Marwadi University
Faculty of Technology
Department of Information and Communication Technology

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 lifeproblems
4. Analyze the behaviour of Electronics circuits containing Semiconductor device, OperationalAmplifier 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", PearsonEducation, 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, 7thEdition, 2008.
5. S Salivahanan and N Suresh Kumar, "Electronics Device and Circuits" Tata McGraw-Hill EducationPrivate Limited, 2nd Edition, 2008.
6. Jacob Milman and Christos C. Halkias, "Electronics Device and Circuits", Tata McGraw-Hill, 3rdEdition, 2008.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves asguidelines 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 atransistor.

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 DCsignal.
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 ofthe 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

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

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 ofscience 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 seriesexpansion	07
3	**Ordinary Differential Equations** Reorientation, order and degree, Variable separable method, Linear differentialequations, 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 asguidelines 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

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

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 willensure 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 systemconditions.
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, phasor method, admittance method of analysis of AC circuits.	07
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 GroundGrids, 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 IndiaPvt. 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 asguidelines 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

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

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 programs for various open-source programmable boards
3. To develop programs for specific requirements with interfacing of various components andmodules
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 variouspins, 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 debuggingskills	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 asguidelines 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

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

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 anyproblem 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/ usecases

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 TypeCasting, 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 Privatelimited, 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 asguidelines 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 fromthe user
7. Write a program that accepts a number from keyboard and find weather the number is ODD orEVEN 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 theeligible 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 gradefor 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 reverseorder.
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 forswapping 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

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

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 ofvarious 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 usingPCB design software
4. Identify the existing configuration of the computers and peripherals.
5. Apply their knowledge about computer peripherals to identify / rectify problems onboar
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 thefunctionality of ALU	04
3	**Assembling a PC** Assembling various computer parts like Processor (CPU), Computer Case, OpticalDrives, 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 asguidelines 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.

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

Subject Code: 01PE0101

Subject Name: Physical Education/Sports/Yoga

B. Tech. Year – I (Semester I)

Objective: Fitness is the key for any Kind of success, the main aim of this course to make students Fit Mentally and physically by making them participate in different Games which includes Indoor Games and Outdoor Games.

Credits Earned: 01

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

- Students will be able to understand the basic principles and practices of Physical Education, Sports and Yoga.
- Students will be able to instruct the Physical Activities, Sports and Yoga practices for Healthy Living.
- To develop professionalism among students to conduct, organize & officiate Physical Education, Sports and Yoga events at Universities and National Level.
- Students are being given Professional level training in all Games where in they represent the University at national 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	
00	00	02	01	00	00	00	00	00	00

Contents:

Unit	Topics	Hours
1	Introduction to Physical Education/Sports/Yoga	2
2	Health and Wellness	2
3	Adventure Sports	2
4	Sports & Recreation	2
5	Fitness for Careers	2

	LIST OF SPORTS GAMES (Outdoor)	
1	Foot ball –Basic Skills taught to all students	3
2	Cricket : Basic skills of this Game taught to students	3
3	Basket Ball – Basic skills of this Game taught to students	3
4	Volley Ball - Basic skills of this Game taught to students	3
5	Kabaddi - Basic skills of this Game taught to students	3
6	Yoga _ Basic knowledge of Asanas/ Prayanam	3

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

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 helpinglearners 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

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

1. To enhance reading skills for academic purposes
2. To evolve appropriate writing competence for academic purposes
3. To carry out reading and writing tasks in the context of technology and technology related content
4. To express their ideas in formal, academic written form

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, approachingreading: 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 ofwriting: essay, case study, research paper, term paper, 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	13
	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 andLarry 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 June2017.
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 asguidelines 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 forAcademic Purposes. Cambridge University Press, 2012.
7. Hamp-Lyons, Liz, and Ben Heasley. Study Writing: A Course in Writing Skills for AcademicPurposes. Cambridge University Press, 2013.
8. Langan, John, and Judith Nadell. Doing Well in College: A Concise Guide to Reading, Writing, andStudy skills. McGraw-Hill Book Col., 1980.
9. Vise, David A., and Mark Malseed. The Google Story. Bantam Dell, 2008.

Marwadi University
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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. Develop speaking competence for academic purpose
2. Speak on a given topic in the context of technology
3. Express ideas in an organized way for conversations and interactions related to academic requirements
4. Enhance the ability to make a presentation on a given topic

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, expressingpoints 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 (withvideo 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 asguidelines 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." the muse. 2017. https://www.themuse.com/tags/communication. Accessed 4July 2017.
2. Presentation Magazine. 2017. https://www.presentationmagazine.com/. Accessed 4 July 2017.
3. "Presentation Skills." SKILLS 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.

Marwadi University
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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 digitalelectronic 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 andmemory 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 andDivision, 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 OpenCollector/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 andROM, 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, 1stEdition, 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 asguidelines 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 ICTester.
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 fanout.
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 example4, 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 usingdigital 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 usedin 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

Marwadi University
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Department of Information and Communication Technology

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 betweenideas 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 newproducts.
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 andsides 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 ofFDM 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 asguidelines 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 ofdifferent 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/

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

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 solvesuch 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 CunninghamPublished by Tata Mc Graw Hill

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves asguidelines 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%	5%	5%	0%

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

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, Datavisualization, 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, AssignmentOperators, Miscellaneous Operators	02
4	**R-Decision and Control Loop Statements** if condition, if else condition, switch condition, repeat loop, while loop, forloop, 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 asguidelines 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 fordata
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

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

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 deliveredin 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. Explain the linear dependence of vectors of different vector space.
2. Apply the concept of Eigen values and vectors in various field of engineering like control theory, vibration analysis, quantum mechanics etc.
3. Understand role of mathematical modeling in taking care of different issues related to heat transfer, mechanics, momentum, etc.
4. Understand the key role of vector integral calculus in finding flux in vector field, finding potential function, etc.
5. Determine convergence of improper integrals and explain special functions like Beta, Gama and error functions.
6. Apply Gauss elimination to solve linear system of equations.

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 vectorspace, 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 inverseof 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 valuesand 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 asguidelines 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%	30%	15%	10%	0%

Supplementary Resources:

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

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

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 anduse concepts such as variables, conditional and iterative execution methods etc.
2. To understand the fundamentals of object-oriented programming in Java, including definingclasses, 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 packageand 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, javawith 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 Finallystatement, 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 JavaBeansand 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 Stream,File Output Stream, Input Stream Reader, Output Stream Writer	03
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 windowsFrame 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 HillEducation.
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 asguidelines 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, adda 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 ofabout 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 & returnsit 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 Displaythe 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 anempty 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 Javaprogram 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. Readin 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 bothrecursive 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 primenumbers up to that Integer?
19. Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is apalindrome?
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

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

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 interactionsand videos.

Credits Earned: 02 Credits

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

1. Understand importance of role of Values in developing self
2. Inculcate right values, ethics, attitudes, manners and behaviors for life
3. Respond and relate with expectations, competitions and power of networking
4. Apply the values in order to live a positive, healthy and productive life
5. Understand the significance of having appropriate attitude and balance towards work life as well as personal life.

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 HumanValues 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 ofexploration 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 andearning 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 effectsof emotions in life.	02
6	**Workplace values 1 – Manners** Understanding workplace as a second home and source of livelihood, inculcatespirit 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 inright 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 bodylanguage	02
11	**Understanding hazards of Social Networking sites** Developing sound habits, breaking bad habits, understanding hazards of badhabits 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, focusingupon 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 tomaximize 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 mindand tips for a successful show.	02
	Total Hours	28

Suggested Text books / Reference books:

1. Creating Values in Life: Personal, Moral, Spiritual, Family and Social Values – By Ashok Gulla
2. Teaching Your Children Values – By Linda and Richard Eyre
3. The Book of Virtues for Young People – William J. Bennett
4. The Monk who sold His Ferrari – By Robin Sharma
5. Seven habits of Highly Effective People – By Dr. Stephen R Covey
6. Stop Worrying & Start Living – By Dale Carnegie
7. 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 asguidelines 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
Department of Information and Communication Technology

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 themto 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 forprogramming 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 twoobjects.
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 MinimalSpanning 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 ofgraphs, 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 andelementary 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 ComputerScience, 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 asguidelines 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

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

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 basedmicroprocessor 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 simplecomputer architecture.
4. List and specify the various features of microprocessor, memory and I/O devices includingconcepts of system bus.
5. To write assembly language programs and download the machine code that will providesolutions 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:

Units	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 controlUnit	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, SerialCommunication.	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 asguidelines 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 threedifferent 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 BCDnumber 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 locationsstarting 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/

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

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. Italso 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 digitalmodulation 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, Typesof 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, Unguidedmedia- 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 applicationof optical fiber.	03
	Total Hours	42

Suggested Text books / Reference books:

1. Principles of Electronic Communication Systems by Louis E. Frenzel (3rd Edition), Tata-McGrawHill.
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 asguidelines 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/

https://www.tutorialspoint.com/principles_of_communication/principles_of_communication_introduction.htm

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

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 issuesthey 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 andaction 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 andstakeholder 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 relateto 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 Engineerssuch 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 ofethical 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 PHILearning Pvt. Ltd.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves asguidelines 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%	35%	10%	10%	0%

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

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

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 variousoperations on them.
2. Understand about various types of systems, classify them, analyze them and understand theirresponse 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 propertiesand 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 processingconcept.	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 ofROC, Properties of z-transform, Poles and Zeros, Inverse z-transform -Power Series expansion and Partial fraction expansion, Solution of difference equationusing 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 timeFourier transform, Fourier series representation of discrete time periodic signalsand 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 andApplications, 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", CRCPress.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves asguidelines 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 softwaretool.
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.h

tm 3. https://nptel.ac.in/courses/117/101/117101055

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

Subject Code: 01CT0309

Subject Name: Programming with Python

B. Tech. Year – II (Semester III)

Objective:

1. To describe the core syntax and semantics of Python programming language.
2. To discover the need for working with the strings and functions.
3. To illustrate the process of structuring the data using lists, dictionaries, tuples and sets.
4. To infer the Object-oriented Programming concepts in Python.
5. To develop the ability to write GUI and database applications in Python

Credits Earned: 01 Credit

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

1. To write, test, and debug simple Python programs.
2. To implement Python programs with conditionals and loops.
3. Use functions for structuring Python programs.
4. Represent compound data using Python lists, tuples, and dictionaries.
5. Read and write data from/to files and database in Python using GUI.

Pre-requisite of course:
Basic knowledge of Programming, Object Oriented Concepts

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	0	0	0	25	25	50

Contents:

Unit	Topics	Hours
1	**Introduction:** Introduction to Python programming language, Data and Expressions: Literals, Variables and Identifiers, Operators, Expressions and Data Types, Control Structures, Boolean Expressions	5
2	**Statements and List:** Selection Control, Iterative Control, Lists: List Structures, Lists in Python, Iterating over Lists in Python,	4
3	**Dictionaries and Sets:** Dictionary, Set and Tuple in Python	3
4	**Functions:** Program routes, Calling Value Returning Functions, Calling Non-value Returning Functions, Parameter Passing, Keyword and Default Arguments in Python.	4
5	**Modules and OOP:** Python Modules, Classes and OOP, Exception Handling, String Processing and Regular Expression	5
6	**GUI Programming:** Introduction to GUI Programming, Controls, Event Handling	4
7	**File Handling and Database Connectivity:** File Handling: Opening, Reading and Writing Text Files, Database Connectivity with Python	3
	Total Hours	28

Suggested Text books / Reference books:

1. Mark Lutz , “Learning Python”, O Reily, 4th Edition, 2009, ISBN: 978-0596158064
2. Mark Lutz , “Programming Python” , O Reily, 4th Edition, 2010, ISBN 978-0596158118
3. Tim Hall and J-P Stacey , “Python 3 for Absolute Beginners” , 2009, ISBN : 9781430216322
4. Magnus Lie Hetland , “Beginning Python: From Novice to Professional”, 2nd Edition, 2009, ISBN:978159059982
5. C. Dierbach, “Introduction to Computer Science Using PYTHON: A Computational Problem-Solving Focus” (1 ed.), Wiley, 2015. ISBN 978-0470555156.
6. Yashavant Kanetkar, “Let Us Python” (1 ed.), BPB Publishers, 2019. ISBN 978-9388511568.
7. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist” (2 ed.), O’Reilly, 2015. ISBN 978-9352134755.
8. Martin C. Brown, “Python: The Complete Reference” (1 ed.), McGraw-Hill, 2001. ISBN 978-9387572942.

