniques.
2. Apply the knowledge in the applications ranging from small scale to larger scale security systems.
3. Apply knowledge in interpreting the secured systems for real world problems.
4. Analyse the encryption standards and the security strengths of the applied cryptographic algorithm
5. Evaluate the performance of the given case study application and solve the fault to improve the security standards

Pre-requisite of course:
Computer Networks, Discrete Probability and Algorithms

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	02	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Security in Computing Environment** Need for Security; Security Attack – Threats, Vulnerabilities, and Controls, Types of Threats (Attacks); Security Services – Confidentiality, Integrity, Availability; Information Security; Methods of Protection	02
2	**Basics of Cryptography** Terminologies used in Cryptography; Substitution Techniques – The Caesar Cipher, One-Time Pads, The Vernam Cipher, Book Cipher; Transposition Techniques – Encipherment/Decipherment Complexity, Diagrams, Trigrams, and Other Patterns, pseudo–Random Generators	05
3	**Symmetric Key Encryption** Block Ciphers, Data Encryption Standard (DES) Algorithm – Overview of the DES Algorithm; Double and Triple DES – Double DES, Triple DES; Security of the DES; Advanced Encryption Standard (AES) Algorithm	05
4	**Public Key Encryption** Integer Factorization Problems, Characteristics of Public Key System; RSA Technique – Encryption-Method; Key Exchange; Diffie-Hellman Scheme; ElGamal, Security analysis	05
5	**Message Authentication and Integrity** Authentication requirement, Authentication function, CBC-MAC, SHA, MD5, HMAC, Birthday Attack, Hash function, Security of hash function, Digital signature, Biometrics, Passwords, authentication protocols, Kerberos	05
6	**Network Security** Network Concepts; Threats in Networks – Who Attacks Networks? Threats in Transit: Eavesdropping and Wiretapping, Protocol Flaws, Impersonation; DOS, DDOS, Man in the Middle Attacks, Network Security Controls – Architecture, Encryption, Virtual Private Networks, Public Key Infrastructure (PKI) and Certificates.	04
7	**IP Security** Overview of IP Security (IPSec); IP Security Architecture; Modes of Operation; Security Associations (SA) – Security Parameter Index (SPI), SA Management, Security Policy; Authentication Header (AH); Internet Key Exchange	04
8	**Web Security** Web Security Requirements; Secure Socket Layer (SSL) – SSL Architecture, SSL Protocol; Transport Layer Security (TLS); Secure Electronic Transaction (SET) – Features, Components, Dual Signature, Purchase Request.	04
9	**Electronic Mail Security** Threats to E-Mail; Requirements and Solutions – Confidentiality,	04

	Integrity; Encryption for Secure E-Mail; Secure E-Mail System – PGP (Pretty Good Privacy), S/MIME (Secure Multipurpose Internet Mail Extensions).	
10	**Firewalls** Firewalls, Types, Packet Filtering Gateway, Stateful Inspection Firewall, Application Proxy, Guard, Personal Firewalls	02
11	**Impact of Security and Security standards** BSI Security standards like BS ISO/IEC 27002, BS ISO/IEC 27033-1, BS ISO/IEC 27033-2, BS ISO/IEC 27033-3, BS ISO/IEC 27033-4, BS ISO/IEC 27033-5, NIST SP 800-114, Hyperconverged Infrastructure and its impact on network security	02
	Total Hours	42

Suggested Text books / Reference books:

1. Cryptography and Network Security Principles and Practices, 5th edition -- William Stallings [Prentice Hall]
2. Introduction to Cryptography with Coding Theory -- Washington & Trappe [Pearson].
3. Applied Cryptography: Protocols, Algorithms, and Source Code in C -- Bruce Schneier, [John Wiley & Sons].

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	10%	40%	20%	10%	10%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Implement Shift Cipher
2. Implement One Time Pad Cipher
3. Implement Playfair Cipher
4. Implement Hill Cipher
5. Implement Vigenere Cipher
6. Implement Rail Fence Cipher
7. Implement RSA cipher
8. Understand DES cipher implementation
9. Understand AES cipher implementation
10. Understand MAC implementation
11. Visualizing SSL architecture

12. Visualizing the Roundtrip time for the packet pinging
13. Visualizing Biometric and Digital Signature feature extractions
14. Understand Firewalls and anti-virus systems

Supplementary Resources:

1. https://www.coursera.org/learn/crypto
2. https://crypto.stanford.edu/~dabo/courses/OnlineCrypto/
3. https://www.udacity.com/course/applied-cryptography--cs387
4. https://www.classcentral.com/course/crypto-616
5. https://www.edx.org/learn/cryptography
6. https://www.bsigroup.com/en-GB/Cyber-Security/Standards-for-IT-and-cyber-security/
7. https://www.bsigroup.com/en-GB/Cyber-Security/Securing-IT-networks/Standards-for-securing-IT-networks/

Subject Code: 01CT0702

Subject Name: Information Theory and Coding

B. Tech. Year – IV (Semester VII)

Objective:
The objective of the course is to define and apply basic concepts of information theory, learn principles and applications of information theory in communication systems, how information is measured in terms of probability and entropy, information coding techniques including error-correcting codes and various data compression methods.

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand information channels and explain the working of various source and channel coding algorithms.
2. Calculate information measures for various discrete channels and coding schemes.
3. Design codewords for given probability distributions using various source and channel coding algorithms.
4. Distinguish the relationship between information parameters and analyze statistics for various coding algorithms.
5. Construct coding algorithms, related matrices, polynomials, encoding, and decoding diagrams.

Pre-requisite of course:
Linear Algebra, Probability Theory and Computer Networks

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	02	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to Information Theory** Concept of the amount of information, Entropy, Mutual Information, Conditional, and Joint Entropy, Measures for Continuous Random Variable, Relative Entropy, Information Rate, Channel Capacity, Redundancy and Efficiency of channels, Discrete Channels: Binary Symmetric Channel, Binary Erasure Channel, Noiseless and Deterministic Channels, Cascaded Channels, Binary Asymmetric Channel, Shannon Theorem	08
2	**Source Coding** Encoding techniques, Purpose of encoding, Instantaneous Codes, Kraft Inequality, Coding efficiency and Redundancy, Lossless compression algorithms: Shannon-Fano-Elias coding, Huffman Coding, Run Length Coding, Arithmetic Coding, LZW coding,	08
3	**Chanel Coding-I** Parity check coding, Linear block codes, Error detecting and correcting capabilities, Generator and Parity check matrices, Standard array and Syndrome decoding, Hamming codes Cyclic codes – Generator polynomial, Generator and Parity check matrices, Encoding of cyclic codes, Syndrome computation, and error detection, Decoding of cyclic codes, BCH codes, RS codes, Burst error correction	09
4	**Channel Coding-II** Convolutional codes – Encoding and State, Tree and Trellis diagrams, Maximum likelihood decoding of convolutional codes -Viterbi algorithm, Sequential decoding -Stack algorithm. Interleaving techniques – Block and convolutional interleaving, Coding, and interleaving applied to CD digital audio system - CIRC encoding and decoding, interpolation, and muting. ARQ – Types of ARQ, Performance of ARQ, Probability of error and throughput	10
5	**Rate-Distortion Theory** Rate distortion function, random source codes; joint source-channel coding and the separation theorem, Lossy compression techniques: JPEG for images, MPEG for video, LPC for speech	07
	Total Hours	42

Suggested Text books / Reference books:

1. T. M. Cover, J. A. Thomas, "Elements of Information Theory", Second Edition, Wiley
2. R. Togneri, C. J. S. DeSilva, "Fundamentals of Information Theory and Coding Design", Taylor and Francis
3. R. Bose, "Information Theory Coding and Cryptography", Tata McGraw Hill
4. M. Borda, "Fundamentals of Information Theory and Coding", Springer

5. R. J. McEliece, “The Theory of Information and Coding”, Cambridge University Press

Suggested Theory distribution:

The suggested theory distribution as per Bloom’s taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	25%	30%	20%	10%	10%

Suggested List of Experiments:

1. Write a program to determine entropy and mutual information of given channels
    a. Noise-free channel
    b. Binary symmetric channel.
2. Write a program to implement Huffman codes.
3. Write a program to implement Arithmetic codes.
4. Write a program to implement Run-length coding
5. Write a program to implement LZW codes.
6. Write a program for coding and decoding for Linear Block Codes.
7. Write a program for coding and decoding for Cyclic codes.
8. Write a program for coding and decoding for Convolution codes.
9. Write a program for coding and decoding for the BCH code.
10. Write a program for coding and decoding for the RS code.
11. Write a program to decode the convolution code with the Viterbi algorithm and check BER.
12. Write a program to implement JPEG compression.

Supplementary Resources:

1. https://nptel.ac.in/courses/117/101/117101053/
2. https://www.coursera.org/learn/information-theory
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-441-information-theory-spring-2016/syllabus/

Subject Code: 01CT0703

Subject Name: Artificial Intelligence

B. Tech. Year – IV (Semester VII)

Objective:
Artificial intelligence (AI) is a research field that studies how to realize the intelligent human behaviors on a computer. The ultimate goal of AI is to make a computer that can learn, plan, and solve problems autonomously. The main purpose of this course is to provide the most fundamental knowledge to the students so that they can understand the purpose of AI.

Credits Earned: 04 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand the appropriate technique and algorithm for reasoning and developing the solution within an AI problem domain
2. Identify the appropriate representation of the AI problem or domain model
3. Compare the performance of the AI system or component
4. Analyse the gaps and improve the research quality for an existing AI problem
5. Develop the solution for an existing AI problem using the concepts of Neural Nets, NLP, Game Theory, Recommendation System and Reinforcement Learnings.

Pre-requisite of course:
Probability, Linear Algebra, and Algorithms

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	02	04	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to AI** What is AI, Foundations of AI, History of AI, Risks and Benefits of AI, Intelligent Agents-reactive, deliberative, goal-driven, utility-driven, and learning agents, Good Behavior: The concept of Rationality, Nature of Environment, Structure of Agents, Criteria for Success	02
2	**Solving Problems by Searching** Search problems and solution, Search Algorithms- Best-first search, Breadth-first search, Depth First Search, Dijkstra's algorithm, Bidirectional search, Redundant paths, State spaces and search, Heuristic Search Strategies- Hill climbing, Local Maxima, Beam search, peak to peak methods, variable neighborhood Methods	04
3	**Finding Optimal Path** Brute Force, Branch and Bound, A*, Admissibility of A*, Iterative Deepening A*, Algorithm AO*, Pruning the OPEN and CLOSED List, Divide and conquer Beam stack search.	03
4	**Constraint Satisfaction Problems** Constraint Propagation: Inference in CSPs- Node consistency, Arc consistency, Path consistency, K-consistency, Global constraints, Sudoku	03
5	**Knowledge representation** The Schema, Frames, Inheritance in taxonomies, Conceptual Graphs, Using Predicate logic- representing facts in logic, functions and predicates, Agents, Facets of knowledge, Resolution in propositional logic and predicate logic, Question Answering, forward and backward, conceptual Graphs, chaining Unification.	05
6	**Representing and Reasoning with Uncertain Knowledge** Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Exact and approximate Inference in Bayesian Networks, Causal Networks, probabilistic inference, sample applications	04
7	**Deep Learning** Simple Feedforward Network, Computation Graphs for Deep Learning, Convolutional Network¸ Recurrent Neural Networks, Unsupervised Learning and Transfer Learning, Applications	04
8	**Reinforcement Learning** Learning from Rewards, Active and Passive Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, Applications of Reinforcement Learning	04
9	**Natural Language Processing** Language Models, Parsing, Word Embeddings, Sequence Models, Pretraining and Transfer Learning, Learning texts- Keyword Extraction, Paraphrasing, Summarizing, Text Ranking	04