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

1. Write a program to demonstrate different number datatypes in python.
2. Write a program to perform different arithmetic operations on numbers in python.
3. Write a program to create, concatenate and print a string and accessing sub string from a given string.
4. Write a python script to print the current date in following format "Sun August 01 10:10:10 IST 2021"
5. Write a python program to create, append and remove lists in python. Develop programs to understand the control structures of python.
6. Write a program to demonstrate working with tuples in python.
7. Write a program to demonstrate working with dictionaries in python.
8. Write a python program to find largest of three numbers.
9. Write a python program to convert temperature to and from Celsius to Fahrenheit.
10. Write a python program to print prime numbers less than given number.
11. Write a python program to find factorial of a number using recursion
12. Write a python program to that accepts length of three sides of a triangle as inputs.
13. The program should indicate whether or not the triangle is a right angled triangle (use Pythagorean theorem)
14. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
15. Write a python program to define a module and import a specific function in that module to another program.
16. Write a python Program to call data member and function using classes and objects.
17. Write a program to read 3 subject marks and display pass or failed using class and object.
18. Write a program to validate PAN card number and Email ID.
19. Write a GUI program to create Tic-tac-toe in python
20. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first the second file.
21. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
22. Write a GUI program to implement CRUD operation on Student record. (rollno, name, percentage)

Supplementary Resources:

1. https://docs.python.org/3/tutorial/
2. https://www.learnpython.org/
3. https://nptel.ac.in/courses/106/106/106106182/

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

Subject Code: 01CT0308

Subject Name: Data Structure using C++

B. Tech. Year – II (Semester III)

Objective:

1. To teach efficient storage mechanisms of data for an easy access.
2. To design and implementation of various basic and advanced data structures.
3. To introduce various techniques for representation of the data in the real world.
4. To develop application using data structures.
5. To teach the concept of protection and management of data.
6. To improve the logical ability

Credits Earned: 04 Credits

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

1. Implement Object oriented concepts in C++.
2. Differentiate linear and non-linear data structures like stacks, queues, linked list etc
3. Choose appropriate data structure as applied to specified problem definition.
4. Demonstrate operations like searching, insertion, deletion, traversing mechanism etc. on various data structures through programming
5. Select appropriate sorting and searching algorithm based on problem definition in order to get optimum solution
6. Compare and contrast the benefits of dynamic and static data structures implementations

Pre-requisite of course:
Basic knowledge of C language, Object Oriented Concepts

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 of C++** Introduction, Data types, Expression and control statements Iteration statements in C++, Arrays and String, Functions, Structures, Class, Object, Friend Function, Static variables and Functions in class, Constructors and Destructors, Inheritance in C++, Types of Inheritance, Pointers, Virtual Functions, Polymorphism, Abstract classes, Templates in C++, Exception Handling in C++	08
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	08
3	**Stack** The Stack as an ADT, Stack operation, Array Representation of Stack, Link Representation of Stack, Application of stack – Recursion, Polish Notation	04
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	04
5	**Trees** Basic trees concept, Binary tree representation, Binary tree operation, Binary tree traversal, Binary search tree (BST) implementation, Thread Binary tree, The Huffman Algorithm, Expression tree, Introduction to Multiway search tree and its creation (AVL, B-tree, B+ tree), AVL tree balancing; B-tree; Application of trees.	06
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,	04
8	**Searching** List Search, Linear Index Search, Index Sequential Search Hashed List Search, Hashing Methods, Collision Resolution (One way and Two way);	04
	Total Hours	42

Suggested Text books / Reference books:

1. Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and .Mount, Wiley student edition, John Wiley and Sons.
2. Data Structures, Algorithms and Applications in C++, Sartaj Sahani, 2nd Edition.
3. Introduction to Data Structure and its Applications Jean-Paul Tremblay, P. G. Sorenson
4. Data Structures Using C & C++, Rajesh K. Shukla, Wiley- India.
5. Data Structures, Adapted by: GAV PAI, Schaum's Outlines
6. Object Oriented Programming with C++, E.Balaguruswamy, TMH, 6th Edition, 2013.
7. C++: The Complete Reference- Schildt, McGraw-Hill 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
15%	20%	25%	15%	15%	10%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Implementations of Linked Lists menu driven program.
2. Implementation of different operations on linked list – copy, concatenate, split, reverse, count no. of nodes etc.
3. Representation of Sparse matrix using multilinked structure. Implementation of sparse matrix multiplication.
4. Implementation of polynomials operations (addition, subtraction) using Linked List.
5. Implementations of Linked Lists menu driven program (stack and queue)
6. Implementations of Double ended queue using Linked Lists.
7. Implementation of Priority queue program using Linked Lis
8. Implementations of stack menu driven program
9. Implementation of multitask in one array.
10. Implementations of Infix to Postfix Transformation and its evaluation program.
11. Implementations of Infix to Prefix Transformation and its evaluation program.
12. Simulation of recursion
13. Implementations of circular queue menu driven program
14. Implementations of double ended queue menu driven program
15. Implementations of queue menu driven program
16. Implementation of Priority queue program using array.
17. Implementation of Johnsons Algorithm
18. Implementation of Simulation Problem

19. Implementations of Binary Tree menu driven program
20. Implementation of Binary Tree Traversal program.
21. Implementation of construction of expression tree using postfix expression.
22. Implementations of Huffman code construction
23. Implementations of BST program
24. Implementation of various operations on tree like – copying tree, mirroring a tree,
25. counting the number of nodes in the tree, counting only leaf nodes in the tree.
26. Implementations of B-tree menu driven program
27. Implementations of B+ tree program
28. Implementation of Preorder traversal of a threaded binary tree.
29. Implementations of AVL Tree menu driven program
30. Implementations of Shell sort, Radix sort and Insertion sort menu driven program
31. Implementations of Quick Sort, Merge sort and Heap Sort menu driven program
32. Implementations of searching methods (Index Sequential, Interpolation Search) menu driven program
33. Implementation of hashing functions with different collision resolution techniques
34. Implementations of Graph menu driven program (DFS & BSF)

Supplementary Resources:

1. http://www.nptelvideos.in/2012/11/programming-and-data-structure.html
2. http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html
3. http://www.geeksforgeeks.org/data-structures/
4. https://www.hackerrank.com/domains/data-structures/arrays
5. Data Structures And Algorithms Made Easy -To All My Readers By Narasimha Karumanchi

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

Subject Code: 01CT0409

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: 04 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.
5. Analyze and illustrate shell commands and scripts that can manipulate text based data either in files or data streams.

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	
03	00	02	04	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, algorithms, and their evaluation. Process Scheduling, Thread scheduling, case studies UNIX. Linux. Windows	08
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,	04

	Transforming I/O requests to Hardware operations. STREAMS, performance.	
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

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

Subject Code: 01CT0408

Subject Name: Internet and Web Technology

B. Tech. Year – II (Semester IV)

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**	04

	Overview of Laravel, Laravel Application Structure, Introduction to WordPress, WordPress Dashboard, Overview of Joomla, Joomla 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/

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

Subject Code: 01CT0407

Subject Name: Database Management System

B. Tech. Year – II (Semester IV)

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** 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.	04
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

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

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 mostappropriate 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 Techniquesand 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 andDigital 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, PSDof 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 ofvideo and MPEG.	09
5	**Digital Modulation Techniques** Modulation techniques for ASK, QASK, FSK, M-ary FSK, BPSK, DPSK, QPSK, M-aryPSK, 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 andDigital 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 HillPublication.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves asguidelines 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_digi tal.html
2. https://www.classcentral.com/course/swayam-analog-communication-13893
3. https://www.udemy.com/course/analog-communication/

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

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 andactuators 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 forembedded 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 applyingvarious instructions like data transfer, ALU, Branch, subroutine etc.
4. Analyse I/O peripherals like LCD, Keyboard, Relay, Sensor, Motor etc. by interfacing it with AVRmicrocontroller.
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 AliMazidi, Sarmad Naimi and Sepehr Naimi, Pearson Education.
2. Programming and Customizing the AVR Microcontroller, By Dhananjay Gadre, McGraw HillEducation
3. AVR ATmega32 data sheet

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves asguidelines 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 inAssembly and C.
4. Hands-on experimentation of ATMega32 Timer to generate accurate delay using Interrupt inAssembly 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 andC.
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 ATMega32in 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

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

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 anevent, addition rule and conditional probability, multiplication rule, total probability, Bayes' theorm 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 functionof 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 asguidelines 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 modeusing 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/

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

Subject Code: 01CT1510

Subject Name: Applied Linear Algebra

B. Tech. Year – III (Semester V)

Objectives: Linear Algebra is the study of vector spaces and linear transformations on vector spaces. Linear Algebra is central to both pure and applied mathematics. Techniques from linear algebra are also used in analytic geometry, engineering, physics, natural science, computer science, and the social sciences. Topics include the use and application of matrices in the solution of systems of linear equations, determinants, real n-dimensional vector spaces, abstract vector spaces and their axioms, linear independence, span and bases for vector spaces, linear transformations, eigenvalues and eigenvectors, matrix factorizations, and orthogonality. Computer explorations using MATLAB or Python is an integral component of this course.

Credits Earned: 05 Credits

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

1. Understand the use of matrices in solving linear systems of equations (Understand).
2. Determine the approximate solution of any system of linear equations using projection (Apply).
3. Matrix representations of linear transformations and use them in applied problems (Apply).
4. Applying the concept of eigenvalues, eigenvectors to solve real life problems (Apply).
5. Study and analyze various matrix factorization techniques (Analyze).