10	**Recommender Systems** What is RecSys, Factorization Algorithms, SVD, Collaborative Filtering-User based and Item Based, Content-based recommendation- Discovering features of documents	04
11	**Game Theory** What is Game Theory, Applications, Types of Game theory, Nash Equilibrium, Mixed Strategy Nash Equilibrium, Inverse Game Theory, Repeated Games, Bayesian Games	04
12	**Philosophy, Ethics, and Safety of AI** The Limits of AI, Can Machines Really Think, The Ethics of AI, The Future of AI	01
	Total Hours	42

Suggested Text books / Reference books:

1. Deepak Khimani, A first course in Artificial Intelligence, Tata McGraw-Hill
2. Russell, S.J. and Norvig, P., Artificial Intelligence: A Modern Approach, Pearson Education
3. "Artificial Intelligence" -By Elaine Rich And Kevin Knight (2nd Edition) Tata Mcgraw-Hill
4. G.Luger, W.A. Sttubblefield, "Artificial Intelligence", Addison-Wesley Longman
5. N.P. Padhy "Artificial Intelligence and Intelligent Systems", Oxford University Press

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	10%	40%	20%	10%	10%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Implement simple feed-forward network
2. Implement Sequential modelling network
3. Implement the neural network with feed-back system
4. Implement the code for RNN
5. Implement the code for LSTM
6. Implement the code for the image processing
7. Implement the code for CNN
8. Implement the basic code for word embeddings of NLP

9. Implement the code for text rank for keyword extraction
10. Implement the code for text rank for text summarization
11. Implement the code for topic modelling of LDA
12. Implement the recommendation system to recommend movie to users
13. Implement the recommendation system to recommend items to users
14. Implement the content based and collaborative based filtering of recommendation system
15. Implement the snake and ladder game using reinforcement learning
16. Implement the Nash Equilibrium theorem using Game Theory concept
17. Implement the BFS, DFS and Dijkstra's shortest path algorithm
18. Implement the Sudoku game using the concept of CSPs
19. Write a program to implement Tic-Tac-Toe game problem.
20. Write a program to Implement A* Algorithm.

Supplementary Resources:

1. http://www.journals.elsevier.com/artificial-intelligence/
2. https://www.technologyreview.com/s/534871/our-fear-of-artificial- intelligence/
3. http://www.sanfoundry.com/artificial-intelligence-mcqs-inductive-logic-unification-lifting-1/

Subject Code: 01CT0704

Subject Name: Management Information System

B. Tech. Year – IV (Semester VII)

Objective:
The main goals of an MIS are to help executives of an organization make decisions that advance the organization's strategy and to implement the organizational structure and dynamics of the enterprise for the purpose of managing the organization in a better way for a competitive advantage.

Credits Earned: 03 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand the role of management information systems in achieving competitive business advantage through informed decision making.
2. Analyze how information technology affects a firm in terms of value creation and brings strategic benefits to a firm.
3. Interpret how to use information technology to solve business problems.
4. Develop meaningful decision-making capacity for the purpose of acquisition, development, deployment and management of information systems.

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	00	03	50	30	20	00	00	100

Contents:

Unit	Topics	Hours
1	**Organisations and Computing** Introduction, Modern Organization-IT enabled- Networked-Dispersed-Knowledge Organization, Information Systems in Organisations- what are information systems?, Brief history of computing- ENIAC: Way to commercial computers- Advent of artificial intelligence- advent of personal computing-Free Software Movement- Advent of Internet, The	06

	role of internet- Internet and Web: they are different-the internet changes everything. Strategic business use of IS: Interdependence between organization and IS, IS strategies for competitive advantage using Porter's Five Forces Model and Value Chain Model.	
2	**Managing Information Systems in Organisations** Introduction, Managing in the Internet Age, Managing Information Systems in Organizations — IT Interaction Model, Challenges for Managers — Information to Build Information? -To spend them on information systems? -What capabilities should be built with information systems? -How should services be centralized? -What level of safety is required? What is the technology road map for the organization?	05
3	**Competing with IT** Introduction, competitive environment of business - Partnership for mutual benefit -Bargaining power of suppliers - Bargaining power of buyers and options - Barriers to entry-risk of industry regulations, IT, using competition to compete at low cost.	05
4	**Decision Support Systems** Introduction, Understanding DSS- MIS and DSS-Decision making-types of decisions, Analytics and Business Intelligence- BI techniques	04
5	**Managing Data Resources** Introduction, The Need for Data Management- History of data use, Challenges of Data Management- data independence- reduced data redundancy- data consistency- data access- data administration- managing concurrency-managing security- recovery from crashes-application development, Database Concepts- fields, records and files- basic architecture, Data Warehouses- data mining uses	06
6	**Managing IT Function** Introduction, challenges of managing IT function - modern IT environment - centralization vs. decentralization - IT security - technology selection, vendor management - vendor selection - vendor contracts and service levels – relationship management - vendor retention or termination	04
7	**Ethical issues** Introduction, key issues - privacy - workplace monitoring - power over users, information security: First Line of defence - People / Staff, Second Line of defence - Technology, Prevention, Detection and Response to Authority Contemporary / emerging technologies: Cloud and Mobile Computing, E-commerce, m-commerce, Internet of things	08
8	**Practical** Students should emulate an organization and its processes and develop a hypothetical information system. Students should study information systems adapted by various business institutions.	04
	Total Hours	42

Suggested Text books / Reference books:

1. Essentials of Management Information Systems by Kenneth Laudon, Jane Laudon PHI
2. Management Information systems by W.S. Jawadekar TMH
3. Information Technology for Management: Transforming Organizations in Digital Economy by EfraimTurban, Dorothy Leidner, Ephraim McLean and James Wetherby, Wiley
4. Information Systems: Managing the Digital Firm Management by Kenneth Laudon, Jane Laudon, Pearson

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	25%	25%	25%	10%	5%

Supplementary Resources:

1. https://www.inc.com/encyclopedia/management-information-systems-mis.html
2. https://www.smartsheet.com/management-information-systems

Subject Code: 01CT0705

Subject Name: Digital Design using Verilog

B. Tech. Year – IV (Semester VII)

Objective:
This course will introduce the students to the Verilog Hardware Description Language (HDL). Students will learn to model the hardware using hardware description language.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand the Verilog Hardware Description Language
2. Model the combinational and sequential circuits using Verilog
3. Verify the digital design with simulation
4. Analyze the different Verilog modelling style
5. Interpret the data sheets of CPLD and FPGA

Pre-requisite of course:
Digital Electronics

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Digital Circuit Design Flow** Introduction to digital circuit design flow, VLSI design flow, Behavioral design, data path design, logic design, physical design, manufacturing. VLSI design style, FPGA based design, standard cell-based design, Full custom design.	06
2	**Introduction to Verilog** Concept of module, Data types in Verilog, Features of Verilog, Verilog operators	04
3	**Verilog Modeling** Behavioral modeling and structural modeling, Explanation of modeling with different examples, modeling 16x1 multiplexer, modeling 16-bit adder, Switch level modeling	06
4	**Verilog Description Styles** Data flow and behavioral (procedure statements), Example of decoder and D-latch, Various examples using blocking and non-blocking assignment, analyzing that how the modeling style influences the simulator and synthesis tool	08
5	**Verilog Test benches** Writing Verilog test benches, write test bench for combinational design, write test bench for sequential design, generating test vectors	04
6	**Modeling Finite State Machine** Moore Machine, Mealy Machine, Examples	06
7	**Data path and Controller design** Data path design includes functional circuits, registers, multiplexers, bus, adders, multipliers, counters etc. Controller design includes Finite State Machine and provide control to the data path, Example to explain above concept	04
8	**Modeling Memory and register banks** Concepts of modeling memory, how to model memory and initialize memory, Concepts of modeling register banks	04
9	**Verilog modeling of processor** RISC Processor, Basic pipe line concepts, Understanding pipe line implementation	06
10	**CPLD and FPGA** Evolution, PLA and PAL, Simple PLD and its data sheet, Complex PLD(CPLD) and its data sheet, FPGA, Architecture of FPGA, Configurable logic blocks, I/O blocks, Interconnect logic, Interpretation of datasheets of commercially available FPGA, Realization of digital design using FPGA	08
	Total Hours	56

Suggested Text books / Reference books:

1. Verilog HDL A guide to digital design and synthesis by Samir Palnitkar, Pearson Education
2. Fundamentals of Digital Logic with Verilog Design by Stephen Brown and Zvonko Vranesic
3. Verilog HDL Synthesis-A practical primer by J.Bhaskar
4. Verilog Digital System Design by Z.Navabi
5. Digital Design: Principles and practices by Jon F. Wakerly, Prentice Hall
6. Datasheets of CPLD and FPGA

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	20%	35%	30%	0%	10%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Write the Verilog code to implement given logic functions.
2. Write the Verilog code from the given logic circuit.
3. Write the Verilog code for designing 16x1 Multiplexer with 2x1 multiplexer.
4. Write the Verilog code for designing 4x16 decoder with 2x4 decoder.
5. Write the Verilog code for designing 8 to 3 priority encoder.
6. Write the Verilog code for designing half adder and full adder circuit.
7. Write the Verilog code for designing 4 bit ripple carry adder circuit.
8. Write the Verilog code for designing binary to gray code converter circuit.
9. Write the Verilog code for designing BCD to seven segment converter circuit.
10. Write the Verilog code for D latch, SR latch and JK latch.
11. Write the Verilog code for D flip flop, SR flip flop, JK flip flop.
12. Write the Verilog code for designing T-flip flop using D-flip-flop.
13. Design 4-bit register with asynchronous clear and enable using Verilog.
14. Design 4-bit shift register with synchronous reset using Verilog.
15. Design 4 bit up/down counter with parallel load using Verilog.
16. Design Moore machine(FSM) with example using Verilog.
17. Design Mealy machine(FSM) with example using Verilog.

Supplementary Resources:

1. Hardware Modeling Using Verilog: Prof. Indranil Sengupta, IIT Kharagpur
   https://nptel.ac.in/courses/106/105/106105165/
2. Digital System Design with PLDs and FPGAs: Prof. Kuruvilla Varghese, IISc Bangalore
   https://nptel.ac.in/courses/117/108/117108040/
3. https://www.edaplayground.com/

Subject Code: 01CT0706

Subject Name: Computer Vision

B. Tech. Year – IV (Semester VII)

Objective:
Computer vision focuses on the development of algorithms and techniques to analyze and interpret the visible world around us. This requires an understanding of the fundamental concepts related to multi-dimensional signal processing, feature extraction, stochastic optimization, etc. Knowledge of these concepts is necessary for research and further developments in the field of computer vision. Applications range from Biometrics, Medical diagnosis, document processing, mining of visual content, surveillance, advanced rendering, etc.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand the foundations of image formation and the working of vision algorithms.
2. Implement low, mid, and high-level vision algorithms.
3. Apply computer vision techniques on images and videos to get the desired output.
4. Analyze the strengths and weaknesses of different vision methods and techniques for vision problems.
5. Develop an application using computer vision concepts.