Pre-requisite of course: Understanding of elementary linear algebra, MATLAB/PYTHON

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	
4	0	2	5	50	30	20	25	25	150

Contents:

Unit	Topics	Content Hours
1	**Vectors and vector spaces** Scalars: real numbers, complex numbers, examples of vector spaces, linear independence, span, basis vectors, rank, subspace, the null space of A: solving Ax = 0 and Rx = 0, the Complete Solution to Ax = b	07
2	**Linear Transformations** Matrix representation, change of basis, products of linear maps, null space, range, fundamental subspaces, rank-nullity theorem, invertibility, isomorphism, operators,invertible linear maps, change of basis for a linear map/operator, simplifying linear operators by changing basis	14
3	**Eigenvalues and eigenvectors of linear operators** Characteristic polynomial, eigenvalues/eigenvectors, generalized eigenvectors/eigenspaces, multiplicity, trace, determinant, similarity transformation, diagonalization, determinant, applications of eigen values: convolution and DFT, stability, finding expressions for A^k - fibonacci, counting paths in graphs, google search - popularity measures in a network	14
4	**Projection and least squares** Projection to a subspace, distance from a subspace and projection least squares solution to a linear equation, application: MMSE estimation application: linear regression in machine learning	08
5	**Inner Product Spaces** Inner products, vector norms, matrix norms, norms induced by inner products, orthogonality, orthonormality, gram-schmidt procedure, orthogonal complements, orthogonal projection, Cauchy-Schwartz inequality.	06
6	**Singular value decompositions** Singular values and singular vectors, singular value decomposition, application: MIMO communications, low-rank approximations, recommendation systems	07
	Total Hours	**56**

Suggested Text books / Reference books:

1. Gilbert Strang, Introduction to Linear Algebra Fifth Edition (2016), Wellesley-Cambridge Press
2. Stephen Boyd and Lieven Vandenberghe, Introduction to Applied Linear Algebra – Vectors, Matrices, and Least Squares First Edition (2018), Cambridge University Press
3. Sheldon Axler, Linear Algebra Done Right third edition (2015), Springer
4. Gilbert Strang, Linear Algebra for Everyone, First Edition (2020), Wellesley-Cambridge Press
5. Gilbert Strang, Linear Algebra and Learning from Data, First Edition (2019), Wellesley-Cambridge 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:

1. Solving the maze using set of vectors to reach from start to end using restricted movements
2. Image Filtering using Convolution operation
3. Image Rotation using Matrix operations
4. Encryption and Decryption of secret messages using cryptography
5. Correct or recover the codes that have been tampered with while transmission or processing
6. Determining the word representation based on embeddings of different words using word2vec
7. Solving the system of Linear Equations for exact solution
8. Solving the system of Linear Equations for Approximate solution
9. Using QR decomposition for solving linear equations
10. Find the equation of hypothesis to fit the set of datapoints
11. Obtain the linearly transformed image/structure of a given image/structure
12. Application of Radiography images using Projection
13. Calculating the matrix-power using matrix diagonalization
14. Ranking algorithm in search engines using eigenvalues
15. Dimensionality Reduction using Eigenvalues and Eigenvectors
16. Finding the Fibonacci series using eigenvalues and eigenvectors
17. Image compression using Matrix Factorization
18. Content Based Filtering Recommendation system using Singular Value Decomposition
19. Merging multiple images using linear algebra to look as natural image

Instructional Method:

1. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
2. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
3. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
4. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

1. https://math.mit.edu/~gs/linearalgebra/
2. https://web.stanford.edu/~boyd/vmls/
3. https://clas.ucdenver.edu/mathematical-and-statistical-sciences/applied-linear-algebra-preliminary-exam-syllabus
4. http://www.cs.lewisu.edu/~harsyram/Linear_Algebra_Note_Packet_2020.pdf

Subject Code: 01CT0507

Subject Name: Advanced Microprocessor

B. Tech. Year – III (Semester V)

Objectives: This course introduces the ARMv7 and ARMv7 CortexM architecture, Instruction set, assembly language and C language programming of ARMv7 CortexM core-based Microcontroller. It gives a hands-on training of evaluate various on chip peripherals and interfacing external sensors and actuators with Cortex-M based 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 (Understand).
2. Develop real time software and hardware for embedded systems using Cortex M Microcontroller (Create).
3. Write and debug C programs for Cortex-M Microcontroller (Apply).
4. Effectively utilize on chip peripherals such as timers, serial communications, analog-to-digital converters & pulse width modulation for low power applications (Apply).
5. Implement advance communication protocol like I2C and SPI on Cortex-M Microcontroller (Apply).
6. Effectively utilize ARMv7 and ARMv7 CortexM based microcontroller to solves real world problems (Apply).

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	
4	0	2	5	50	30	20	25	25	150

Contents:

Unit	Topics	Contact 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	**Peripheral Programming in C for Cortex M based Microcontroller** Cortex M Microcontroller Architecture and Its memorymap, 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. Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi, TI ARM Peripherals Programming and Interfacing Using C Language, Pearson Education.
2. Jonathan W. Valvano, Embedded Systems: Introduction to Arm® Cortex™-M Microcontrollers, 5th edition, 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 14 experiments to be performed during the semester

1. Installation of CCS and familiarization of ARMv7 Development Board.
2. Hands-on experimentation of GPIO programming in C on ARMv7 development board.
3. Hands-on experimentation of Timer to generate accurate delay in C on ARMv7 developmentboard.
4. Hands-on experimentation of Hibernation and Wakeup by RTC programming in C on ARMv7 development board.
5. Hands-on experimentation of ADC programming in C on ARMv7 development board.
6. Hands-on experimentation of PWM programming in C on ARMv7 development board.
7. Hands-on experimentation of UART Transmit programming in C on ARMv7 development board.
8. Hands-on experimentation of UART Receive programming in C on ARMv7 development board.
9. Hands-on experimentation of UART Transmit and Receive programming in C on ARMv7development board.
10. Hands-on experimentation of interfacing 16x2 LCD and programming in C with ARMv7development board.
11. Hands-on experimentation of interfacing SIM800L GSM/GPRS and programming in C withARMv7 development board.
12. Hands-on experimentation of interfacing HC-05 Serial Bluetooth and programming in C withARMv7 development board.
13. Hands-on experimentation of MPU6050 Accelerometer & Gyroscope Interfacing in C usingI2C protocol with ARMv7 development board.
14. Hands-on experimentation of MAX7219 LED matrix driver Interfacing in C using SPI protocol with ARMv7 development board.
15. Design Mini project based on CortexM based Microcontroller utilizing minimum 3 on-chipperipherals and minimum 2 external sensors/actuators to solve a 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

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

Subject Code: 01GS0501

Subject Name: Cognitive Aptitude 1

B. Tech. Year – III (Semester V)

Objectives: 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 Credits

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

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

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	
2	0	0	0	00	00	00	00	00	00

Contents:

Unit	Topics	Contact 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%	00%	00%

Supplementary Resources:

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

Subject Code: 01CT0503

Subject Name: Computer Networks

B. Tech. Year – III (Semester V)

Objectives: The objective of this course is to understand the significance and concepts of computer networks, to conceptualize and appreciate the layered model for computer networking. The coursealso provides insights to basic protocols and design issues for layered model, leading to design and implementation of 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 (Understand).
2. Analyze various flow and error control algorithms (Analyze).
3. Analyze different medium access protocols and network hardware component (Analyze).
4. Compare various static and dynamic routing protocol (Analyze).
5. Understand various transport services, protocols and application layer functionalities (Understand).
6. Built and test various network topologies and routing protocols for various networksscenarios (Apply).

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	
3	0	2	4	50	30	20	25	25	150

Contents:

Unit	Topics	Contact 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.	09
4	**Network Layer** Network layer design issues, Routing Algorithms, Congestion Control Algorithms, QoS, Internetworking, Network Layer in the Internet.	09
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, 1st edition, Computer Networks PHI Publication
2. Computer Networking- A Top-Down approach, 5th edition, Kurose and Ross, Pearson
3. Forouzan, Data Communication Networking, Reprint, TMH Publication
4. Forouzan, TCP/IP Protocol suit, Reprint, TMH Publication
5. William Stallings, Data and computer Communication, Reprint, 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, analyze and plot received traffic from 3 nodes.
   a) data rate
   b) delay
   c) speed of link
   d) 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 and
   a) Program in NS3 to connect two nodes.
   b) Program in NS3 for connecting three nodes considering one node as a central node.
16. Program in NS3 to implement star topology.
17. 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: 01CT0517

Subject Name: Cross Platform Mobile Application Development

B. Tech. Year – III (Semester V)

Objectives: This course facilitates classroom and laboratory learning, letting students learn dart programming language and develop competence and confidence in cross platform mobile application development using flutter. Students will understand the Flutter app development environment and apply advanced features, so the students can independently create and deploy cross platform mobile application.

Credits Earned: 05 Credits

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

1. Demonstrate the basic primitives in Flutter and Dart framework (Apply).
2. Model native platform code using Flutter and Dart (Apply).
3. Examine the use of widgets and user interactions in application development (Analyze).
4. Evaluate application development using the concepts of animation and interactive widgets (Analyze).
5. Construct flutter and dart applications using customized layouts and service interactions (Create)

Pre-requisite of course: Basics of programming language, 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	
4	0	2	5	50	30	20	25	25	150

Contents:

Unit	Topics	Contact Hours
1	**Introduction to Flutter:** Flutter Framework, Working of Flutter and Dart, installation of Flutter SDK, Using Hot Reload and themes, External packages import, project templates, organizing files and folders. **Introduction to Dart:** Declaring and referencing variables, using operators, flow control statements, using functions and classes, implementing asynchronous programming.	14

2	**Using common widgets:** Scaffold, AppBar, SafeArea, Container, Text, Buttons, column, row, using images and icons, decorators, form widgets, checking orientation **User Inputs:** Collecting text Inputs, setting text limits, Writing platform native code.	14
3	**Adding Animation to App using Widget:** Using AnimatedContainer, AnimatedCrossfade, AnimatedOpacity, AnimationController, using staggered Animations, using CurveTween **App's Navigation:** Using Navigator, named navigator route, Hero widget, BottomNavigationBar BottomMapBar, TabBar, TabBarView, Drawer **Applying Interactivity:** GestureDetector, Dragable and DragTarget Widget, InkWell and InkResponse gestures Dismissible widget	14
4	**Building layouts: Scrolling Lists:** Card widget, Using ListView and ListTitle,GridView, Stack widget, Customizing CustomScrollView using Slivers **Service interaction:** Working with Future object, working with streams, building, widgets based on stream and futures, handling various types of data: JSON, XML, HTML, Sending HTTP request **Saving data with local persistence:** Reading and Writing files, working with key-value pairs, Supporting multiple locales, Introduction to Firebase and cloud Firestore**.**	14
	Total Hours	**56**

Suggested Text books / Reference books:

1. Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development, John Wiley Sons, 1st Edition, 2020
2. D. Kopec, Dart for Absolute Beginners, Apress, 1st Edition, 2014.
3. Fu Cheng, Flutter Recipes, Apress, 1st Edition, 2019.

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:

1. To install and configure Flutter Environment.
2. To Study basics of Dart language and design basic Flutter App.
3. To design Flutter UI by including common widgets.
4. To create an interactive Form using form widget.
5. To design a layout of Flutter App using layout widgets.
6. To include icons, images, charts in Flutter app.
7. To apply navigation, routing and gestures in Flutter App.
8. To analyze sensor data in Flutter App.
9. To Connect Flutter UI with fireBase database.
10. To test and deploy production ready Flutter App on Android platform.
11. Open Ended Practical [Mini Project]
12. Open Ended Practical [Mini Project]
13. Open Ended Practical [Mini Project]
14. Open Ended Practical [Mini Project]

Supplementary Resources:

1. https://flutter.dev/
2. https://developers.google.com/learn/topics/flutter

Subject Code: 01CT0521

Subject Name: Creativity, Problem Solving and Innovation

B. Tech. Year – III (Semester V)

Objectives: To develop creative thinking skill in the students using cone of learning components leading to understanding of various strategies for creativity, problem solving and innovation.

Credits Earned: 01 Credit

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

1. Importance of creativity, problem solving and innovation while addressing science, engineering and social issues (Understand).
2. Demonstrate the ability to contextualize knowledge related to professional engineering practices (Apply).
3. Demonstrate the functioning effectively as an individual and team member (Apply).
4. Ability to engage in life-long learning in the context of technological change (Apply).

Pre-requisite of course: Zeal to learn the subject.

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	
0	0	2	1	00	30	00	20	00	50

Contents:

Unit	Topics	Content Hours
1	**Phase 1** To introduce the subject of the course: this course as a needed skill for your future. Psychology of problem solving; Vertical versus Lateral thinking.	02
2	**Phase 2** Strategy of Questioning; Method of questioning; Importance of asking the right question. Who, what, when, where, why, how?	02
3	**Phase 3** Learning and its importance; Sources of learning; Methods of learning. Purpose and value of education in future creativity in real life.	02
4	**Phase 4** Strategy of Knowing how to see; Making your thought visible; Visualizing	02

	thinking; Mapping of mind, Fishbone diagram.	
5	**Phase 5** Strategy of Thinking Fluency; Generating all possibilities; more the better; Quantity without screening is helpful; SCAMPER technique; Creative or divergent idea generating thinking versus Critical or convergent idea selection thinking.	02
6	**Phase 6** Strategy of Fusing of ideas; Making novel combinations; Connecting the unconnected	02
7	**Phase 7** Strategy of Looking at the other side, looking in other world, finding what you are not looking for and following it up.	02
8	**Phase 8** Strategy of Play, Importance of play; Diversion; Unstructured activities for sheer joy, Activities for joy, Let subconscious figure it out, Various puzzles as play or fun	02
9	**Phase 9** Strategy of Awakening the collaborative spirit, Collaborative thinking, brain storming, Innovation requires collaboration to make it happen.	02
10	**Phase 10** Review Strategies for Creative problem-solving methods, Five building blocks as per Fogler & LeBlanc, Stanford D school approach.	02
11	**Phase 11** Strategy for critical thinking for Choosing, Creative or divergent thinking needs follow up by Critical thinking or Convergent thinking in order to choose the solution for implementation, Kepner-Tregoe (K.T.) method with an example, Edward De Bono CoRT thinking process including PMI (Plus, Minus and Interesting), Also Edward de Bono method of decision making called Six thinking hats.	02
12	**Phase 12** Edward de Bono explaining and teaching his ideas having evolved many years ago consisting as CoRT thinking tool, Lateral thinking and the decision making by Six thinking hats method	02
13	**Phase 13** Strategy for Making; From idea to innovation.	02
14	**Phase 14** Individual presentation for 75 minutes by 15 students (5 minutes per student).	04
	Total Hours	**30**

Suggested Text books / Reference books:

1. Zig Zag, The surprising path to greater creativity by R. Keith Sawyer. 2013.
2. Group Genius by Keith Sawyer, the creative power of Collaboration. 2007.
3. Crackling Creativity, The secrets of creative genius by Michael Michalko 2001.
4. Thinkertoys by Michael Michalko, second edition 2006.
5. De Bono's Thinking Course by Edward De Bono, Revised Edition 1994.
6. Six Thinking Hats by Edward De Bono Revised and updated edition 1999.
7. Lateral thinking, Creativity Step by Step by Edward De Bono. 1973.
8. How to Mind Map by Tony Buzan. 2002.
9. Mapping Inner Space by Nancy Margulies with Nusa Maal. Second edition.2002.
10. The Myths of Innovation by Scott Berkun. Expanded and revised edition 2010.
11. The art of Innovation by Tom Kelly with Jonathan Littman. 2001.
12. Creative Confidence: Unleashing the Creative Potential Within Us All by Tom Kelly and David Kelly. 2013.
13. A Whack on the side of the head by Roger von Oech. Revised edition 1998.
14. A Kick in the seat of the pants by Roger von Oech.1986.
15. They all laughed by Ira Flatow. 1992.
16. Imagine, How creativity works by Jonah Lehrer. 2012.
17. 101 Creative problem-solving techniques by James m Higgins.1994.
18. Creative approach to problem solving by Scott G Isaksen, K Brian Dorval, Donald J Treffinger. 2000.
19. Creative problem solving An Introduction by Donald J. Treffinger, Scott G Isaksen and K. Brian Stead Dorval. 4th edition, 2006.
20. Strategies for creative problem solving by H. Scott Fogler & Steven E. LeBlanc. Second edition 2008.
21. Game storming by Dave Gray, Sunni Brown and James Macanufo.2010.
22. Creating minds by Howard Gardner. 1993.
23. Creativity –Flow and Psychology of Discovery and Invention by Mihaly Csikzentmihalyi.1996.
24. Aha! Insight by Martin Gardner. 1978.
25. The Ultimate Lateral & Critical Thinking Puzzle book by Paul Sloane, Des MacHale & M. A. DiSpezio. 2002.
26. Test your Lateral Thinking IQ by Paul Sloane. 1994.
27. Intriguing Lateral Thinking Puzzles by Paul Sloane & Des MacHale.1996.

Subject Code: 01CT0512

Subject Name: Design and Analysis of Algorithm

B. Tech. Year – III (Semester V)

Objectives: 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. (Understand)
2. Develop different algorithms using various methods like dynamic and Greedy methods. (Apply)
3. Select appropriate pattern matching algorithm to develop model for substring, subsequence, DNA matching, etc. (Apply)
4. Distinguish between Polynomial, Non-Polynomial complete and Hard problems (Analyse)
5. Evaluate various graph algorithms for sparse and dense network structures (Evaluate)

Pre-requisite of course: Proficiency in any programming language, Data Structures, Discrete 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	
3	0	2	4	50	30	20	25	25	150

Content:

Unit	Topics	Content 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.	2
2	**Asymptotic Analysis of Algorithm:** The efficient algorithm, Average, Best- and worst-case analysis, Amortized analysis, Asymptotic Notations (Big Oh, Big Theta, Big Omega), Master Method, Sorting Algorithms and their analysis, 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 FirstSearch, 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 DynamicProgramming	06
7	**Backtracking and Branch and Bound:** Introduction, The Eight queens' problem, Knapsack problem, Travelling Salesman problem, Minmax principle	04
8	**String Matching:** Introduction, The naive string-matching algorithm, The Rabin-Karp algorithm, String Matching with finite automata	04
9	**Introduction to NP-Completeness:** The class P and NP, Polynomial reduction, 2-CNF Satisfiability, -CNF Satisfiability, NP- Completeness Problem, NP-Hard Problems. Travelling Salesman problem, Hamiltonian problem	04
	Total Hours	**42**

Suggested Text books / Reference books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, forth edition, The MIT Press
2. Gills Brassard and Paul Bratley, Fundamental of Algorithmics, first edition, Prentice-Hall International
3. Introduction to Design and Analysis of Algorithms, Anany Levitin, third edition (2021), Pearson.
4. Design and Analysis of Algorithms, Dave and Dave, first edition (2007),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:

1. Implementation and Time analysis of sorting algorithms
2. Bubble sort, Selection sort, Insertion sort, Merge sort and Quicksort
3. Implementation and Time analysis of linear and binary search algorithm.
4. Implementation of max-heap sort algorithm
5. Implementation and Time analysis of factorial program using iterative and recursive method
6. Implementation of a knapsack problem using dynamic programming.
7. Implementation of chain matrix multiplication using dynamic programming.
8. Implementation of making a change problem using dynamic programming
9. Implementation of a knapsack problem using greedy algorithm
10. Implementation of Graph and Searching (DFS and BFS).
11. Implement prim's algorithm.
12. Implement Kruskal's algorithm.
13. Implement LCS problem.
14. To implement following string-matching algorithms and analyze time complexities: a. Naïve b. Rabin Karp c. Knuth Morris Pratt
15. Write a program for Floyd-Warshal algorithm.
16. Write a program for travelling salesman problem.
17. Write a program for Hamiltonian cycle problem.
18. To implement Huffman coding and analyze its time complexity.
19. Write a program for Strassen's Matrix Multiplication.

Instructional Method:

1. The course delivery method will depend upon the requirement of content and need of students. Theteacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
2. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
3. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
4. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

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

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

Subject Code: 01CT0513

Subject Name: Digital Signal and Image Processing

B. Tech. Year – III (Semester V)

Objective: The objective of the course is to provide understanding of discrete time signals and systems. Students learn to apply time, space and frequency domain operations, design of digital filters, apply image processing algorithms and understand DSP processors.

Credits Earned: 04 Credits

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

1. Understand the concepts of discrete time signals and systems. (Understand)
2. Formulate mathematical formulas for discrete processing functions. (Analyze)
3. Analyze discrete signals using different time, space and frequency domain algorithms and compare their performance. (Analyze)
4. Apply signal and image processing algorithms for suitable applications. (Apply)
5. Design discrete-time systems such as digital filters. (Apply)

Pre-requisite of course: Signals and Systems, 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	
3	0	2	4	50	30	20	25	25	150

Contents:

Unit	Topics	Contact Hours
1	**Introduction:** A review of continuous and discrete time signals and systems, representing an image, spatial and gray level resolution, aliasing, zooming and shrinking an image, relationship between pixels	4
2	**Time and space domain operations:** Correlation, convolution, gray level transformations, Histogram processing, spatial filtering, non-linear spatial filters	7
3	**Frequency domain operations:** Z transform, Fourier transform, frequency analysis of discrete- time signals, Discrete fourier transform and its properties, Fast Fourier transform and its applications, linear filtering approach to compute FFT, The Goertzel algorithm, The Chirp-z algorithm, two dimensional DFT and its inverse, smoothing and sharpening frequency domain filters, Homomorphic filtering	11

4	**Implementation of discrete-time systems:** Block diagram and signal flow diagram representations of linear constant-coefficient difference equations, structures for FIR systems, structures for IIR systems, state space analysis and structures	4
5	**Design of digital filters:** Digital filters, FIR filters, design of linear phase FIR filers: using windowing method, using frequency sampling method, using optimal FIR filter design method, design of IIR filers from analog filters, design of digital low pass, band pass, band stop, high pass Butterworth filter	8
6	**Morphological image processing:** Dilation, erosion, opening, closing, hit-or miss transformation, boundary extraction, region filling, convex hull, thinning, thickening, skeletons, pruning	4
7	**DSP processors:** Importance of DSP processors, hardware units, VLIW architecture, pipelining, applications of DSP	4
	Total Hours	**42**

Suggested Text books / Reference books:

1. John G. Proakis and Dimitris G. Manolakis, “Digital Signal Processing: Principles, Algorithm & Application”, 4th edition, Pearson
2. Alan V. Oppenhiem, Ronald W. Schafer, John R Buck, “Discrete Time Signal Processing”, 2nd edition, Person
3. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", 3rd edition, Prentice-Hall, 2008
4. B. Venkataramani, M. Bhaskar “Digital Signal Processors: Architecture, Programming and Applications”, 2nd edition, Tata McGraw-Hill
5. V. Udayashankara, “Modern Digital Signal Processing”, 2nd edition, PHI

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%	15%	10%	20%

Suggested List of Experiments: Minimum 14 experiments to be performed during the semester

1. Simulate discrete time sequences.
2. Simulate linear convolution and circular convolution on discrete time signals.
3. Simulate cross correlation and autocorrelation on discrete time signals.
4. Design Butterworth and Chebyshev filter using bilinear transformation method.
5. Design FIR filter with windowing method.
6. Perform FFT and IFFT on discrete time signal.
7. Perform gray level operations images.
8. Generate Histogram of images, apply Histogram equalization and Histogram matching on it.
9. Simulate smoothing and sharpening operation on images using spatial filters.
10. Apply non-linear filters on images and investigate its application in noise-removal.
11. Simulate smoothing and sharpening operations on images using frequency domain filters.
12. Simulate dilation, erosion, opening and closing operation on images.
13. Simulate Hit or Miss Transformation on images.
14. Simulate Boundary Extraction on images.
15. Study audio data acquisition using DSK6713 board.

Supplementary Resources:

1. https://nptel.ac.in/courses/117102060
2. https://nptel.ac.in/courses/108106151
3. https://nptel.ac.in/courses/117105135

Subject Code: 01CT0516

Subject Name: Engineering Electrodynamics

B. Tech. Year – III (Semester V)

Objective: The objectives of this course are to understand the basics of electromagnetic theories, the antenna parameters and its various applications. This course includes the basic of microwave engineering theories for wave propagation and application of the electromagnetic theory for antenna design to understand the advance optical antenna concepts and its applications and design various types of antenna for different communication application.

Credits Earned: 05 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 (Understand).
2. Build up a basic understanding in electromagnetics and antenna theories (Understand).
3. Create basic antenna structures for various applications (Apply).
4. Analysis and implementation of optical antenna (Analyze).