Pre-requisite of course:
Linear Algebra, Vector Calculus, Data Structure, and Programming

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Image Formation** Orthographic and Perspective Projection, Camera model, Camera calibration, Intrinsic and Extrinsic Parameters, Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, Stereo Vision	08
2	**Basic Image Processing** Images as functions, Image Enhancement, Image Filtering, Convolution, Histogram Processing, Fourier Transform, Image Morphology	06
3	**Shape from X** Light at Surfaces, Phong Model, Reflectance, Photometric Stereo; Surface Properties, Shape from Shading, Shape from Texture, color, motion and edges, Shape from focus	08
4	**Feature detection and matching** Edge detection, Line detection, interest points, and corners detection, shape analysis, SIFT, SURF, HOG	08
5	**Segmentation** Active contours, Region growing, K-means and mixtures of Gaussians, Mean shift, Graph cuts, Fourier and wavelet descriptors, Important applications: Background subtraction, Shot boundary detection, Interactive segmentation, Forming image regions	08
6	**Optimization techniques** Optimization-based algorithms for solving vision problems, Markov random field and its applications to depth estimation/ image restoration/ image deconvolution, Image registration and morphing, Compressed sensing for vision applications	08
7	**Applications of Computer Vision** Object detection, Object recognition, Activity recognition, Computational Photography, Biometrics, In-vehicle vision systems	06
	Total Hours	52

Suggested Text books / Reference books:

1. Szeliski Richard, "Computer Vision: Algorithms and Applications", 1st edition, Springer-Verlag London Limited, 2011
2. D. Forsyth and J. Ponce, "Computer Vision- A model approach", 2nd edition, Pearson Prentice Hall, 2012
3. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", 3rd edition, Prentice-Hall, 2008
4. E. R. Davies, " Computer and Machine Vision: Theory, Algorithms, Practicalities", 4th edition, Elsevier Inc. 2012
5. Learning OpenCV: Computer Vision with the OpenCV Library, Gary Bradski, O`Reilly Media, 2008.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	25%	30%	20%	10%	10%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Understanding camera calibration and parameters
2. Implement Image Pre-processing
3. Implement image filtering using linear filters
4. Perform shape from shading
5. Implement depth estimation from SFS
6. Generate disparity map
7. Implement edge detection using a canny edge detector
8. Implement corner detection using Harris-corner detector
9. Find lines from images using Hough transform
10. To detect local features using SIFT and SURF
11. To segment image using region growing
12. Implement Object recognition
13. Perform Image morphing
14. Perform Background subtraction
15. Implement target tracking
16. To perform face recognition
17. To construct a 3D model from a single image

Supplementary Resources:

1. https://nptel.ac.in/courses/106105216/
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-801-machine-vision-fall-2004/index.htm
3. https://www.udacity.com/course/introduction-to-computer-vision--ud810
4. https://www.coursera.org/learn/computer-vision-basics

Subject Code: 01CT0707

Subject Name: Multimedia Computing

B. Tech. Year – IV (Semester VII)

Objective:
Multimedia has become an essential part of modern computer technology. In this course, students will be introduced to the principles and current technologies of multimedia systems. The issue of effectively representing, processing, and retrieving multimedia data such as sound and music, graphics, image, and video will be addressed. Students will gain experience in those areas by implementing some components of the multimedia streaming system as their term project. Some advanced topics in the latest web technologies and current multimedia research will also be discussed.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand multimedia data, compression schemes, licensing applications, storage and streaming techniques
2. Identify multimedia signal representations, experiment with compression standards and develop 1D, 2D and 3D multimedia objects
3. Evaluate performances multimedia data for multimedia storage and distribution systems
4. Analyze trade-off between different compression standards with media quality
5. Create objects and animations using multimedia software

Pre-requisite of course:
Linear Algebra, Analog and Digital Communication, and Basic Programming

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction** What is multimedia, Properties of multimedia systems: Independency, computer support, communication systems, Global structure, Multimedia system Architecture: - IMA, workstation, network architecture Evolving Technologies, Applications of multimedia	04
2	**Multimedia data and interactions Data Streams** Elements of multimedia systems, Objects of multimedia systems, Types: Traditional Vs Continuous, Medium: perception, representation, presentation, storage, transmission, information exchange Multimedia communication system Model:- Interpersonal communication, Interactive application over internet, Entertainment and application Requirements : User, network Architectural Issues Multimedia communication subsystems :- Application subsystem, Transport subsystem, QoS and resource management, basic concepts establishing and closing multimedia call, Managing resources during multimedia transmission	07
3	**Compression & Decompression** Introduction to digitization principle -text, image, audio, video, File formats - RTF, TIFF, RIFF, Need and types of data compression, Binary (Text) compression scheme, Packbit encoding (RLE), CCITT group-3 1D, 3 21D and 4 2D compression, Color image, JPEG methodology, JPEG 2000 standard, Performance comparison of JPEG and JPEG2000	07
4	**Video** Introduction to digital video: Types - chromasub sampling, CCIR, HDTV Computer Video format, Video compression: Based on motion compression Motion vector search technique: Sequential, 2D logarithmic, Hierarchal search, Standards used - H.261, Comparison of MPEG and H.264, MPEG 1,2,4,7 and File formats - DVI	07
5	**Audio/Sound Basic sound concepts** Computer representation of sound, Audio formats- MIDI, WAV. Music: MIDI concepts, MIDI Devices, MIDI Messages, MIDI SMPTE timing standard MIDI Software: Speech, Speech Generation, Speech Analysis, Speech Transmission Audio Compression: ADPCM in speech coding, MPEG audio	07
6	**Storage Requirements Basic technology** Video disk: Audio data rate - SNR wrt VCD player, CD player, DVD, Juke box, Peripherals and databases required for multimedia Input devices:- Electronic pen, Scanner, digital camera Output devices :- Printers (Inkjet, laser) , plotters Multimedia database system :Characteristics, Data structures Operations, Models : Object oriented, relational databases.	07

7	**Distributed Multimedia Systems** Components of distributed MM system, MM object server, managing distributed objects, Distributed C.S operations, synchronization	05
8	**Multimedia presentation and Authoring** Multimedia system design & its Issues, Authoring Systems, Design Issues Approaches, Types, User Interface Issues, Architecture, Information characteristics for presentation, Presentation design knowledge, Effective HCI	07
9	**Applications** Copyright Act for multimedia and method of licensing Applications: - Multimedia animation, Virtual Reality, Knowledge based multimedia systems	03
	Total Hours	54

Suggested Text books / Reference books:

1. Virtual Reality Systems, John Vince, Pearsn Education.
2. Data Compression: The Complete Reference, David Salomon, Springer International Edition
3. Ralf Steinmetz and Klara Mahrstedt, "Multimedia computing, communications and Applications", Pearson Education Asia, 6th reprint 2009.
4. Multimedia System design, Prabhat K. Andheigh, Kiran Thakrar

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	20%	20%	20%	15%	15%

Suggested List of Experiments:

1. Study of MAYA software.
2. Study of FLASH software.
3. Creating a banner.
4. Creating a ghost (unshaped) 2D object.
5. Create animation using (expt 3,4).
6. Add sound to above expt (with play button).
7. Create moving objects (using expt 5).
8. Create a game using action script.
9. Create a flash-based presentation (4/5 frames) with UI controls.
10. Study of VLC player, its setting, streaming and non-streaming techniques.

11. Study of streaming audio/video for distributed network.
12. Study of VRML Create a 3D object using 2D and show special effects for the same.

Supplementary Resources:

1. https://nptel.ac.in/courses/117/105/117105083/
2. https://www.coursera.org/learn/copyright-for-multimedia#syllabus
3. https://www.lynda.com/Maya-training-tutorials/255-0.html

Subject Code: 01CT0708

Subject Name: Big Data Analytics

B. Tech. Year – IV (Semester VII)

Objective:
Big data is an extremely useful area in the era of computing techniques as it aids in finding useful pattern from large datasets. Large datasets are so huge that they cannot be processed with traditional technologies. We require special computing system which can handle large data and tandem it with other important aspects like parallel processing, data failure and data pre-processing.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Gain Understanding about Big Data Technology and its Tools.
2. Understand and apply extracting useful pattern from large datasets.
3. Implementation of Big data mining techniques using different software.
4. Understand how data analytics and data science maps to current industry.
5. Understanding and implementing Algorithms in an optimized way using various Big Data Tools.

Pre-requisite of course:
Basic Programming Knowledge, Data Mining

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to Big Data** Introduction-Distributed file System, What is Big Data? Difference between traditional Distributed file system and Big Data Software, Big Data Analytics, Big data Applications	05
2	**Introduction to Hadoop** How Hadoop works? Hadoop Architecture, Explanation of Hadoop EcoSystem, Hadoop Basic commands.	06
3	**Hadoop Input and Output** Data Integrity in Hadoop, Data Compression and Data Serialization in Hadoop, Avro, How Avro works?	05
4	**Hadoop MapReduce** Mapper, Reducer, MapReduce YARN, Job Scheduling, Sorting and Shuffling in MapReduce, MapReduce Input Formats, MapReduce Output Formats How to code in MapReduce program , analyze data using MapReduce	11
5	**Hadoop Ecosystem/Environment: Pig, Hive, Hbase, ZooKeeper** Pig Latin Structures, Statements, Functions, User-Defined Function in Pig, Loading, Storing and Sorting Data in Pig, HiveQL, Tables in Hive, Querying Data, User-Defined Function in Hive, Introduction to HBase, HBASE vs RDBMS, What is ZooKeeper, Zoopkeeper Services, Build Application with ZooKeeper	12
6	**Apache Spark** Introduction to Apache Spark, pySpark, RDD, Working with Key-value pair, Loading and saving data in spark, Learning about Machine Learning Library in Spark.	07
7	**NoSql** Introduction to NoSql, NoSql vs SQL, NewSql, Introduction to MongoDB, MongoDB Create-Drop Databases, Create-Drop Collection, CRUD operation in documents, MongoDB indexing, Aggregation, replication, sharding, Connect Java Application with MongoDB.	06
	Total Hours	52

Suggested Text books / Reference books:

1. Tom White, “HADOOP: The definitive Guide”, O Reilly 2012.
2. BIG Data and Analytics , Sima Acharya, Subhashini Chhellappan, Willey
3. MongoDB in Action, Kyle Banker,Piter Bakkum , Shaun Verch, Dream tech Press
4. Learning Spark: Lightning-Fast Big Data Analysis Paperback by Holden Karau

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	20%	25%	25%	10%	10%

Suggested List of Experiments:

1. Installation and use of Hadoop in ubuntu.
2. Run HDFS commands in hadoop environment.
3. Implementation of a MapReduce Algorithm.
4. Hive Installation.
5. Run Hive related commands on given data.
6. UDF creation in Hive to truncate blank space.
7. Install HBASE and Apply various table queries.
8. Install MongoDB and execute basic commands in MongoDB Shell.
9. Connect MongoDB with java.
10. Install Scala and program in interactive mode and script mode.
11. Run a job on Apache spark.
12. Create and run SQL and NOSQL queries

Supplementary Resources:

1. http://in.reuters.com/tools/rss
2. http://www.altova.com/xmlspy.html
3. https://www.w3.org/RDF/

Subject Code: 01CT0709

Subject Name: Advance Java

B. Tech. Year – IV (Semester VII)

Objective:
This course develops programming ability of students to create dynamic web applications using server-side technology with Java Database Connectivity. Students can learn networking and remote method invocation using Java API. Different Java frameworks like Spring, Java Server Faces and Hibernate will increase ability of students in web application development.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Describe the components of J2EE Architecture, MVC Framework and Multi-tier Application and Various Network Protocol.
2. To make use of Servlet and JSP API in the process of enterprise application deployment.
3. Implement components such as Session, Filters, JSTL, Beans.
4. Distinguish Application Server, Web Container, JDBC and ORM tools.
5. Design and Development of web application having collaboration of Servlets, JSPs, JSF, Spring and Hibernate base upon the requirement.

Pre-requisite of course:
Object Oriented Programming with JAVA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**JDBC Programming** The JDBC Connectivity Model, Database Programming: Connecting to the Database, Creating a SQL Query, Getting the Results, Updating Database Data, Error Checking and the SQLException Class, The SQLWarning Class, The Statement Interface, PreparedStatement, CallableStatement The ResultSet Interface, Updatable Result Sets, JDBC Types, Executing SQL Queries, ResultSetMetaData, Executing SQL Updates, Transaction Management	08
2	**Servlet API and Overview Servlet Model** Overview of Servlet, Servlet Life Cycle, HTTP Methods Structure and Deployment descriptor ServletContext and ServletConfig interface, Attributes in Servelt, Request Dispacher interface The Filter API: Filter, FilterChain, Filter Config Cookies and Session Management: Understanding state and session, Understanding Session Timeout and Session Tracking, URL Rewriting	12
3	**Java Server Pages JSP Overview** The Problem with Servlets, Life Cycle of JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment. JSP Directives, JSP Action, JSP Implicit Objects JSP Form Processing, JSP Session and Cookies Handling, JSP Session Tracking JSP Database Access, JSP Standard Tag Libraries, JSP Custom Tag, JSP Expression Language, JSP Exception Handling, JSP XML Processing.	15
4	**Hibernate 4.0** Overview of Hibernate, Hibernate Architecture, Hibernate Mapping Types, Hibernate O/R Mapping, Hibernate Annotation, Hibernate Query Language	12
5	**Spring** Introduction to spring, Dependency Injection, Spring AOP, Spring ORM, Spring MVC.	09
	Total Hours	56

Suggested Text books / Reference books:

1. Core and Advanced Java, Black Book, Recommended by CDAC, Revised and Upgraded [eBook] Dreamtech Press.
2. Java The Complete Reference - Eleventh Edition by Herbert Schildt.
3. Advanced Java Programming by Prasanalakshmi B
4. Intermediate & Advanced Java Programming by Stone River
5. Head First Java by Kathy Sierra

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	25%	30%	20%	10%	10%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. WAP that will retrieve data from Database and display on Console screen. (JDBC)
2. WAP that will take firstName, surName, email from user. Store that data into DB and display data from DB. (JDBC)
3. Search userDOB by passing arguments as date to servlet by submit the serch.jsp page at SearchResult.java servlet that returns the rows of result back to clientResult.jsp page. (Servlet).
4. Create one class file named DBTransaction.java file under classes directory. That returns the connection obj. to servlet ConServlet.java file under same classes folder. Use this servlet for controller. Accept the data from CV.jsp page as forms data pass it to servlet that redirect data to the InsertData() method of DBTransaction.java file. Use ServletContext for controller (JDBC-Servlet).
5. Take USerName and Email-id from user in html page. Store email-id in xml file also. Display both values in servlet. (Servlet)
6. A servlet program to do session tracking and session counter using serssionListener.
7. JSP program to demonstrate arithmetic operations.
8. Gets two numbers in html page from the user and submit that numbers in jsp page,print appropriate output using methods. (JSP)
9. Get value from user and create cookie in another jsp page and also view that cookie. (JSP)
10. Get value from user and create session in another jsp page and also view. (JSP)
11. Session Demo program. Create login.jsp and check it from user_master db and set session for next UserAccount.jsp page. (JDBC-JSP)
12. Create employee_master table and check if user is authenticated or not by login module and set appropriate session. Every time whenver user loged in the lastAccessTime should be shown to user. give logout link and destory the session attributes and redirecte the user to again login page. (JDBC-JSP)
13. JSP program to demonstrate jsp:forward action tag.
14. Create one user login registeration page in jsp with all required form fields and insert into database. insertion of data done at servlet level where connection method is created in servlet. Accept the client httpServletRequest. (JDBC-Servlet-JSP)

Supplementary Resources:

1. www.nptel.com
2. www.javatpoint.com
3. https://www.tutorialspoint.com/java/index.htm
4. https://www.codejava.net/struts-tutorials

Subject Code: 01CT0710

Subject Name: Embedded Operating System

B. Tech. Year – IV (Semester VII)

Objective:
To acquire knowledge and skills about concepts related to OS such as Scheduling techniques, threads, inter-thread communications, memory management, different types of scheduling , Porting FreeRTOS for Cortex M3 microcontroller and implement various functions of RTOS.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Describe the fundamental concepts of RTOS
2. Develop programs for real time services, firmware and RTOS.
3. Develop programs for multithreaded applications on FreeRTOS.
4. Program in C on FreeRTOS ARM Cortex-M3 Port.
5. Demonstrate Task Management and Inter-Task Communication.
6. Design Realworld embedded system application with RTOS.

Pre-requisite of course:
Basic of Microcontroller programming

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Real time systems and Resources** Real Time Systems, Embedded Systems, Requirements of Embedded System, Challenges in Embedded System. System Resources, Resource Analysis.	06
2	**Real Time Operating System** Need of Real Time Operating System (RTOS), Classification of RTOS, Misconceptions of RTOS, Features of RTOS, RTOS architecture, Realtime kernel, Task management, Preemptive and non-preemptive Scheduler, Task synchronization, Intertask communication, Memory management, Timer management, Interrupt and event handling.	12
3	**Embedded Firmware Design and development** Embedded Firmware Design Approaches, Super-loop-based approach, Embedded Operating System based approach, Programming in Embedded C, Integrated development environment (IDE), Overview of IDEs for Embedded System Development.	12
4	**Embedded System design with FreeRTOS** Introduction to FreeRTOS, multitasking on an STM32 based Cortex-M3 Microcontroller, STM32 Port of FreeRTOS, Resources Used by FreeRTOS, Task Management, Task Functions, Task Priorities, Idle task and task hook function, Creation and Deletion of tasks. Queue Management, Characteristics of a Queue, Working with Large Data, Interrupt Management, Queues within an Interrupt Service Routine, Critical Sections and Suspending the Scheduler, Resource Management, Memory Management.	12
5	**Trace tool for RTOS** FreeRTOS trace analyzer setup, Analysis of valuable dynamic behaviour information , troubleshoot, optimise FreeRTOS firmware. visualizing the real-time execution of tasks and ISRs, including FreeRTOS calls and User Events.	10
	Total Hours	52

Suggested Text books / Reference books:

1. Real-Time Embedded Systems And Components, Sam Siewert , Da Vinci/Charles River Media.
2. The FreeRTOS™ Reference Manual, version 10.0.0 issue 1, FreeRTOS Organization.
3. Mastering the FreeRTOS™ Real Time Kernel, Richard Barry, Real Time Engineers Ltd.

Suggested Theory distribution:
The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
0%	10%	30%	15%	25%	20%

Suggested List of Experiments:
Minimum 12 experiments to be performed during the semester

1. Setup FreeRTOS port for STM32 microcontroller.
2. Write and test C Program with FreeRTOS to demonstrate creation of 3 task and start scheduler.
3. Write and test C Program with FreeRTOS to send data between tasks using Simple and Structured Queue.
4. Write and test C Program with FreeRTOS to visualize preemptive and non-preemptive scheduling.
5. Write and test C Program with FreeRTOS to visualize memory management using heap1.
6. Write and test C Program with FreeRTOS to visualize memory management using heap2.
7. Write and test C Program with FreeRTOS to visualize memory management using heap3.
8. Write and test C Program with FreeRTOS to explore use of Binary Semaphore for task synchronization while sharing common resource i.e., UART
9. Write and test C Program with FreeRTOS to explore use of Binary Semaphore as signaling mechanism for ISR.
10. Write and test C Program with FreeRTOS to create priority Inversion situation.
11. Write and test C Program with FreeRTOS to demonstrate Priority Inheritance using mutex to avoid priority inversion.
12. Write and test C Program with FreeRTOS to use software timers with and without CMSIS.
13. Setup and utilize trace tool to analyze FreeRTOS firmware behavior.
14. Write and test C Program with FreeRTOS to print 3 sensor data on common LCD utilizing semaphore.
15. Write and test C Program with FreeRTOS to demonstrate intertask communication using queue.
16. Design and troubleshoot mini project using STM32 and FreeRTOS for any Real-world Application utilizing minimum 4 task, semaphore, mutex and queue.

Supplementary Resources:

1. https://www.st.com/en/embedded-software/freertos-kernel.html
2. https://www.freertos.org/portstm32iar.html

Subject Code: 01CT0711

Subject Name: Wireless System Design

B. Tech. Year – IV (Semester VII)

Objective:
After completion of this course, student will be able to get fundamental knowledge of ad-hoc wireless, next generation sensor network, its applications, various routing protocols of MANET, architecture, protocols and security of Wireless system. Students are also able to differentiate between Wireless adhoc network and wireless sensor network. This subject will provide practice hands-on experience in designing a mobile ad hoc network using the NS2 network simulator through a lab experiment

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand wireless adhoc network and wireless sensor network
2. Explain the principles and characteristics and its architecture of Wireless system.
3. Apply the knowledge to identify appropriate physical and MAC layer protocols and suitable routing algorithm based on the network and user requirement.
4. Analyze various routing, security and solution protocols of Wireless system design.
5. Implement solutions to real world problems using sensor devices and its principles of working.
6. Design and implement a basic mobile ad hoc or wireless sensor network via simulations.

Pre-requisite of course:
Fundamentals of analog and digital communication, basic knowledge of data, advanced communication and wireless networks, routing protocols, IEEE 802.XX standards.

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction-Wireless Ad Hoc Network and sensor network** Infrastructure-based and infrastructure-free wireless networks, Ad-hoc network familiarity- Definition, Characteristics and Major challenges, Mobile Ad Hoc Network (MANET)-Introduction, Issues in Ad hoc wireless networks, Example commercial applications of Ad hoc networking, Ad hoc wireless Internet. Wireless sensor network - Definition, Characteristics and applications, Closest Peers, IEEE 1451 and Smart Sensors, Sensors for Smart Environments, Commercially Available Wireless Sensor Systems, Self-Organization and Localization, Differentiate between Wireless adhoc network and wireless sensor network (WSN).	12
2	**MANET Routing Protocol** Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Table Driven Routing Protocols: Destination Sequenced Distance Vector (DSDV), On–Demand Routing protocols : Ad hoc On–Demand Distance Vector Routing (AODV).	08
3	**Single node and Network architecture** Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Design principles for WSNs,	12
4	**Protocols** Fundamentals of (wireless) MAC protocols, Low Duty Cycle Protocols And Wakeup Concepts: S-MAC and Mediation Device Protocol, Contention based protocols: PAMAS, Schedule based protocols: LEACH, IEEE 802.15.4 MAC protocol, Routing Protocols: Energy Efficient Routing, Physical layer and Transceiver design considerations in WSNs.	12
5	**Security and solution protocols in Wireless system design** Network designer security goals, Security considerations in wireless sensor networks, Denial-of-service attacks: Physical-layer and link-layer attacks, Network-layer attacks, Transport layer and application attacks Solution protocols: Localized Encryption and Authentication Protocol (LEAP), Security Protocols for Sensor Networks (SPINS), Intrusion Tolerant Routing in Wireless Sensor Networks (INSENS).	12
	Total Hours	56

Suggested Text books / Reference books:

1. C. Siva Ram Murthy and B. S. Manoj, ―Ad Hoc Wireless Networks Architectures and Protocols‖, Prentice Hall, PTR, 2004.(1st unit half,2nd unit)
2. Holger Karl , Andreas willig, ―Protocol and Architecture for Wireless Sensor Networks‖, John wiley publication, Jan 2006.(3rd and 4th unit)
3. Jagannathan Sarangapani, ― Wireless Ad Hoc and Sensor Networks Protocols,Performance, and Control, CRC press, 2007.(1st unit half)(Unit 5th)
4. Feng Zhao, Leonidas Guibas, ―Wireless Sensor Networks: an information processing approach‖, Elsevier publication, 2004.
5. Charles E. Perkins, ―Ad Hoc Networking‖, Addison Wesley, 2000.
6. I.F. Akyildiz, W. Su, Sankarasubramaniam, E. Cayirci, ―Wireless sensor networks: a survey‖, computer networks, Elsevier, 2002, 394 - 422.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
25%	30%	25%	10%	5%	5%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Introduction to network simulators used for wireless Ad-Hoc and Sensor Networks.
2. Simulating a Mobile Adhoc Network
3. Setting up a Bluetooth Network
4. Introduction to TCL scripting: demonstration of one small network simulation script.
5. To study various trace file formats of network simulators.
6. To implement and compare various MAC layer protocols.
7. To implement AODV routing algorithms in MANET.
8. To implement DSDV routing algorithms in MANET.
9. To implement signal strength based link management routing protocols.
10. To calculate and compare average throughput for various TCP variants.
11. To implement and compare various routing protocols for wireless sensor networks.
12. To study Ethereal / Wireshark software and analyze dump files.
13. Design and simulate DSDV (Destination Sequenced Distance Vector) protocol in NS2.