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	
4	0	2	5	50	30	20	25	25	150

Content:

Unit	Topics	Content 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	16

2	**Antenna theory and design** Antenna parameters, directivity, gain, input impedance, wire antennas, monopoles dipoles helices, aperture theory, horns and reflector antennas, phasedarrays, friis transmission formula, receiving properties of antenna.	12
3	**Microwave engineering** Parallel plate / rectangular waveguides, attenuation of modes, waveguide excitation waveguide dispersion, transmission lines, microwave circuit.	10
4	**Computational Electromagnetics.** Finite difference time domain, absorbing boundary condition, perfectly matchedlayers, periodic boundaries, finite element method	08
5	**Graphene and Plasmonics Nano Antenna** Graphene and other 2D materials, fundamentals of optical nano antenna, linear antennas, nonlinear antennas, application	08
	Total Hours	**56**

Suggested Text book/Main Reference:

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

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves asguidelines 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 List of Experiments:

Perform the following exercises with SPICE tool.

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.
10. Design and simulate 1D FDTD simulation code with perfectly matched layer.
11. Identify the design of the antenna for your mobile phone.
12. Design and simulate the antenna for fulfilling the communication task of mobile communication.
13. Design and simulate 2D FDTD simulation code with perfectly matched layer.
14. Design 50-ohm transmission line.

Subject Code: 01CT0515

Subject Name: Information and Web Security

B. Tech. Year – III (Semester V)

Objective: To provide knowledge regarding working of information and web security mechanisms with by considering security issues and to learn the insights of information assurance techniques in area of information and web security.

Credits Earned: 05 Credits

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

1. Analyze common threats, attack and mechanism, deal with them (Analyze).
2. Apply various Symmetric and asymmetric key Algorithms (Apply).
3. Apply the concepts of Hash function, digital signature and digital certificates (Apply).
4. Understand security concepts for web development (Understand).
5. Identify the various security hazards related to web applications and need of security measures (Analyze).

Pre-requisite of course: Internet & 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 Information Security:** Overview of internet security, Firewalls, Internet security, Management concepts and information privacy and copyright issues, Basics of asymmetric cryptosystems.	02
2	**Conventional Encryption & Number Theory:** Conventional encryption model, Steganography, Classical encryption techniques (Substitution and Transposition techniques), Prime and relative prime numbers, Modular arithmetic, Euler's theorem, Euclid's algorithm, Discrete logarithmic, Modular arithmetic, The Euclidean algorithm, Finite field of the form, Extended Euclidean algorithm.	07

3	**Black Cipher Method:** Stream ciphers and block ciphers, Block cipher structure, Data encryption standard (DES) with example, Strength of DES, Blowfish, RC5, Cast-128, RC2, Design principles of block cipher, AES with structure, Traffic confidentiality, Random number generation, Key distribution	08
4	**Advanced symmetric cipher:** Multiple encryption and triple DES, Electronic code book, Cipher block chaining mode, Cipher feedback mode, Output feedback mode, Counter mode	06
5	**Public Key Cryptography:** Public key cryptosystems with applications, Requirements and cryptanalysis, RSA algorithm, Its computational aspects and security, Diffie-hillman key exchange algorithm, Man-in-Middle attack	06
6	**Message authentication and hash functions:** Authentication requirement, Functions, Message authentication code, Hash functions, Security of hash functions and macs, MD5 message digest algorithm, Secure hash algorithm, Hmac	07
7	**Introduction to Web Security:** IP security overview, Architecture, Authenticationheader, Key management, pretty good privacy, S/Mime and types, Web security requirement, SSL and transport layer security, Secure electronic transactions, Firewall design principles, Types of firewalls. Web Threat Model, Authenticated Sessions, Code Origin Policies, Cross-site Scripting, Cross-Site Request Forgery, JavaScript Hijacking, Web Service Security, Website Vulnerability Scanner.	06
8	**Web Application Security &Vulnerability:** Web Application Security, How Does Web Application Security Work, Web Application Lifecycle Maintenance, Importance of Web Application Security, What Makes Web Application Vulnerable, Web Application Vulnerabilities, Broken Access Control, Broken Authentication and Session Management, Buffer Overflows, Cross Site Scripting Flaws, Denial of Service, Improper Error Handling, Insecure Configuration Management, Insecure Storage, SQL Injection Flaws, Unvalidated Input, Defensive Measures	10
9	**E-Commerce Security:** Overview of online Security issues, Security for client computers, Communication channel security, Security for server computers	04
	Total Hours	**56**

Suggested Text books / Reference books:

1. William Stallings, “Cryptography and Network Principles and Practice”, Third and Fourth Edition, Pearson Publication.

2. Faiyaz Ahamad, "Cyber Law and Information Security", Dreamtech Publications.
3. Mukhopadhyay and Forouzan, "Cryptography & Network Security", McGraw-Hill.
4. Atul Kahate, "Cryptography and Network Security", 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
5%	25%	30%	25%	10%	5%

Suggested List of Experiments: Minimum 14 experiments to be performed during the semester

1. Write code to implement Substitution cipher and Transposition cipher.
2. Write code to implement DES.
3. Write code to implement AES.
4. Write code to implement Diffie-hillman key exchange algorithm
5. Write code to implement RSA algorithm.
6. Write code to implement MD5 message digest algorithm
7. Write code to implement Dictionary Attack and Brute Force Attack.
8. Installation of Wire shark, tcpdump, etc and observe data transferred in client server communication using UDP/TCP and identify the UDP/TCP datagram.
9. Installation of rootkits and study about the variety of options.
10. Perform an Experiment to Sniff Traffic using ARP Poisoning.
11. Demonstrate intrusion detection system using any tool (snort or any other s/w).
12. Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures.
13. Installation and overview of Burpsuite Tools in Kali Linux.
14. Perform SQL injection
15. Perform Cross-site scripting and Cross-site request forgery (CSRF)
16. Demonstrate Information disclosure vulnerabilities
17. Configure NGINX and Apache webserver in Linux with https protocol
18. Configure Fail2ban with NGINX to protect the web server.

Supplementary Resources:

1. Black Book, "Web Technologies", Dreamtech Press (2012).
2. Black Book, "HTML 5", Dreamtech Press.
3. Developing Web Applications in PHP and AJAX, McGraw-Hill (2010).
4. P.J. Deitel & H.M. Deitel, "Internet and World Wide Web How to program", Pearson, 4th Edition.
5. https://portswigger.net/web-security/all-labs#sql-injection
6. https://portswigger.net/web-security/all-labs#cross-site-scripting

7. https://portswigger.net/web-security/all-labs#cross-site-request-forgery-csrf
8. https://portswigger.net/web-security/all-labs#information-disclosure

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

Subject Code: 01CT1509

Subject Name: Linux Administration

B. Tech. Year – III (Semester V)

Objectives: 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 (Understand).
2. Apply Command line in Linux to manage user, user groups, system management, volume management, and troubleshooting application, scheduling task and system level issue (Apply).
3. Illustrate client server applications with appropriate security (Apply).
4. Configure various services of Linux such like DNS, Apache web server, virtualization (Apply).
5. Evaluate various shell Scripting (Analyze).

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	
4	0	2	5	50	30	20	25	25	150

Content:

Unit	Topics	Content Hours
1	**Introduction And 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 Files Using Command Lines** 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	05
5	**File Systems** Makeup of file systems, managing file systems, adding a new disk, Volume Management, Creating file systems.	04
6	**Core System Services** The init Daemon, xinetd and inetd, The Logging Daemon, Configuring Logging Daemon, The CRON program	05
7	**Compiling the Linux Kernel** Kernel concepts, Finding Kernel Source Code, Building the Kernel, Patching the Kernel	05
8	**DNS** Installing DN 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.	06
10	**Virtualization**	06

	Virtualization Implementation, Kernel based Virtual Machines (KVM), Containers, Docker, Kubernetes	06
	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. Linux introduction & Installation of Linux-Operating system.
2. Software package management, mount and unmount the disks, devices
3. File Handling Commands
4. User Handling Commands
5. Group Handling Commands
6. Startup and Shutdown Commands
7. Installation and Configuration of DNS server
8. Installation and Configuration of Apache Server
9. Building and patching Linux Kernel.
10. Write a command with syntax & usage and execute the advance filters such as grep, egrep, fgrep.
11. Write a command with syntax & usage then execute the ps command, process management commands: & nohub, kill, nice.
12. Write a command with syntax & usage then execute the communication commands.
13. To execute device pattern using Meta character to match each of the following.
14. File Moment Using Command Line Arguments
15. Configuring different servers (FTP, SSH, NFS, NTP Time Server, DHCP, Samba)

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/https://www.linuxfoundation.org

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

Subject Code: 01CT0519

Subject Name: Machine learning

B. Tech. Year – III (Semester V)

Objectives: 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 supervisedmachine learning algorithms (Apply)
2. Understand and apply unsupervised algorithm for clustering (Understand)
3. Apply the concepts of dimensionality reduction, regularization and optimization in differentreal-world problems (Apply)
4. Evaluate various machine learning algorithms with appropriate evaluation metrices (Analyze)
5. Demonstrate training and testing of basic neural network models like CNN, RNN, LSTM, etc.(Apply)
6. Implement appropriate machine learning algorithms for the given case study (Evaluate)

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	
4	0	2	5	50	30	20	25	25	150

Contents:

Unit	Topics	Contact 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	3

2	**Data Understanding** Basic types of data, exploring structure of data, plotting and exploring numerical data, categorical data, Data Quality and Remediation, data preprocessing	3
3	**Performance measures** Importance of performance measurement, confusion matrix, Training Data Set, Testing Data Set, Validation Data Set, Overfitting, Underfitting, Bias, Variance	3
4	**Basics of Feature Engineering** Feature, Feature engineering, Feature transformation, feature extraction, Feature selection, Feature relevance and redundancy, correlation	4
5	**Supervised Learning Techniques** Linear Regression, Logistic Regression, Polynomial Regression, K-Nearest Neighbour, Decision Tree, Random Forest, Support Vector Machine, naïve Bayes	8
6	**Unsupervised Learning Techniques** K-Means Clustering, Hierarchical Clustering, Density-Based Clustering	7
7	**Dimensionality Reduction & Collaborative Filtering** Advantages of dimensionality reduction, Dimensionality Reduction using PCA, LDA techniques, Collaborative Filtering & Its Challenges	4
8	**Statistical Machine Learning** Concentration inequalities and generalization bounds, plugin classifiers, Feature maps and the "kernel trick", Theory of generalization, least-squares, Ridge and Lasso regularization, Gaussian Mixture Model, Gradient Boosting Machines	8
	Introduction to Artificial Neural Networks Artificial Neuron Model, Operations of Artificial Neuron, Types of Neurons Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Single Layer and Multi-Layer Feed Forward Networks	6
9	**Introduction to Deep Learning** Basic building blocks of deep neural network, Convolutional Neural Network, Recurrent Neural Network, Long, Short-Term Memory	8
	Total Hours	**54**

Suggested Text books / Reference books:

1. E Alpaydin, Introduction to Machine Learning, 2010, MIT Press
2. S. Marsland, Machine Learning: an algorithmic perspective, 2009, CRC Press
3. R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification, second edition, Wiley
4. P. A. Devijver and J. Kittler, Pattern Recognition: A Statistical Approach, 1982, Prentice Hall
5. Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, 2016, MIT 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
15%	20%	30%	20%	10%	5%

Suggested List of Experiments:

1. To implement single variable Linear Regression
2. To implement multiple variable Linear Regression
3. To implement Logistic Regression and evaluate the performance
4. To implement Polynomial Linear Regression
5. To implement Naïve Bayes Algorithm
6. To implement Support Vector Machine
7. To implement K-Nearest Neighbor
8. To implement K-Means Clustering Algorithm
9. To implement DBScan Algorithm
10. To implement Hierarchical Algorithm
11. To implement Dimensionality Reduction using PCA
12. To implement Single layer Perceptron Learning algorithm
13. To implement Multi-layer Perceptron Learning algorithm
14. To implement different activation functions on dataset
15. To implement Kernel-Based Image Filtering technique
16. To implement the LSTM algorithm on recurrent neural network
17. To implement Convolutional neural Network Algorithm

Instructional Method:

1. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
2. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
3. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
4. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

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

List of simulation software / IDEs:

1. PyCharm
2. Google Colab
3. Jupyter Notebook

Subject Code: 01CT0518

Subject Name: .Net Technology

B. Tech. Year – III (Semester V)

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 (Understand).
2. Develop and implement applications with C# (Apply).
3. Analyze the Component Services, Threading, Remoting, Windows services, web services (Analyze).
4. Design the functional web application using the concepts of .NET, various server controls, State management, MVC Architecture and application security (Apply).
5. Design, develop and deploy web application (Create).