Supplementary Resources:

1. https://nptel.ac.in/courses/106105160/
2. http://user.informatik.uni-goettingen.de/~sensorlab/Lab_Content
3. http://www.isi.edu/nsnam/ns/
4. http://en.wikipedia.org/wiki/Network_simulation
5. http://www.ita.cs.rpi.edu/
6. https://www.wireshark.org/

Subject Code: 01CT0712

Subject Name: Internet of Things

B. Tech. Year – IV (Semester VII)

Objective:
The objective of the course is to introduce to fundamentals of IoT and understand applications of IoT in various domains. Explore hardware, software, communication and data management enablers for IoT and learn to use them along with fulfilling security requirements of IoT.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand IoT architecture, hardware and software components, protocols and applications. .
2. Apply proper access technologies and protocols to build IoT Motes.
3. Implement algorithms related to various layers in protocol stack of IoT framework.
4. Distinguish between various IoT architectural components, hardware modules, communication techniques, security technologies and relate them with IoT applications.
5. Construct an IoT solution for existing application domains.

Pre-requisite of course:
Introduction to Single Board Computer Programming, Computer Networks, Internet and Web Technology

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to Internet of Things** Definitions, Core Concepts, Related Concepts, Challenges, IoT framework, IoT Reference Models, IoT Architecture: IoTWF architecture, architecture for adequate design for required security, architecture of edge computing, OPC unified architecture, oneM2M	08
2	**Hardware in IoT** RFID, Sensors, Actuators, MEMS, Smart Objects, IoT Hardware Boards, Case study – Sensor tag energy harvesting, batteries and super capacitors, interfacing of sensors with microcontroller	08
3	**Communication technology in IoT** Communication Criteria, Access technologies and communication protocols: Bluetooth, BLE, LoRaWAN, WirelessHART, Zwave, LTE-M, NB-IoT, Sigfox, 6LowPAN, 6TiSCH, LLN, RPL	10
4	**Cloud and IoT** MQTT, Publish-Subscribe Operation, Packet Structure, Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, XMPP, AMQP, Integrating Internet Services with Interoperable data encoding with XML, JSON and CBOR, Sensor data models and representation, The Sensor Mark-up Language (SENML), lightweight web services for IoT, ContikiOS	10
5	**Security in IoT** protocols and technologies, Lightweight formats for crypto security, CoAP, DTLS, Object security for constrained RESTful environments, OAUTH based authorization, Denial of Service attacks, selective jamming in wireless networks, Intrusion detection systems and firewalls	10
6	**Recent trends in IoT** IoT application domains: Smart Cities, Smart Manufacturing, Smart Grid, Smart Buildings, Intelligent Transportation Systems, Healthcare	06
	Total Hours	52

Suggested Text books / Reference books:

1. Q. F. Hassan, "Internet of Things A to Z: Technologies and Applications", IEEE Press, Wiley
2. D. Hanes, G. Salguerio, P. Grossetete, R. Barton, J. Henry, " IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press
3. J. Holler, V. Tsiatsis, C. Mulligan, S. Karnouskos, S. Avesand, D. Boyle, "From Machine to Machine to Internet of Things", Academic Press, ELSEVIER
4. P. Raj, A. Raman, "The Internet of Things Enabling Technologies, Platforms, and Use Cases", CRC Press

5. IEEE Standard for an Architectural Framework for the Internet of Things (IoT)," in IEEE Std 2413-2019, vol., no., pp.1-269, 10 March 2020, doi: 10.1109/IEEESTD.2020.9032420.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
15%	30%	20%	15%	10%	10%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Define and Explain Eclipse IoT Project.
2. List and summarize few Eclipse IoT Projects.
3. Sketch the architecture of IoT Toolkit and explain each entity in brief.
4. Demonstrate a smart object API gateway service reference implementation in IoT toolkit.
5. Write and explain working of an HTTP- to-CoAP semantic mapping proxy in IoT toolkit.
6. Describe gateway-as-a-service deployment in IoT toolkit.
7. Explain application framework and embedded software agents for IoT toolkit.
8. Explain working of Raspberry Pi.
9. Connect Raspberry Pi with your existing system components.
10. Give overview of Zetta.
11. To understand implementation of MQTT using ContikiOS.
12. To understand implementation of CoAP using ContikiOS.
13. To create IPv6 network and configure network stack using Cooja simulator.
14. To sense temperate and humidity using sensors interfaced with IoT hardware board.
15. To detect presence using proximity sensor interfaced with IoT hardware board.
16. To detect distance of object using ultrasonic sensor interfaced with IoT hardware board.
17. To interface pressure sensor with IoT hardware board and read sensed data.
18. To read RFID tag using RFID reader interfaced with IoT hardware board.
19. To control LED on IoT hardware board using Bluetooth module interfaced with it.
20. To get location data using GPS module interfaced with IoT hardware module on webpage.

Supplementary Resources:

1. https://www.coursera.org/specializations/iot
2. https://www.coursera.org/specializations/internet-of-things
3. https://nptel.ac.in/courses/106/105/106105166/

Subject Code: 01CT0713

Subject Name: Programming with Application Development

B. Tech. Year – IV (Semester VII)

Objective:
This course facilitates classroom and laboratory learning, letting students learn kotlin programming language and develop competence and confidence in android app development. Students will understand the Android Platform and apply advanced features, Sensors, APIs so the students can independently create and deploy Android Applications with SQLite.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Illustrate and explain basic concepts of Kotlin programming.
2. Understand the architecture and user interface of android.
3. Select appropriate controls and layouts based on problem definition.
4. Understand the real-life situation and solve it using advanced features, APIs and sensors available in android with SQLite database.
5. Build, publish and monetize the Android apps using Kotlin programming.

Pre-requisite of course:
Basics of programming language and Concepts of OOP

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Introduction to KOTLIN Programming** Basics of Kotlin, Operations and Priorities, Decision Making , Loop Control, Data Structures (Collections), Functions, Object-Oriented Programming: Inheritance, abstract, interface, super and this, visibility modifiers.	06
2	**Introduction to Android and User Interface** ANDROID SDK Features, Introduction to Development Features, Developing for ANDROID, developing for mobile and embedded devices, ANDROID development tools, Basics of an ANDROID application, introduction to manifest, externalizing resources, application lifecycle, ANDROID activities, Widgets: Button, TextView, ImageView, ProgressBar, ListView, EditText, Calendar, DateTime etc, Working with Intent	10
3	**Android Storage: Files, Shared Preferences, SQLite Database** Creating, saving and retrieving shared preferences, Including static files as resources, working with the file system, Introducing ANDROID databases, Content values and cursors, Working with SQLite databases, Creating content providers, Using content providers, Native ANDROID Content providers	10
4	**Enhancing User Experience, Maps & Location Based Service, Sensors** Material design, RecyclerView, CardView, TabLayout, ViewPager, Menus and dialogs, drawable and gradients, Using location-based services, Selecting a location provider, Finding your current location, Creating map-based activities, Hardware sensors, Sensors and sensor manager, monitoring devices movement and orientation	12
5	**Audio, Video, Camera, Bluetooth, Wifi** Playing audio and video manipulating raw audio, using camera to take pictures, recording video, adding media to mediastore, Managing Bluetooth, Monitor and manage Wifi	06
6	**Telephony API, Publishing, Monetizing & Distributing the Android Application** Hardware support for telephony, using telephony, introducing SMS Send & Receive, Signing, publishing, monetizing & distributing applications	10
7	**Introduction of other mobile application development technology/framework** iOS Development Framework, Flutter	02
	Total Hours	56

Suggested Text books / Reference books:

1. Kotlin for Android App Development, Peter Sommerhoff, Addison-Wesley
2. Pro Android with Kotlin - Developing Modern Mobile Apps, Peter Spath, Apress

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	20%	25%	20%	10%	15%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Object-oriented concepts-based program in Kotlin
2. Introduction to android operating system and study of basic widgets.
3. Demonstrate android lifecycle activities by creating app.
4. Implement list views and adapters in app
5. Create app which demonstrate dialog interfaces in android
6. Apply intents in android app
7. Create android app with database (SQLite) connectivity and manipulation.
8. Demonstrate material design in android app
9. Create android app to track location-based activities.
10. Create android app using any built-in Sensor
11. Demonstrate through android app how audio, video and camera services can work.
12. Create Android app to list available Bluetooth and Wi-Fi device.
13. Create android app to use telephony API in android
14. Demonstrate how android app can be published on Playstore and implement monetization

Supplementary Resources:

1. https://developer.android.com/index.html
2. https://developer.android.com/kotlin
3. https://www.coursera.org/learn/kotlin-for-java-developers
4. https://swayam.gov.in/nd2_aic20_sp02
5. https://flutter.dev/
6. https://developer.apple.com/develop/

Subject Code: 01CT0714

Subject Name: Human Computer Interaction

B. Tech. Year – IV (Semester VII)

Objective:
Acquire the knowledge and skills needed to create highly usable software systems and Prepare to contribute to the advancement of Human-Computer Interaction theory and practice.

Credits Earned: 05 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Describe typical human–computer interaction (HCI) models and styles, as well as various historic HCI paradigms.
2. Apply an interactive design process and universal design principles to designing HCI systems
3. Describe and use HCI design principles, standards and guidelines.
4. Identify some of the common pitfalls in data analysis, interpretation, and presentation.
5. Design, implement and evaluate effective and usable graphical computer interfaces.

Pre-requisite of course:
Demonstrable programming skill in at least one high-level language.

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
04	00	02	05	50	30	20	25	25	150

Contents:

Unit	Topics	Hours
1	**Foundation of HCI** The Human: I / O Channel - Memory - Reasoning and Problem Solving; Computer: Device - Memory - Processing and Network; Interaction: Model - Framework - Ergonomics - Styles - Elements - Interactivity - Pattern	05
2	**Interactive System Design** Concept of usability - definition and extension, HCI and software engineering, GUI design and aesthetics, prototyping techniques	06
3	**Model-Based Design and Evolution** Basic ideas, Introduction to different types of models, GOMS family of models (KLM and CMN-GOMS), Fitts law and Hick Hyman's rule, model based design case studies	07
4	**Human-Centered Software Evaluation** Setting goals for evaluation; Evaluation without users: rehearsal, KLM, guidelines, and standards; Evaluation with users: usability testing, interviews, surveys, experiments.	07
5	**Human-Centered Software Development** Process Approaches, Features and Overview; Functionality and usability: task analysis, interviews, surveys; Specifying conversation and presentation; Prototyping Techniques and Tools - Paper Storyboards, Inheritance, and Dynamic Dispatch, Prototyping Language and GUI Builders.	08
6	**Graphical User-Interface Design** Graphical User Interface, Principles of GUI Toolkit; Selecting interaction styles and interaction techniques; HCI aspects of common widgets; HCI aspects of screen design: layout, colors, fonts, labeling; Handling human failure; Beyond simple screen design: visualization, representation, metaphors; Multi-modal interactions: graphics, sound and haptics; 3D Interaction and Virtual Reality	09
7	**HCI Aspects Of Multimedia Systems** Classification and information architecture: hierarchy, hypermedia; Information retrieval and human performance - Web search, database query language utility, graphics, sound; HCI design of multimedia information systems; Speech recognition and natural language processing; Information Devices and Mobile Computing.	08
8	**Design -Case Studies** Case Study 1- Multi Key press Hindi Text Input Method on a Mobile Phone, Case Study 2 - GUI design for a mobile phone based Matrimonial application., Case Study 3 - Employment Information System for unorganized construction workers on a Mobile Phone.	06
	Total Hours	56

Suggested Text books / Reference books:

1. Ben Schneiderman, “Designing the User Interface ", 5th Edition, Addison Books Wesley,2010.
2. Jacob Nielsen, “Usability Engineering ", Elseiver, 1994.
3. Alan Dix et al, “Human - Computer Interaction ", Prentice Hall, 3 rd Edition, 2003.
4. Alan Cooper, “The Essentials of User Interface Design ", IDG Books, 1995

Suggested Theory distribution:

The suggested theory distribution as per Bloom’s taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	15%	25%	20%	15%	15%

Suggested List of Experiments:

1. Choose any common software interface. Analyze its interfaces by navigating to find out if it adheres to the eight Shneiderman Rules.
2. Consider the two-word processing system: MS Word and Latex. Highlight their key differences from usability point of view.
3. Suppose you want to test the touch-based interaction of a smart phone. Propose a wizard of oz approach for doing the same.
4. Construct the KLM for the example discussed in this lecture, taking the mental operator into account.
5. . Construct KLM and compute the execution time for the task of closing an active window using the “X” button at the top-right corner of the screen.
6. Construct KLM and compute the execution time for the task of closing an active window using the “close” menu option from the “file” menu. Compare the execution time with the one computed in Q2 before. Which one is better?
7. Construct (CMN)GOMS model for the task of file deletion assuming: GUI-based file deletion, Command-line based file deletion and Compare the two. Which one is better?
8. Draw the Users Mental Model for a Transfer of Money from one account to another on an ATM using Normans seven principles draw a Normans Interaction Diagram for 2 Tasks in any application software of your choice.