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#:** c 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	**Working with SQL server:** Introduction to SQL server, Different types of queries, SQL index, SQL views, stored procedure, cursor	04
6	**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 usingADO.NET, Configuration Overview.	06
7	**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	06
8	**ASP.NET MVC:** Controller, Model, View, Layout, Partial Views, Razor Language, jQuery Ajax, Entity Framework, routing mechanism, Web API	12
9	**Introduction to .NET Core:** Controllers, views, models, layout, Introduction to entity framework core, Routing, Web api, Dependency injection	06
10	**Deployment of web app:** Deploy web app locally and accessing in local environment from multiple devices	02
	Total Hours	**56**

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
4. Kurt Nomark, Object-Oriented Programming in C#, First edition 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
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 andread 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 control in C#. NET.
13. Write a API which can be consumed from any other languages I.e. Android / iOS / php / java etc.
14. Write a program to generate daily different offers to attract customers for online shopping portal.

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

Pre-requisite of course: Fundamentals of signals, Modulation techniques and Fundamental concept oflights 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

Content:

Unit	Topics	Content Hours
1	**Overview of Optical fiber Communications** Electromagnetic spectrum, Optical Spectral bands, Evolution of fibre optic system, Multiplexing Techniques, Elements of an optical fibre transmission link with the functional description of each block, WDM concepts, transmission widows, advantages of optical fibre link over conventional copper systems, applications of fibre 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, InternationalStandards 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 RPON	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)
6. Fiber-Optic Communication: Systems and Components by Sunita P Ugale Vivekanand Mishra (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
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.
13. To perform micro-bending loss of given single or multimode optical fiber. (Hint: using corrugated structure and weights)
14. To perform macro-bending loss of given multimode optical fiber. (Hint: making the number of loops around the cylindrical mendral.)
15. Find out of Mode Field Diameter (MFD) of given single mode fiber. (Hint: Using a pin hole detector, graph papers and formula, we can calculate MFD.)

Supplementary Resources:

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

Subject Code: 01CT0514

Subject Name: VLSI Design

B. Tech. – Year – III (Semester V)

Objectives: 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. 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, design methodologies, design quality, design for manufacturability and testability (Apply)
2. Develop fundamentals in fabrication of MOSFETs and MOS transistor (Understand)
3. Analyze MOS inverters with its static and switching characteristics (Analyze)
4. Analyze combinational and sequential MOS logic circuit (Analyze)
5. Acquire basic concepts of low power CMOS logic circuits (Apply)

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	
4	0	2	5	50	30	20	25	25	150

Contents:

Unit	Topics	Contact 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.	6

2	**Fabrication of MOSFET** Introduction, Fabrication Process flow: Basic steps, Wafer formation, Photolithography, Gate oxide, gate and drain formation and Contacts and Metallization. nMOS Fabrication. C-MOS n-Well Process, Layout Design rules, full custom mask layout design.	6
3	**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, MOSFET scaling and small geometry effects, MOSFET capacitance	10
4	**MOS Inverters** Introduction, Resistive load inverter, Inverters with n-type MOSFET load, CMOS Inverter, Propagation delay, Interconnect delay, switching power dissipation of inverter	8
5	**Combinational and Sequential CMOS Logic Circuits** MOS logic circuit with depletion load, CMOS logic circuits, Complex logic circuit, pass transistor circuits, CMOS with transmission gate, Multiplexer and XOR gate using CMOS transmission gate, SR latch circuit, Clocked latch and flip-flop circuits, CMOS D-latch and edge triggered flip flop, Dynamic logic circuits	10
6	**Chip I/P and O/P Circuits** ESD protection, Input circuits, Output circuits, On chip Clock Generation and Distribution, Latch –Up and its Prevention	2
7	**Low-power CMOS logic circuits** Introduction, Overview of Power Consumption, Low power design, Leakage power dissipation, Reduction in switching activity, Gated clock signals	6
8	**Design for manufacturability** Introduction, Process variations, Basic concepts and definitions	2
9	**Design for Testability** Introduction, Fault types and models, Controllabilityand observability, Ad Hoc Testable design techniques, Scan –based techniques, built-in Self-Test (BIST) techniques, Current monitoring IDDQ test	4
	Total Hours	54

Suggested Text books / Reference books:

1. Sung Mo Kang,Yusuf Leblebici, “CMOS Digital Integrated Circuits Analysis and Design”, Tata McGraw Hill, 3rd Edition, 2003.

2. Neil H.E.Weste, David Harris, "CMOS VLSI Design", Pearson,3rd Edition. 2005, Reprint, 2012.
3. Douglas A. Pucknell, Kamran Eshraghian,"Basic VLSI Design", Prentice Hall of India, 3rdEdition, Reprint 2009.
4. John P. Uyemura, "Introduction to VLSI circuits and systems", Wiley, 2rd Edition 2002, Reprint 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. Introduction to SPICE tool.
2. Develop the current-voltage characteristics of NMOS transistor.
3. Develop the current-voltage characteristics of PMOS transistor.
4. Implement NAND gate using CMOS transistors and simulate the design.
5. Implement NOR gate using CMOS transistors and simulate the design.
6. CMOS implementation of XOR and XNOR gate. Simulate the design.
7. Draw CMOS inverter and simulate the design with input and output waveforms.
8. Draw the layout of NAND and NOR gate and simulate the design.
9. Draw the layout of AND and OR gate and simulate the design.
10. Implement the 2x1 MUX using Transmission gate and simulate the design.
11. Develop layout of CMOS inverter and simulate it.
12. Measure propagation delay of CMOS inverter.
13. Develop the D-latch using CMOS transmission gate and simulate it.
14. Develop the edge triggered D flip flop and simulate it.

Major Equipment/software: SPICE Circuit simulator

List of Open-Source Software/learning website: NPTEL, LTSPICE Spice circuit simulator

Instructional Method:
1. Course delivery is combined use of white board/black board and power point presentation using projector as per requirement.

2. Students will be assessed with continuous evaluation approach with assignments and quizzes at regular interval.
3. For effective communication with students, canvas LMS (Learning Management System) is used.

Supplementary Resources:

1. NPTEL Videos on CMOS VLSI Design
2. https://nptel.ac.in/courses/108/107/108107129
3. https://nptel.ac.in/courses/117/101/117101058/
4. https://nptel.ac.in/courses/117/101/117101004
5. http://ece-research.unm.edu/jimp/vlsi

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: 01CT0614

Subject Name: Optimization Technique

B.Tech. – Year –III (Semester VI)

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

Credits Earned: 3 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
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
3	0	0	3	50	30	20	00	00	100

Contents:

Unit	Topics	Hours
1	**MODULE 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	5
2	**MODULE 2: mathematical preliminaries** Linear algebra, matrices, vector space, vector calculus, eigen values, eigen vectors, eigen space analysis, probabilistic theory, elementary multivarient calculus	3

3	**MODULE 3: linear programming** Introduction to LP problems, formulation of LP problems, steps for solution of LP problems, graphical solution, maximisation and minimization using simplex algorithm, two phase method, duality in LP, integer LP, karmakar method	6
4	**MODULE 4: transportation problems** Introduction to transportation problem, varient of transportation problem, methods to solve transportation problem	5
5	**MODULE 5: assignment problems** Introduction to assignment problems, methods to solve assignment problems	3
6	**MODULE 6: non-linear programming** Graphical illustration of non linear programming, one variable unconstrained optimization, multi variant unconstrained optimization, Quadratic programming, Separable programming, convex programming	6
7	**MODULE 7:network analysis** Network definition, analysis, probability of PERT analysis, project time cost tradeoff, introduction to resource allocation	5
8	**MODULE 8:sequencing** Sequencing needs, processing N jobs in 2 machines, processing N jobs in 3 machines, processing N jobs in m machines	5
9	**MODULE 9: Advance Optimization Algorithms** Genetic Algorithms, Simulated Annealing, Particle Swarm Optimization, Ant Colony Optimization, Optimization of Fuzzy Systems	5
	Total Hours	**43**

Suggested Text book/Main Reference:

1. Introduction to Operations Research, 7th. Ed. Frederick Hillier. McGraw-Hill, 2000.
2. Simulation Model Design and Execution, P. Fishwick. Prentice Hall, 1995. REFERENCE
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
6. HTaha, Operation Research –, Pearson Education.
7. A Verma, Operation Research, S.K. Kataria and Sons.
8. V Kapoor, Operation Research, Sultan Chand & 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	Analyse	Evaluate	Create
15%	15%	30%	35%	5%	--

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

Subject Code: 01CT0615
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: 03 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	00	03	50	30	20	00	00	100

Contents:

Unit	Topics	Hours
1	**Introduction** Importance of Software Engineering, Discipline of Software Engineering; Eclipse Introduction, Overview, and Demo; Lifecycle models: Requirements Engineering, Design and Implementation, Maintenance, Software Process Model Introduction, Waterfall Process, Spiral Process, Evolutionary Prototyping Process, Agile Process, Choosing a Model, Lifecycle Documents; Version Control System: Introduction to Git, Git Demo: Git + Eclipse, Git .	06

2	**Requirements Engineering:** General RE Definition, Functional and Non-functional Requirements, User and System Requirements, Modelling Requirements, Analysing Requirements, Requirements Prioritization, Requirements Engineering Process, and steps; Creating SRS and performing requirements inspections. Engineering standards in building, testing, operation and maintenance of the computer and software systems	06
3	**OO Software and UML:** Object Orientation Introduction, UML Structural Diagrams: Class Diagrams, Component Diagram, UML Structural Diagram: Deployment Diagram. UML creation tips. **UML Behavioral Diagram**: Use Case, Use Case Diagram: Creation Tips, **UML behavioral Diagrams:** Sequence, **UML behavioral Diagrams:** State Transition Diagram. UML creation tips; **Software Architecture**: What is Software Architecture? Advantages and use of architectural models. Architectural patterns. Designing architectural patterns. Design Patterns: Patterns Catalogue, Pattern Format, Factory Method Pattern, Strategy Pattern, Choosing a Pattern, Negative Design Patterns.	12
4	**Software Testing:** Black Box Testing Failure, Fault and Error, Verification Approaches, Pros and Cons of Approaches, Testing Introduction, Testing Granularity Levels, Alpha and Beta Testing, Black-Box Testing, **Systematic Functional Testing Approach**; Test Data Selection, Equivalence Partitioning and Boundary Value Analysis, Create and Evaluate Test Case Specifications, Generate Test Cases from Test Case Specifications. **White-Box Testing:** Coverage Criteria Intro, Statement Coverage, Control Flow Graphs, Test Criteria.	09
5	**Agile Development Methods:** Cost of Change, Agile Software Development, Extreme Programming (XP), XP's Values and Principles, Test First Development, Refactoring, Pair Programming, Continuous Integration, Testing Strategy, High Level Scrum Process. **Unified Software Process:** Use-Case Driven, Inception Phase, Elaboration Phase, Construction Phase, Transition Phase, Phases and Iterations. Software Evolution: Evolution processes, Legacy Systems, Software Maintenance. Situations during software evolution and maintenance. Software Reengineering and Refactoring: Reasons to Reengineer and Refactor, Advantages, Refactoring Demo, Refactoring Risks, Cost of Refactoring, When Not to Refactor	09
Total Hours		42

Suggested Hands on activities:

1. Examine each phase of the Software Development Life Cycle (SDLC) in detail and the numerous activities that are carried out during each one. Determine the goals and summary results for each SDLC phase.
2. As a software architect or project manager, think about each project that will be produced using any technology. Create the project's Software Requirement

Specification (SRS) document.