Supplementary Resources:

1. https://nptel.ac.in/courses/106/103/106103115/
2. https://www.coursera.org/learn/human-computer-interaction
3. https://www.coursera.org/learn/design-research

Marwadi University

Faculty of Technology

B. Tech. in Information and Communication Technology

Semester VIII

Subject Code: 01CT0801

Subject Name: Project

B. Tech. Year – IV (Semester VIII)

Objective:
The subject provides hands-on learning experience to the students with the opportunity to explore a problem or issue of personal or professional interest and to address that problem or issue through focused study and applied research under the direction of a faculty member or industrial guide. This course also provides platform to implement learnt concepts in various subjects in case of project design and to provide in-depth exposure in the field of software, data analytics, embedded, VLSI, networking, and security in case of industrial training. It is also useful to enhance students' ability to think critically and creatively, to solve practical problems, to make reasoned and ethical decisions, and to communicate effectively.

Credits Earned: 14 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Investigate the chosen topic in depth
2. Apply the concepts and theories learnt in previous subjects
3. Apply the various methodologies to design project for specific application
4. Explore the new ideas & the possible areas to work ahead
5. Sharpen the skills in specific direction

Pre-requisite of course:
Basic knowledge of all academic subjects and readiness to explore new things

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
00	00	28	14	00	00	00	100	100	200

Contents:

Unit	Topics
1	The Project work should include appropriate elements of engineering standards, design, analysis, modeling, simulation, experimentation, prototyping, software development, research etc. as per the requirement of the project definition
2	Exploration of various domains of the discipline and finalization of domain for project or Industrial Training
3	Identification of proposed project definition by student or students' group in coordination with faculty guide or industrial mentor to address issue related to economic, environmental, social, political, ethical, health & safety, manufacturability, sustainability, management, science etc.
4	Student's presentation on selected topic with outcomes of the project/Industrial Training and approval by project approval panel
5	Intermediate semester presentations include block diagram, flow chart, micro level block diagram, schematic, required hardware or software, features and application of project at regular interval
Total Hours: 28 / week	

Assessment of project work:

In semester evaluation Evaluation by project evaluation committee from institute (50% marks) and project guide (50% marks)	**Assessment tool**	**Review – I 1st month of semester**	**Review – II Mid of semester**
	TW Marks Distribution	50 Marks	50 Marks
End semester evaluation Evaluation by project evaluation committee from institute (50% marks) and project guide (50% marks)	**Assessment tool**	**Viva Exam**	
	Viva Marks Distribution	100 Marks	

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	5%	15%	15%	20%	40%

Subject Code: 01CT0802
Subject Name: Cross-Platform Mobile Development
(MOOC Credit)
B. Tech. Year – IV (Semester VIII)

Credits Earned: 03 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Learn Flutter and Dart from the ground up, step-by-step
2. Build engaging native mobile apps for both Android and iOS
3. Use features like Google Maps, the device camera, authentication and much more!
4. Learn how to upload images and how to send manual and automated push notifications
5. Learn all the basics without stopping after them: Dive deeply into Flutter & Dart and become an advanced developer

Pre-requisite of course:
Basic programming language

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	00	03	50	30	20	25	25	150

The course is offered with the objective of credit transfer by learning through MOOC course. The selection of the online course should reflect the syllabus content, mentioned below. The MOOC course must be of minimum 36 hours with appropriate assessment scheme.

Content Overview:
Introduction of Flutter, Flutter Basics, Running apps on different devices & debugging apps, Widgets, Styling, Adding logic – Building apps, Responsive and adaptive User interfaces and apps, Widget & Flutter Internals – Deep dive, Navigation & Multiple Screens, State Management, Working with User Input and Forms, Sending Http requests, Adding user Authentication, Adding Animations, Using Native Device Features, Firebase, Image Upload, Push Notifications – Building a Chat App, Running Native Shift, Objective C, Java or Kotlin Code, Publishing to the App Stores.

Subject Code: 01CT0803
Subject Name: SEO and Digital Marketing
(MOOC Credit)
B. Tech. Year – IV (Semester VIII)

Credits Earned: 03 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Grow a Business Online from Scratch
2. Make Money as an Affiliate Marketer
3. Land a High-Paying Job in Digital Marketing
4. Work from Home as a Freelance Marketer

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	00	03	50	30	20	25	25	150

The course is offered with the objective of credit transfer by learning through MOOC course. The selection of the online course should reflect the syllabus content, mentioned below. The MOOC course must be of minimum 36 hours with appropriate assessment scheme.

Content Overview:

Introduction of Digital Marketing, Market Research, Make a website, Email Marketing, Copywriting, Search Engine Optimization, YouTube Marketing, Facebook Marketing, Twitter Marketing, Quora Marketing, Google AdWords, Google Analytics, Instagram Marketing, Pinterest Marketing, LinkedIn Marketing, Facebook Ads, App Marketing, Old Content.

Subject Code: 01CT0804
Subject Name: VLSI Physical Design
(MOOC Credit)
B. Tech. Year – IV (Semester VIII)

Credits Earned: 03 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Learn the basic design flow in VLSI physical design domain
2. Learn the static timing analysis
3. Learn floor planning and partitioning
4. Learn clock routing
5. Learn concepts of DFT and BIST
6. Learn low power design techniques

Pre-requisite of course:
Basic concepts in digital circuit design

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	00	03	50	30	20	25	25	150

The course is offered with the objective of credit transfer by learning through MOOC course. The selection of the online course should reflect the syllabus content, mentioned below. The MOOC course must be of minimum 36 hours with appropriate assessment scheme.

Content Overview:
VLSI physical design flow, chip floor planning and power planning, cell placement, static timing analysis, timing issues of the design, importance of clock tree, clock routing, clock tree synthesis, clock skew, clock jitter, insertion delay, testability of the chip, Design for Testability, various technique for identifying stuck at logic 0 and stuck at logic 1 fault, scan based technique, power consumption of the chip, low power design techniques.

Subject Code: 01CT0805
Subject Name: Data Visualization
(MOOC Credit)
B. Tech. Year – IV (Semester VIII)

Credits Earned: 03 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Examine and improve an ineffective visualization
2. Effectively present data visually to enhance audience comprehension of findings and insights.
3. Apply visualization best practices.
4. Create and design visualizations that work best for the target audience.
5. Find and select appropriate data that can be used in order to create a visualization that answers a particular research question.

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	00	03	50	30	20	25	25	150

The course is offered with the objective of credit transfer by learning through MOOC course. The selection of the online course should reflect the syllabus content, mentioned below. The MOOC course must be of minimum 36 hours with appropriate assessment scheme.

Content Overview:

Introduction of Effective and Ineffective Visuals, Types of Visualizations, Types of Visualizations in Suitable Tool, Visual Perception and Cognitive Principles, Pre-Attentive Attributes of Visualizations, Gestalt Principle: Proximity, Data, Relationships, and Design, Static versus Interactive Visualizations, Visual Analytics with appropriate Tools, Date Hierarchies, Converting Discrete and Continuous Dates, Introduction to Table Calculations, Mapping, Custom Geocoding, Key Performance Indicators, Creating Complex KPIs Using Tableau, Framing and Format, Emotion Modulators: Color, Language, and Other Design Elements.

Subject Code: 01CT0806
Subject Name: Advance Database
(MOOC Credit)
B. Tech. Year – IV (Semester VIII)

Credits Earned: 03 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Use Advance database tool like MongoDb to its full potential in future projects
2. Write efficient and well-performing queries to fetch data in the format you need it
3. Use all features advance database offers you to work with data efficiently
4. Ability to apply acquired knowledge for developing holistic solutions based on advance database systems/database techniques.
5. Analyse and use emerging technologies such as various frameworks of Big Data and Advance tools of Big Data.

Pre-requisite of course:
Database in SQL

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	00	03	50	30	20	25	25	150

The course is offered with the objective of credit transfer by learning through MOOC course. The selection of the online course should reflect the syllabus content, mentioned below. The MOOC course must be of minimum 36 hours with appropriate assessment scheme.

Content Overview:
Introduction to MongoDB Document Model, Getting Data into MongoDB, Filtering on Scalar Fields, Atlas Free-Tier Cluster, Analysing Data with Aggregation, Data Types in MongoDB, Filtering on Array Fields, How MFlix Works with MongoDB, Query movies using operators, Indexes, Geospatial Queries, Graphing with MongoDB, Making Plots with Matplotlib & MongoDB, Introduction Bigdata, Hadoop framework, Hive: Big data SQL, Spark: Stream and analyze the big data, Apache Kafka, Garbage collection, Data locality and broadcasting.

Subject Code: 01CT0807
Subject Name: Network Administration
(MOOC Credit)
B. Tech. Year – IV (Semester VIII)

Credits Earned: 03 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Describes the function of network layer and types of networks
2. Interpret different types of IP Address and sub-netting for different scenarios
3. Classify types of routing and characteristics of routing protocols
4. Demonstrate the use of line commands for different operation and configuration of router and switch
5. Built, modify and test various network topology, access control mechanism with different routing protocols

Pre-requisite of course:
Data Networking and Communication

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	00	03	50	30	20	25	25	150

The course is offered with the objective of credit transfer by learning through MOOC course. The selection of the online course should reflect the syllabus content, mentioned below. The MOOC course must be of minimum 36 hours with appropriate assessment scheme.

Content Overview:
Network basics, Network architectures (OSI Model), Hubs, switches and routers, basics of data forwarded through a network, IP addresses, IP Subnetting, Cabling and network topologies, Ethernet basics, TCP and UDP, Broadcast and collision domain, DNS and DHCP, Routing, VLANs, Spanning Tree, Cisco device initial configurations, ACLs, Network naming, IP Telephony, Quality of Service (QoS), SDN.

Subject Code: 01CT0808
Subject Name: FPGA Based System Design
(MOOC Credit)
B. Tech. Year – IV (Semester VIII)

Credits Earned: 03 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Learn the basic FPGA Architecture
2. Learn configuration of FPGA
3. Learn the concepts of reconfigurable FPGA
4. Learn complex FPGA based systems
5. Learn design flow of FPGA based systems

Pre-requisite of course:
Digital Electronics

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	00	03	50	30	20	25	25	150

The course is offered with the objective of credit transfer by learning through MOOC course. The selection of the online course should reflect the syllabus content, mentioned below. The MOOC course must be of minimum 36 hours with appropriate assessment scheme.