3 Design all UML diagrams: Activity Diagram, Use-case Diagram, Data Dictionary, e E-R Diagram, Data Flow Diagram of the system.

4 Apply Basic and Intermediate COCOMO to resolve the situation.

5 Examine the case study to find the problem and fix it. In the end, an FP-oriented estimate model must be applied to evaluate the calculation portion of the effort.

6 Draw a control flow diagram and add cyclomatic complexity to the programming code (any java code). Figure out how many of separate paths needed for testing.

7 Assign a group of students a mini project to create software docs for the systems specified below,

- Create a of Software Requirements Specification (SRS)
- Function oriented design using SA/SD
- OO design using UML diagrams
- Develop a test case for given system
- Implementation of any testing method (White box)

8 Address design-based problems (DP) and open-ended issues.

Suggested Text books / Reference books:

1. R. Pressman, Software Engineering A Practitioner's Approach (8 ed.), McGraw Hill International, 2019. ISBN 978-1259253157.
2. Sommerville, Software Engineering (10 ed.), Person Publications Publishing Company, 2017. ISBN 978-9332582699.

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%

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: 01CT0616

Subject Name: Artificial Intelligence

B.Tech. Year – III (Semester VI)

Objective: Artificial intelligence (AI) is a research field that studies how to realize the intelligent human behaviours 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 the course, the students will be able to:

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

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

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	Mid Sem (M)	Internal (I)	Viva (V)	Term work (TW)	
3	0	2	4	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 Behaviour: The concept of Rationality, Nature of Environment, Structure of Agents, Criteria For Success	2
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	3
3	**Finding Optimal Path** Brute Force, Branch and Bound, A*, Admissibility of A*, Iterative Deepening A*, Algorithm AO*, Pruning the OPEN and CLOSED List	3
4	**Constraint Satisfaction Problems** Constraint Propagation: Inference in CSPs- Node consistency, Arc consistency, Path consistency, K-consistency ,Global constraints, Sudoku	3
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	4
6	**Machine Learning** Types of Dataset, Types of Learning, Prediction, Classification, Generation, Regression and Clustering approach, Feature Extraction and Scaling, Loss Function	5
7	**Deep Learning:** Simple Feedforward Network, Computation Graphs for Deep Learning, Activation Functions, Convolutional Network¸ Recurrent Neural Networks, Unsupervised Learning and Transfer Learning, Applications	7
8	**Reinforcement Learning** Learning from Rewards, Active and Passive Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, Applications of Reinforcement Learning	6
9	**Natural Language Processing** Language Models, Lemmatization, Stemming, Parsing, Word Embeddings, Topic Modeling, Learning texts- Keyword Extraction, Summarizing, Text Ranking	7
10	**Recommender Systems** Recommendation Systems, Factorization Algorithms, SVD, Collaborative Filtering-User based and Item Based, Content-based recommendation- Discovering features of documents	6
11	**Game Theory** What is Game Theory, Applications, Types of Game theory, Nash Equilibrium, Mixed Strategy Nash Equilibrium, Bayesian Games	3
11	**Philosophy, Ethics, and Safety of AI** The Limits of AI, Can Machines Really Think?, The Ethics of AI, The Future of AI	1
	Total Hours	**50**

Suggested Textbooks/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	Analyse	Evaluate	Create
10%	10%	40%	20%	10%	10%

Suggested List of Experiments:

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 textrank for keyword extraction
10. Implement the code for textrank 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.

Instructional Method:

a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

c. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources/Web-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/

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

Subject Code: 01CT0617

Subject Name: Human Centered Design

B. Tech. Year – III (Semester VI)

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, Builds 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
5%	5%	15%	20%	20%	40%

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.html10.https://ryanstutorials.net/problem-solving-skills/

Subject Code: 01CT0618
Subject Name: Sensors and IoT
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 Nodes.
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	**IoT Devices** Classification of Things in IoT, Sensors and its classification, Actuators and its classification, Working principles of various sensors, MEMS, Smart Objects, Case study – Sensor tag energy harvesting, batteries and super capacitors, interfacing of sensors with microcontroller	08
3	**IoT Protocols** Communication Criteria, Access technologies and communication protocols: Bluetooth, BLE, LoRaWAN, WirelessHART, Zwave, LTE-M, NB-IoT, Sigfox, 6LowPAN, 6TiSCH, LLN, RPL, 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	20
4	**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
5	**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. Explain working of Raspberry Pi.
2. Connect Raspberry Pi with your existing system components.
3. To sense temperate and humidity using sensors interfaced with IoT hardware board.
4. To detect presence using proximity sensor interfaced with IoT hardware board.
5. To detect distance of object using ultrasonic sensor interfaced with IoT hardware board.
6. To interface pressure sensor with IoT hardware board and read sensed data.
7. To read RFID tag using RFID reader interfaced with IoT hardware board.
8. To control LED on IoT hardware board using Bluetooth module interfaced with it.
9. To get location data using GPS module interfaced with IoT hardware module on webpage.
10. To understand implementation of MQTT using ContikiOS.
11. To understand implementation of CoAP using ContikiOS.
12. To create IPv6 network and configure network stack using Cooja simulator.
13. Demonstrate a smart object API gateway service reference implementation in IoT toolkit.
14. Sketch the architecture of IoT Toolkit and explain each entity in brief.
15. Write and explain working of an HTTP- to-CoAP semantic mapping proxy in IoT toolkit.
16. Describe gateway-as-a-service deployment in IoT toolkit.
17. Explain application framework and embedded software agents for IoT toolkit.
18. Define and Explain Eclipse IoT Project.
19. List and summarize few Eclipse IoT Projects.
20. Give overview of Zetta.

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/

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

Subject Code: 01CT0619
Subject Name: Digital Design using Verilog
B. Tech. – Year – III (Semester VI)

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 modeling 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	
4	0	2	5	50	30	20	25	25	150

Contents:

Unit	Topics	Contact 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.	6
2	**Introduction to Verilog** Concept of module , Data types in Verilog , Features of Verilog , Verilog operators	4

3	**Verilog Modeling** Behavioral modeling and structural modeling, Explanation of modeling with different examples, modeling 16x1 multiplexer, modeling 16 bit adder, Switch level modeling	6
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	8
5	**Verilog Test benches** Writing Verilog test benches, write test bench for combinational design, write test bench for sequential design, generating test vectors	4
6	**Modeling Finite State Machine** Moore Machine, Mealy Machine, Examples	6
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	4
8	**Modeling Memory and register banks** Concepts of modeling memory, How to model memory and initialize memory, concepts of modeling register bank	4
9	**Verilog modeling of processor** RISC Processor, Basic pipe line concepts, Understanding pipe line implementation	6
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	8
	Total Hours	56

Suggested Text book/Main Reference:

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 from given set of experiments and verify with available simulator tool)

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.

Open Ended Projects:

1. Design 4 bit ALU which performs the following tasks.
   a. Add b.Subtract c.Multiplication d. Division e. OR f. AND g. Invert h.XOR
2. Implement bus structure to transfer data among registers using two different approaches.
   a. Using tristate driver b. Using multiplexer
3. Design control circuit for a simple processor to perform basic operations mentioned below.
   a. load data into register b. copy data from register to register c. add d. subtract

Instructional Method:

1. Course delivery is combined use of white board/black board and power point presentation using projector as per requirement.
2. Students will be assessed with continuous evaluation approach with assignments and quizzes at regular interval.
3. For effective communication with students, canvas LMS (Learning Management System) is used.
4. Students are given opportunity to interact with mentors from industries through mock interview.

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/
   https://www.edaplayground.com/

Subject Code: 01CT0623

Subject Name: Advance Java

B. Tech. Year – III (Semester VI)

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 likeSpring, 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 andUpgraded [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 search.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 last Access Time should be shown to user. give logout link and destory the session attributes and redirect the user to again login page. (JDBC-JSP)
13. JSP program to demonstrate jsp: forward action tag.
14. Create one user login registration 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: 01CT0624

Subject Name: Theory of Computation

B. Tech. Year – III (Semester VI)

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 $L = \{w | na(w) mod 4 = 3\}$ (where $na(w)$ 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 $M1$ =

$(\{q0,q1,q2\},\{a,b\},\delta,q0,\{q2\})$ Table 1: NDFA $M1$

	a	B
→ $q0$	$q0,q1$	$q2$
$q1$	$q0$	$q1$
$q2$		$q0,q1$

2. Design DFA for the given NDFA $M2$ = $(\{q0,q1,q2,q3\},\{0,1\},\delta,q0,\{q3\})$ Table 2: NDFA $M21$

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

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, $M3 = (\{qi|i= 0,1,...,7\},\{a,b\},\delta,q0,\{q3\})$

Tutorial 4

Write a C program to minimize the given DFA with optimal number of states. Table 3: FA $M3$

	a	b
→ $q0$	$q1$	$q0$
$q1$	$q0$	$q2$
$q2$	$q3$	$q1$
$q3$	$q3$	$q0$
$q4$	$q3$	$q5$
$q5$	$q6$	$q4$
$q6$	$q5$	$q6$
$q7$	$q6$	$q3$

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

(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: 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

Subject Code: 01CT0626

Subject Name: Game Programming and Virtual Reality

B. Tech. Year – III (Semester VI)

Objectives: The main objectives of the course are to Introduce 3D Immersive Environments and content creation specifically for 3D Game development and the game creation pipeline, from design, implementation and testing. The course focuses on Virtual Reality, hardware and software. It aims to gain an understanding of how game players move in virtual environments and how to create a narrative immersive experience in VR. The course enables students to create their own immersive games using various head mounted displays.

Credits Earned: 05 Credits

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

1. Have an appreciation for 3D digital games in both desktop and immersive context.
2. Understand the basic principles and requirements of virtual reality.
3. Be able to create 3D Game content including character generation and control.
4. Write software for using game controllers and tracking for motion control.
5. Describe historical developments of VR games and understand their social impact and their benefits in a variety of situations, such as education and serious games.
6. Create narrative experiences and application specifically for VR.