Content Overview:
FPGA design flow, FPGA architecture, configurable logic block, logic element, interconnection between configurable logic blocks, programming the FPGA, system on chip, system on programmable chip, FPGA based reconfigurable computing systems, decision making when to use FPGA for particular design, explore FPGA technologies.

Subject Code: 01CT0809
Subject Name: Advance C++ Programming
(MOOC Credit)
B. Tech. Year – IV (Semester VIII)

Credits Earned: 03 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Discover how to design and write robust and maintainable object-oriented code by applying SOLID principles
2. Learn how to follow SOLID principles using appropriate abstractions and programming patterns in C++
3. Know how to structure C++ projects, test and refactor object-oriented code
4. Learn how to use CMake, Google Test for unit testing and Boost libraries in C++ projects
5. Get acquainted with UML (class and sequence diagrams)

Pre-requisite of course:
Basic understanding of OOP and C++

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	00	03	50	30	20	25	25	150

The course is offered with the objective of credit transfer by learning through MOOC course. The selection of the online course should reflect the syllabus content, mentioned below. The MOOC course must be of minimum 36 hours with appropriate assessment scheme.

Content Overview:
Converting a C Program to C++, C++ Advantages Function in C++, C++ Generics and Functions, Multiple Template Arguments, Graph Theory & Algorithms, C++ Creating Types, Enum & Operator Overloading, Natural Way to Build Widgets, C++ Classes & Object Orientation, Constructors, Deep vs. Shallow Copy, Destructor, Dynamic Data Structures in STL, MST, C++11 Feature: auto, Vector Methods, STL Input File, Iterators Categories, Bidirectional Iterator, Random Access Iterator, Lambda Expressions: for each Function, Function Adapters, Basics of Inheritance, Traits and Inheritance, Virtual Member Functions, The Inheritance Mechanism, A Derived Class, Virtual, Referential Garbage

Collection, Abstract Base Class = 0 Notation, Assertion & Exception Handling, Static Asserts - New C++11 Feature, Design Patterns, C++11 Standard, Thread, <tuple> C++11 New Library, Factory Method, UML diagrams.

Subject Code: 01CT0810
Subject Name: Game Development
(MOOC Credit)
B. Tech. Year – IV (Semester VIII)

Credits Earned: 03 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Discuss the concepts of Game design and development.
2. Design the processes, and use mechanics for game development.
3. Explain the Core architectures of Game Programming.
4. Use Game programming platforms, frame works and engines.
5. Create interactive Games.

Pre-requisite of course:
Unity tool knowledge and basic asset creation knowledge

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	00	03	50	30	20	25	25	150

The course is offered with the objective of credit transfer by learning through MOOC course. The selection of the online course should reflect the syllabus content, mentioned below. The MOOC course must be of minimum 36 hours with appropriate assessment scheme.

Content Overview:
Asset Import and Configuration, Material Creation, Prefab Creation, Lighting with a Skybox, Creating Lights and Configuring Lighting Settings, Tuning Reflection, Creating Post-Processing Effects, UI Design, Adding Interactivity, Interpreting for XR Development, Setting Up a Character Controller, Creating the Player Animator Controller, Creating the Player Camera, Working with Collaborate

Subject Code: 01CT0811
Subject Name: Introduction to DevOps Tools
(MOOC Credit)
B. Tech. Year – IV (Semester VIII)

Credits Earned: 03 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Diagnose a team's delivery pipeline and bring forward prioritized recommendations to improve it
2. Explain the skill sets and roles involved in DevOps and how they contribute toward a continuous delivery capability
3. Review and deliver automation tests across the development stack
4. Explain the key jobs of system operations and how today's leading techniques and tools apply to them
5. Explain how high-functioning teams use DevOps and related methods to reach a continuous delivery capability
6. Facilitate prioritized, iterative team progress on improving a delivery pipeline

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	00	03	50	30	20	25	25	150

The course is offered with the objective of credit transfer by learning through MOOC course. The selection of the online course should reflect the syllabus content, mentioned below. The MOOC course must be of minimum 36 hours with appropriate assessment scheme.

Content Overview:

Understating of DevOps & DevOps Process, Git introduction and installation, Configure User Information in GIT, GIT Text Editor, Compare Stage Area with Local Repository in GIT, Architectural Overview of Jenkins, Code Pipeline, Configure Jenkins with GIT & Maven, Remote Build Trigger in Jenkins, Jenkins Job DSL with Maven Project, Jenkins as a code pipeline, Docker File Instructions & Construction Commands, Stop-Remove the Containers, Docker CLI Monitoring, Docker Swarm, Kubernetes, Kubernetes Node

Workflow, HELM on Kubernetes, AWS VPC, EC2 Instance Auto scaling, EKS Cluster Using AWS.

Subject Code: 01CT0812
Subject Name: Deep Learning for Computer Vision
(MOOC Credit)
B. Tech. Year – IV (Semester VIII)

Credits Earned: 03 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understand how to build a convolutional neural network, including recent variations such as residual networks.
2. Apply convolutional networks to visual detection and recognition tasks.
3. Apply transfer learning to object localization and detection.
4. Apply object detection models such as regional-CNN and ResNet-50, customize existing models, and build your own models to detect, localize, and label your own rubber duck images
5. Implement image segmentation using variations of the fully convolutional network (FCN) including U-Net and d) Mask-RCNN to identify and detect numbers, pets, zombies, and more.

Pre-requisite of course:
Linear Algebra, Vector Calculus, Data Structure and programming

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	00	03	50	30	20	25	25	150

The course is offered with the objective of credit transfer by learning through MOOC course. The selection of the online course should reflect the syllabus content, mentioned below. The MOOC course must be of minimum 36 hours with appropriate assessment scheme.

Content Overview:
Foundations of CNNs, Edge Detection, Padding, Convolution over volume, Simple Convolutional network example, Pooling layers, Classic Networks, ResNets, MobiNet, Efficient Net, Transfer Learning, Data Augmentation, Object Localization, Landmark Detection, Object Detection, Convolutional Implementation of Sliding Window, Bounding Box Predictions, Non Max Suppression, YOLO algorithm, Semantic Segmentation over U-net, Transpose convolution, U-Net architecture, One shot Learning, Siamese Network,

Triplet Loss, Deep ConvNets, Transfer Learning with ResNet50, R-CNN, Tesnorflow, RetinaNet, FCN architecture, Class Activation Maps, Salienct, GradCAM, ZFNet

Subject Code: 01CT0813

Subject Name: Embedded Linux

(MOOC Credit)

B. Tech. Year – IV (Semester VIII)

Credits Earned: 03 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Understanding of Linux architecture and acquire the skills needed for building an OS for Embedded systems
2. Ability to do Linux programming.
3. Analyse the complete setup of BeagleBone Board used especially for Linux based Embedded system and to do the programming for the same
4. Write the programs for interfacing various components with BeagleBone Board
5. Ability to install, configure and booting Angstrom Linux on BeagleBone Board.

Pre-requisite of course: NA

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	00	03	50	30	20	25	25	150

The course is offered with the objective of credit transfer by learning through MOOC course. The selection of the online course should reflect the syllabus content, mentioned below. The MOOC course must be of minimum 36 hours with appropriate assessment scheme.

Content Overview:

Understanding ROM – Uboot-Kernel boot process on Linux-ARM systems and Testing, Kernel, Bootloaders compilations Step-by-Step and testing on Beaglebone Hardware, Understanding various sub systems of AM335x SOC such as GPIOs, I2C, MMC, boot modes etc, Understanding platform devices and how it works, Understanding ARM-board configuration files, Linux device Tree, Understating various boot modes of AM335x, Serial booting (UART), TFTP booting, NFS booting, Beaglebone Networking, Busybox compilations and Testing, Configuring and using Buildroot on Beaglebone, Using I2C tools on BBB, Hardware interfacing projects and 'C' application development using Eclipse IDE, GPIO programming, Interfacing external LEDs, 7 segment displays and code

development, Interfacing LCD and related projects, EEPROM programming, Understanding Linux Concepts, Download, Install and Configure Linux, System Access and File System, Linux Fundamentals, System Administration, Shell Scripting, Networking, Servers and System Updates, Disk management.

Subject Code: 01CT0814
Subject Name: Spread Spectrum communications
(MOOC Credit)
B. Tech. Year – IV (Semester VIII)

Credits Earned: 03 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Describe the types and advantages of spread spectrum modulation formats.
2. Describe the differences and benefits of different types of spreading codes.
3. Analyze the performance of spread spectrum systems in the presence of interference.
4. Analyze the performance of multiple access techniques based on spread spectrum.
5. Describe the major factors influencing the capacity of CDMA wireless networks.

Pre-requisite of course:
Digital Communication and fundamentals of Wireless Communications

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	00	03	50	30	20	25	25	150

The course is offered with the objective of credit transfer by learning through MOOC course. The selection of the online course should reflect the syllabus content, mentioned below. The MOOC course must be of minimum 36 hours with appropriate assessment scheme.

Content Overview:
Introduction to Digital communications and Spread Spectrum, Direct Sequence Spread Spectrum, Frequency Hopping, Pseudo-random sequence generation, Synchronization Issues for Spread-Spectrum, Performance analysis of Direct-Sequence Spread Spectrum, Frequency-Hopped Spread-Spectrum, and CDMA.

Subject Code: 01CT0815
Subject Name: Advance Web Technology
(MOOC Credit)
B. Tech. Year – IV (Semester VIII)

Credits Earned: 03 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Apply framework environment for user input, forms and validation.
2. Analyse different authentication techniques using encryption / decryption.
3. Deploy third party services into the application.
4. Create dynamic web application with the use of advance concepts of web technology to achieve optimization in coding.
5. Demonstrate the use of different emerging frameworks as a frond end as well as backend.

Pre-requisite of course:
Core PHP / J2EE / JavaScript

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	00	03	50	30	20	25	25	150

The course is offered with the objective of credit transfer by learning through MOOC course. The selection of the online course should reflect the syllabus content, mentioned below. The MOOC course must be of minimum 36 hours with appropriate assessment scheme.

Content Overview:
Laravel Fundamentals, Laravel Blade templating engine, Database - Laravel Migrations, Raw SQL Queries, Database - Eloquent / ORM, Database - Eloquent Relationships, Database – Tinker, Eloquent One to One Relationship CRUD, Eloquent One to Many Relationship CRUD, Forms and Validation, Database - Some more model manipulation, Forms - Uploading files, Middleware - Security / Protection, Permissions & Roles, WYSIWYG and File Management installation, Deploying our app to a shared hosting account.

Marwadi UNIVERSITY		**Marwadi University**
		ICT
		B.Tech. Draft Teaching and Examination Scheme Semester I & II (WEF 2018)

B. Tech. Year I, Sem I								**Evaluation Scheme**					
Subject Code	**Subject Name**	**Category**		**Teaching Scheme (Hours)**			**Credits**	**Theory Marks**			**Tutorial/ Practical Marks**		**Total Marks**
				Theory	**Tutorial**	**Practical**		**ESE(E)**	**IA**	**CSE**	**Viva (V)**	**Term Work (TW)**	
01MA1101	Differential and Integral Calculus	BSC	BS-UC	4	2	0	5	50	30	20	25	25	150
01EE0104	Electrical Circuits	ESC	ES-UC	4	0	2	5	50	30	20	25	25	150
01EC0101	Basics of Electronics Engineering	ESC	ES-UC	3	0	2	4	50	30	20	25	25	150
01SL0102 / 01SL0103	Reading & Writing for Technology / Speaking & Presentation Skills	HSMC	GN-UE	2	0	0	2	0	30	20	25	25	100
01CT0101	Introduction to Computer Programming	ESC	ES-UC	3	0	2	4	50	30	20	25	25	150
01CT0103	Foundation skills in sensor interfacing	PCC-ICT	EE	0	0	2	1	0	0	0	25	25	50
01CT0104	ICT Workshop	ESC	ES-UC	0	0	2	1	0	0	0	25	25	50
01PE0101	Physical Education/Sports/Yoga	MC	NCC	0	0	2	1	0	0	0	0	0	0
	Total	**30**	**30**	**16**	**2**	**12**	**23**	**200**	**150**	**100**	**175**	**175**	**800**

B. Tech. Year I, Sem II								**Evaluation Scheme**					
Subject Code	**Subject Name**	**Category**		**Teaching Scheme (Hours)**			**Credits**	**Theory Marks**			**Tutorial/ Practical Marks**		**Total Marks**
				Theory	**Tutorial**	**Practical**		**ESE(E)**	**IA**	**CSE**	**Viva (V)**	**Term work (TW)**	
01MA1151	Matrix Algebra and Vector Calculus	BSC	BS-UC	4	2	0	5	50	30	20	25	25	150
01EC0102	Digital Electronics	ESC	ES-UC	3	0	2	4	50	30	20	25	25	150
01ME0105	Engineering Drawing and Computer Aided	ESC	ES-UC	2	0	4	4	50	30	20	25	25	150
01CT0105	Object Oriented Programming	PCC-ICT	PC	3	0	2	4	50	30	20	25	25	150
01EN0101	Basics of Environmental Studies	ESC	ES-UC	2	0	0	2	50	30	20	0	0	100
01CT0106	Introduction to R and RStudio	PCC-ICT	PC	0	0	2	1	0	0	0	25	25	50
01CR0103	Value Education	HSMC	GN-UC	2	0	0	2	0	0	0	50	50	100
	Total	**28**	**28**	**16**	**2**	**10**	**22**	**250**	**150**	**100**	**175**	**175**	**850**

Marwadi UNIVERSITY		**Marwadi University**
		ICT
		B.Tech. Draft Teaching and Examination Scheme Semester III & IV (WEF 2018)

B. Tech. Year II, Sem III								**Evaluation Scheme**					
Subject Code	**Subject Name**	**Category**		**Teaching Scheme (Hours)**			**Credits**	**Theory Marks**			**Tutorial/ Practical Marks**		**Total Marks**
				Theory	**Tutorial**	**Practical**		**ESE(E)**	**IA**	**CSE**	**Viva (V)**	**Term Work (TW)**	
01MA0231	Discrete Mathematics and Graph Theory	BSC	BS-UC	4	2	0	5	50	30	20	25	25	150
01CT0301	Computer Organisation and Architecture	PCC-ICT	PC	3	0	2	4	50	30	20	25	25	150
01CT0302	Signals and Systems	PCC-ICT	PC	3	0	2	4	50	30	20	25	25	150
01CR0302	Professional Ethics	HSMC	GN-UC	1	0	0	1	0	0	0	50	50	100
01CT0303	Introduction to Communication Engineering	PCC-ICT	PC	3	0	2	4	50	30	20	25	25	150
01CT0307	Data Structure and Algorithm	PCC-ICT	PC	4	0	2	5	50	30	20	25	25	150
01CT0306	Design Engineering	PROJ-ICT	EE	0	0	2	1	0	0	0	25	25	50
	Total	**30**	**30**	**18**	**2**	**10**	**24**	**250**	**150**	**100**	**200**	**200**	**900**

B. Tech. Year II, Sem IV								**Evaluation Scheme**					
Subject Code	**Subject Name**	**Category**		**Teaching Scheme (Hours)**			**Credits**	**Theory Marks**			**Tutorial/ Practical Marks**		**Total Marks**
				Theory	**Tutorial**	**Practical**		**ESE(E)**	**IA**	**CSE**	**Viva (V)**	**Term work (TW)**	
01CT0401	Probability and Statistics	PCC-ICT	IE	3	2	0	4	50	30	20	25	25	150
01CT0402	Problem solving using Python	PCC-ICT	PC	3	0	2	4	50	30	20	25	25	150
01CT0403	Microcontroller and Interfacing	PCC-ICT	PC	3	0	2	4	50	30	20	25	25	150
01CT0404	Analog and Digital Communication	PCC-ICT	PC	3	0	2	4	50	30	20	25	25	150
01CT0405	Engineering Electrodynamics	PCC-ICT	PC	3	0	0	3	50	30	20	0	0	100
01CE0401	Operating System	PCC-ICT	PC	4	0	2	5	50	30	20	25	25	150
01CT0406	Technical Writing	HSMC	GN-UE	1	0	0	1	0	0	0	25	25	50
	Total	**30**	**30**	**20**	**2**	**8**	**25**	**300**	**180**	**120**	**150**	**150**	**900**

Marwadi UNIVERSITY		**Marwadi University**
		ICT
		B.Tech. Draft Teaching and Examination Scheme Semester V & VI (WEF 2018)

B. Tech. Year III, Sem V								**Evaluation Scheme**					
Subject Code	**Subject Name**	**Category**		**Teaching Scheme (Hours)**			**Credits**	**Theory Marks**			**Tutorial/ Practical Marks**		**Total Marks**
				Theory	**Tutorial**	**Practical**		**ESE(E)**	**IA**	**CSE**	**Viva (V)**	**Term Work (TW)**	
01CT0501	Optimization Techniques	PCC-ICT	PC	3	0	0	3	50	30	20	0	0	100
01CT0502	Database Management System	PCC-ICT	PC	3	0	2	4	50	30	20	25	25	150
01CT0503	Computer Networks	PCC-ICT	PC	3	0	2	4	50	30	20	25	25	150
01CT0504	Internet and Web Technology	PCC-ICT	PC	3	0	2	4	50	30	20	25	25	150
01CT0505	Introduction to Single Board Computer Programming	PCC-ICT	PC	0	0	2	1	0	0	0	25	25	50
01CT0506	Human Centered Design	PROJ-ICT	EE	0	0	2	1	0	0	0	50	50	100
01CT05XX	Department Elective - 1	PEC-ICT	PEC	4	0	2	5	50	30	20	25	25	150
01GS0501	Cognitive Aptitude -1	MC	NCC	2	0	0	0	0	0	0	0	0	0
	Total	**30**	**30**	**18**	**0**	**12**	**22**	**250**	**150**	**100**	**175**	**175**	**850**

Department Elective – 1
1) 01CT0507 - Advanced Microprocessor
2) 01CT0508 - Optical Communication
3) 01CT0509 - Linux Administration
4) 01CT0510 - Applied Linear algebra
5) 01CT0511 - Theory of Compuation

B. Tech. Year III, Sem VI								**Evaluation Scheme**					
Subject Code	**Subject Name**	**Category**		**Teaching Scheme (Hours)**			**Credits**	**Theory Marks**			**Tutorial/ Practical Marks**		**Total Marks**
				Theory	**Tutorial**	**Practical**		**ESE(E)**	**IA**	**CSE**	**Viva (V)**	**Term work (TW)**	
01CT0601	Digital Signal Processing	PCC-ICT	PC	3	0	2	4	50	30	20	25	25	150
01CT0602	Wireless Communication and Mobile Computing	PCC-ICT	PC	3	0	2	4	50	30	20	25	25	150
01IT0601	Software Engineering	PCC-ICT	PC	3	0	2	4	50	30	20	25	25	150
01CT0603	Reverse Engineering	PROJ-ICT	EE	0	0	2	1	0	0	0	50	50	100
01CT06XX	Department Elective - 2	PEC-ICT	PEC	4	0	2	5	50	30	20	25	25	150
01CT06XX	Department Elective - 3	PEC-ICT	PEC	4	0	2	5	50	30	20	25	25	150
01CR0601	Business Benchmark	HSMC	UC	1	0	0	1	0	0	0	50	50	100
01GS0601	Cognitive Aptitude -2	MC	NCC	2	0	0	0	0	0	0	0	0	0
	Total	**32**	**32**	**20**	**0**	**12**	**24**	**150**	**90**	**100**	**225**	**225**	**950**

Department Elective – 2,3
1) 01CT0604 - Embedded System Design
2) 01CT0605 -RF and Microwave Communication
3) 01CT0606 - Advanced Computer Networks
4) 01CT0607 - Machine learning
5) 01CT0608 - Compiler Design
6) 01CT0609 - VLSI Designs
7) 01CT0610 - Satellite Communication
8) 01CT0611 - Cloud Computing
9) 01CT0612 - Data Warehousing and Data mining
10) 01CT0613 - .NET Technology

Marwadi UNIVERSITY		**Marwadi University**
		ICT
		B.Tech. Draft Teaching and Examination Scheme Semester VII & VIII (WEF 2018)

B. Tech. Year IV, Sem VII								**Evaluation Scheme**					
Subject Code	**Subject Name**	**Category**		**Teaching Scheme (Hours)**			**Credits**	**Theory Marks**			**Tutorial/ Practical Marks**		**Total Marks**
				Theory	**Tutorial**	**Practical**		**ESE (E)**	**IA**	**CSE**	**Viva (V)**	**Term Work (TW)**	
01CT0701	Cryptography and Network Security	PCC-ICT	PC	3	0	2	4	50	30	20	25	25	150
01CT0702	Information Theory and Coding	PCC-ICT	PC	3	0	2	4	50	30	20	25	25	150
01CT0703	Artificial intelligence	PCC-ICT	PC	3	0	2	4	50	30	20	25	25	150
01CT0704	Management Information System	HSMC	GN-UE	3	0	0	3	50	30	20	0	0	100
01CT07XX	Department Elective – 4	PEC-ICT	PEC	4	0	2	5	50	30	20	25	25	150
01CT07XX	Department Elective – 5	PEC-ICT	PEC	4	0	2	5	50	30	20	25	25	150
	Total	**30**	**30**	**20**	**0**	**10**	**25**	**300**	**180**	**120**	**125**	**125**	**850**

	Department Elective - 4,5 1) 01CT0705 - Digital Design using Verilog 2) 01CT0706 - Computer Vision 3) 01CT0707 - Multimedia computing 4) 01CT0708 - Big Data Analytics 5) 01CT0709 - Advanced Java	6) 01CT0710 - Embedded Operating System 7) 01CT0711 - Wireless system Design 8) 01CT0712 - IOT 9) 01CT0713 - Programming for Application Development 10) 01CT0714 - Human computer interaction

B. Tech. Year IV, Sem VIII								**Evaluation Scheme**					
Subject Code	**Subject Name**	**Category**		**Teaching Scheme (Hours)**			**Credits**	**Theory Marks**			**Tutorial/ Practical Marks**		**Total Marks**
				Theory	**Tutorial**	**Practical**		**ESE (E)**	**IA**	**CSE**	**Viva (V)**	**Term work (TW)**	
01CT0801	Project	PROJ-ICT	PC	0	0	28	14	0	0	0	100	100	200
01CT08XX	Department Elective – 6	PEC-ICT	PEC	3	0	2	4	50	30	20	25	25	150
	Total	**33**	**33**	**3**	**0**	**30**	**18**	**50**	**30**	**20**	**125**	**125**	**350**

	Department Elective - 6 (MOOC) 1) 01CT0802 - Cross-Platform Mobile Development 2) 01CT0803 - SEO and Digital Marketing 3) 01CT0804 - VLSI Physical Design 4) 01CT0805 - Data Visualization 5) 01CT0806 - Advance Database 6) 01CT0807 - Network Administration 7) 01CT0808 - FPGA Based System Design	8) 01CT0809-Advance C++ Programming 9) 01CT0810-Game Development 10) 01CT0811 - Introduction to DevOps Tools 11) 01CT0812 - Deep Learning for Computer Vision 12) 01CT0813 - Embedded Linux 13) 01CT0814 - Spread spectrum communications 14) 01CT0815 - Advance Web Technology