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	
4	0	2	05	50	30	20	25	25	150

Contents:

Unit	Topics	Contact Hours
1	**Introduction to visual scripting using unity** Unity Hub, Unity Editor Basic Windows, Unity Editor Windows, Editor Layout- Render Pipelines- Package Manager- 2D and 3D, Visual Scripting, Post Processing, Ambient Occlusion URP, Text, Text MeshPro -Prefabs, Unity Package- Grids, Render Texture, Introduction to Visual Scripting windows, Arrange Panels of Script Graph windows, Pan Zoom and return to the script graph windows. Preparing the Script Scene, Creating Script Machine, Creating Graphs, Setting up Script Graph Window- Program a Visual Script, Start and Update, Display Fuzzy Finder-	08

	Examining Unit, using Graph Inspector, Configuring a Unit - Changing Inline Values in a graph	
2	**Programming using visual scripting in unity** Configuring Variables, Creating variables in black board, Object Types- Graph variables, Object Variables- One Graph and two variable objects. Programming Fundamentals in visual scripting, Add a New Graph, Get the rotation rate- Adding Time Unit- Adding Multiply Unit, Applying calculated value, Branch the flow- Change position with vector3- Switch	08
3	**Basic unity programming in gaming perspective** Physics behind gaming, Player Movement -Player Speed, player jumping -is groundedsuper units- visual scripting groups, animations, Cinemachine- platform visuals- Spikes, Visual scripting events, UI, Player falls to death, Coins, Level win, multiple level, post processing, Shared graph	09
4	**Introduction to VR systems** Augmented-Virtual and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR ,VR and MR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, VR as a discipline, Basic features of VR systems, Architecture of VR systems, VR hardware : VR input hardware: tracking systems, motion capture systems, data gloves, VR output hardware: visual displays.	06
5	**Stereoscopic Vision & Haptic rendering** Fundamentals of the human visual system, Depth cues, Stereopsis, Retinal disparity, Haptic sense, Haptic devices, Algorithms for haptic rendering and parallax, Synthesis of stereo pairs, Pipeline for stereo images	08
6	**VR software development** Challenges in VR software development, Master/slave and Client/server architectures, Cluster rendering, Game Engines and available sdk to develop VR applications for different hardware (HTC VIVE, Oculus, Google VR)	07
7	**Application of VR in Digital Entertainment** VR Technology in Film & TV Production. VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR	06
	Total Hours	52

Suggested List of Experiments:

1. Installation of Unity and Visual Studio,
2. Installation of VR development environment
3. Demonstration of the working of HTC Vive, Google Cardboard, Google Daydream and Samsung gear VR.
4. Develop a scene in Unity that includes objects like a cube, plane and sphere, apply transformations on the 3 game objects.
5. Add video and audio source to a designed scene

6. Change the colour, material and texture of each Game object separately in the scene.
7. Write a C# program in visual studio to change the colour and material/texture of the game objects dynamically on button click.
8. Develop a scene in Unity that includes a sphere and plane . Apply Rigid body component, material and Box collider to the game Objects.
9. Write a C# program to grab and throw the sphere using vr controller.
10. Develop a simple UI(User interface) menu with images, canvas, sprites and button.
11. Write a C# program to interact with UI menu through VR trigger button such that on each successful trigger interaction display a score on scene
12. Create an immersive environment (living room/ battlefield/ tennis court) with only static game objects. 3D game objects can be created using Blender or use available 3D models.
13. Include animation and interaction in the immersive environment

Suggested Text books / Reference books:

1. George Mather, Foundations of Sensation and Perception:Psychology Press; 2 edition, 2009.
2. The VR Book: Human-Centered Design for Virtual Reality, by Jason Jerald
3. Learning Virtual Reality by Tony Parisi, O' Reilly
4. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition.Wiley-IEEE Press, 2003/2006.
5. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

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%

Instructional Method:

1. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
2. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
3. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
4. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

List of simulation software / IDEs:

1. Unity
2. PyCharm
3. Google Colab
4. Jupyter Notebook

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

Subject Code: 01CTXXXX

Subject Name: Advanced Web Technology

B. Tech. Year – III (Semester VI)

Objective:
The objective of the course is to understand modern web technologies based on JavaScript.

Credits Earned: 05 Credits

Course Outcomes: On the completion of the course, students will be able to:

1. Implement NoSQL Database CRUD operations
2. Acquire knowledge about Server-side JS framework to make Database Connectivity
3. Acquire knowledge about functionalities of Client-side and Server-side JS frameworks
4. Explore ReactJS features and create component-based web pages
5. Develop Front-end web pages and connect to the Back-end Databases

Pre-requisite of course:

- Student should have a basic understanding of fundamental languages used by the browser and the server.
- Student should be confident in designing and styling web pages using HTML & CSS.
- Fundamental concepts of JavaScript should be clear and should also be familiar with DOM(Document Object Model) in browser.
- Basic understanding of Node/express will speed up the learning process but is not recommended.

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	**Client-side JS Framework – ReactJS** Introduction to ReactJS, Introducing JSX, Rendering Elements, Component and Props, State and Life Cycle, Handling Events, Conditional Rendering, List and Keys, Forms, Lifting State Up, Composition vs Inheritance, Thinking in React, Manual and Unit Testing.	14
2	**Server-side JS Framework – Node JS** Get started with Node.js, Node Package Manager, Modules Asynchronous Program, Callbacks, Events and Event Loop, Streams and Buffers, Connect Node.js to Database, Web Sockets, API using NodeJS	7
3	**Express JS** MVC Pattern, Introduction to Express, Routing, HTTP Interaction, Handle Form Data, Handle Query Parameters, Cookies and Sessions, User Authentication, Error Handle, Create and Consume RESTful Services, Use Templates, Functional and Unit Testing	14
4	**MongoDB** Introduction to MongoDB, CRUD Operations in Mongodb, Introduction to Mongoose, Core concepts of Mongoose, Extending Models - Working with hooks, Validation of model data, Creating custom static methods, Creating custom instance methods, CRUD operations with Mongoose	7
5	**Cloud & Deployment** Basics of Devops and Cloud Infrastructure, In-depth of DNS and network terminologies, Introduction to AWS, AWS-ECS, EC2, Docker, Kubernetes, Git Basics, Git with CI/CD, Hosting website on various platforms like Heroku, etc.	10
	Total Hours	**52**

Suggested Text books / Reference books:

1. Krasimir Tsonev, "Node.js by Example”
2. Title: MongoDB Cookbook Author(s): Amol Nayak
3. Title: Fullstack React: The Complete Guide to ReactJS and Friends Author(s): Anthony Accomazzo
4. https://reactjs.org/docs/getting-started.html
5. https://nodejs.dev/en/learn/

Suggested Theory distribution:

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

Suggested List of Experiments:

1. Create an application for student result management using React JS.
2. Develop a web application which involves database operations using NodeJS
3. Improve any React (+NodeJS) application by adding Error Handling.
4. Develop a web application which involves database operations using Express
5. Create modern, scalable and high-speed Web Applications with React and Node.js +Express
6. Create a RESTful service with Node, Express and MongoDB
7. Frontend: Using ReactJS, make Image Carousel, FAQ/Accordion and Shopping item list with filters.
8. Frontend: Using ReactJS, integrate video player like a youtube clone.
9. Frontend: Using ReactJS, make a e-commerce website (flipkart or amazon) clone
10. Backend: Using NodeJS, build a real time chat application or email sender.
11. Backend: Using NodeJS, build a job search platform or e-commerce platform api to search and filter.
12. Database: Using MongoDB, build the CRUD operations with NodeJS
13. Database: using MongoDB, NodeJS and ReactJS, build a project to fetch and post data from frontend to database.
14. Deployment: Using AWS, deploy the project in EC2 instances or use Lambda functionalities to build APIs.

Additional Frameworks:

1. Frontend: **Next JS** (ReactJS based framework), **Angular 12/13** (requires Typescript knowledge)
2. Backend: **Nest JS**
3. Database: **MySQL, PostgreSQL**
4. Cloud: **Google Cloud Services**

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

Subject Code: 01CT0622

Subject Name: Big Data Analytics

B. Tech. Year – III (Semester VI)

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: 04 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?	06
4	**Hadoop MapReduce** Mapper, Reducer, MapReduce YARN, Sorting and Shuffling in MapReduce, MapReduce Input Formats, MapReduce Output Formats, How to code in MapReduce program , analyze data using MapReduce	09
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	10
6	**Apache Spark** Introduction to Apache Spark, pySpark, Working with Key-value pair, Loading and saving data in spark, Learning about Machine Learning Library in Spark.	08
7	**NoSql** Introduction to NoSql, NoSql vs SQL, Introduction to MongoDB, MongoDB Create-Drop Databases, Create-Drop Collection, CRUD operation in documents, MongoDB indexing, Aggregation, replication, Connect Java Application with MongoDB.	07
	Total Hours	51

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

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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/

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

Subject Code: 01CT0621

Subject Name: Computer Vision

B. Tech. Year – III (Semester VI)

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** Image Enhancement, Image Filtering, Convolution, Histogram Processing, Fourier Transform, Image Morphology	08
3	**Shape from X** Light at Surfaces, Phong Model, Reflectance, Properties of shape, Shape from Shading, Texture, color, motion and edges	07
4	**Feature detection and matching** Edge detection, Line detection, interest points, and corners detection, shape analysis, SIFT, SURF, HOG	05
5	**Segmentation** Active contours, Region growing, K-means and mixtures of Gaussians, Mean shift, Graph cuts, Fourier and wavelet descriptors, Important applications: Background subtraction, 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, Compressed sensing for vision applications	09
7	**Applications of Computer Vision** Object detection, Object recognition, Biometrics, In Vehicle Vision Systems	07
	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: 01CT0627

Subject Name: Cyber Security

B. Tech. Year – III (Semester VI)

Objective:

This course develops the understanding of cyber security tools, crime, and security measures. Students can learn the foundations of Cyber security and threat landscape and develop skills to that will help them to plan, implement and monitor cyber mechanism to ensure the protection of information technology assets. Students are also able to understand the governance, regulatory, legal, economic, environmental, social, and ethical contexts of cyber security.

Credits Earned: 05 Credits

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

1. Understand the concept of Cyber security and issues and challenges associated with it.
2. Understand the cybercrimes, their nature, legal remedies and as to how report the crimes through available platforms and procedures.
3. Understand various privacy and security concerns on online social media and understand the reporting procedure of inappropriate content, underlying legal aspects and best practices for the use of social media platforms.
4. Apply the basic concepts related to E-Commerce and digital payments to create a secure environment for various digital payment modes and related cyber security aspects.
5. Will be able to implement basic tools and technologies to protect their devices.

Pre-requisite of course: None

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	Topic	Hours
1	**Introduction to Cyber security** Defining Cyberspace and Overview of Computer and Web technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Advent of internet, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues, and challenges of cyber security.	07
2	**Cyber-crime and Cyber law** Classification of cyber-crimes, Common cyber-crimes- cyber-crime targeting computers and mobiles, cyber-crime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi , Reporting of cyber-crimes, Remedial and mitigation measures, Legal perspective of cyber-crime, IT Act 2000 and its amendments, Cyber-crime and offences, Organizations dealing with Cyber-crime and Cyber security in India, Case studies	08
3	**Social Media Overview and Security** Introduction to Social networks. Types of social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media, Case studies.	10
4	**E - Commerce and Digital Payments** Definition of E- Commerce, Main components of E-Commerce, Elements of E-Commerce security, E-Commerce threats, E-Commerce security best practices, Introduction to digital payments, Components of digital payment and stake holders, Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments, Digital payments related common frauds and preventive measures. RBI guidelines on digital payments and customer protection in unauthorized banking transactions. Relevant provisions of Payment Settlement Act,2007.	10
5	**Digital Devices Security, Tools and Technologies for Cyber Security** End Point device and Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third-party software, Device security policy, Cyber Security best practices, Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration of basic security policy and permissions.	10

6	**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	07
	Total Hours	**52**

Suggested Text books / Reference books:

1. Cyber Crime Impact in the New Millennium, by R. C Mishra , Auther Press. Edition 2010.
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)
3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13th November, 2001)
4. Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd.
5. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.
6. Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd.
7. Fundamentals of Network Security by E. Maiwald, 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
10%	30%	20%	20%	10%	10%

Suggested List of Experiments:

Minimum 12 experiments to be performed during the semester

1. Checklist for reporting cyber crime at Cyber crime Police Station.
2. Checklist for reporting cyber crime online.
3. Reporting phishing emails.
4. Demonstration of email phishing attack and preventive measures.
5. Basic checklist, privacy and security settings for popular Social media platforms.
6. Reporting and redressal mechanism for violations and misuse of Social media platforms.
7. Configuring security settings in Mobile Wallets and UPIs.
8. Checklist for secure net banking.

9. Setting, configuring and managing three password policy in the computer (BIOS, Administrator and Standard User).
10. Setting and configuring two factor authentication in the Mobile phone.
11. Security patch management and updates in Computer and Mobiles.
12. Managing Application permissions in Mobile phone.
13. Installation and configuration of computer Anti-virus
14. Installation and configuration of Computer Host Firewall.
15. Wi-Fi security management in computer and mobile.

Supplementary Resources:

1. www.nptel.com
2. https://onlinecourses.swayam2.ac.in/nou19_cs08/preview
3. https://www.coursera.org/

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

Marwadi University
Faculty of Technology
Department of Information and Communication Technology

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