J. S. University, Shikohabad

B.Tech (CSE)

All Semesters

(Four years program)

Scheme

&

Syllabus

[Effective from the Session 2021-22]

STUDY AND EVALUATION SCHEME FOR B.TECH. (COMMON TO ALL BRANCHES).

SEMESTER – FIRST

S.No.	Subject Code	Name of Subject	Periods Per Week				Evaluation Scheme			
			L	T	P	Cr.	Sessional	End Exam	Total	Duration
THEORY SUBJECT										
1	BTAS101	Engineering Physics	3	1	0	4	50	100	150	3
2	BTAS103	Engineering Mathematics-I	3	1	0	4	50	100	150	3
3	BTEE101	Basic Electrical Engineering	3	0	0	3	50	100	150	3
4	BTCS101	Programming for Problem Solving	3	0	0	3	50	100	150	3
5	BTMC101	AI For Engineering	2	1	0	2	25	25	50	2
6	BTNC101	Soft Skill - I	2	1	0	NC	25	25	50	2
PRACTICAL/DRAWING SUBJECTS										
7	BTAS151	Engineering Physics Lab	-	-	2	1	25	25	50	3
8	BTEE151	Basic Electrical Engineering Lab	-	-	2	1	25	25	50	3
9	BTCS151	Programming for Problem Solving	-	-	2	1	25	25	50	3
10	BTCE151	Engineering Graphics & Design Lab	-	-	2	1	25	25	50	3
						20	Grand Total		900	

STUDY AND EVALUATION SCHEME FOR B.TECH. (COMMON TO ALL BRANCHES).

SEMESTER – SECOND

S.No.	Subject Code	Name of Subject	Periods Per Week				Evaluation Scheme			
			L	T	P	Cr.	Sessional	End Exam	Total	Duration
THEORY SUBJECT										
1	BTAS202	Engineering Chemistry	3	1	0	4	50	100	150	3
2	BTAS203	Engineering Mathematics-II	3	1	0	4	50	100	150	3
3	BTEC201	Emerging Domain in Electronics Engineering	3	0	0	3	50	100	150	3
4	BTME201	Fundamentals of Mechanical Engineering & Mechatronics	3	0	0	3	50	100	150	3
5	BTMC202	Emerging Technology for Engineering	2	1	0	2	25	25	50	2
6	BTNC201	Soft Skill - II	2	1	0	NC	25	25	50	2
PRACTICA/DRAWING SUBJECTS										
7	BTAS252	Engineering Chemistry Lab	-	-	2	1	25	25	50	3
8	BTEC251	Electronics Engineering Lab	-	-	2	1	25	25	50	3
9	BTAS254	English Language Lab	-	-	2	1	25	25	50	3
10	BTWS251	Mechanical Workshop Lab	-	-	2	1	25	25	50	3
					20		Grand Total		900	

SEMESTER- III

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	BTAS-302	Engineering Science Course/Maths IV	3	1	0	30	20	50		100		150	4
2	BTAS-301	Technical Communication/Universal Human values	2 3	1 0	0 0	30	20	50		100		150	3
3	BTCS-301	Data Structure	3	1	0	30	20	50		100		150	4
4	BTCS-302	Computer Organization and Architecture	3	1	0	30	20	50		100		150	4
5	BTCS-303	Discrete Structures & Theory of Logic	3	0	0	30	20	50		100		150	3
6	BTCS-351P	Data Structures Using C Lab	0	0	2				25		25	50	1
7	BTCS-352P	Computer Organization Lab	0	0	2				25		25	50	1
8	BTCS-353P	Discrete Structure & Logic Lab	0	0	2				25		25	50	1
9	BTCS-354	Mini Project or Internship Assessment*	0	0	2			50				50	1
10	BTMC-301	Computer System Security/Python Programming	2	0	0	15	10	25		50			0
		Total										950	22

*The Mini Project or internship (3-4 weeks) conducted during summer break after II semester and will be assessed during III semester.

SEMESTER- IV

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1		Maths IV/Engg. Science Course	3	1	0	30	20	50		100		150	4
2		Universal Human Values/ Technical Communication	3	0	0	30	20	50		100		150	3
			2	1	0								
3		Operating Systems	3	0	0	30	20	50		100		150	3
4		Theory of Automata and Formal Languages	3	1	0	30	20	50		100		150	4
5		Microprocessor	3	1	0	30	20	50		100		150	4
6		Operating Systems Lab	0	0	2				25		25	50	1
7		Microprocessor Lab	0	0	2				25		25	50	1
8		Python Language Programming Lab	0	0	2				25		25	50	1
9		Python Programming/Computer System Security	2	0	0	15	10	25		50			0
		Total										900	21
*The Mini Project or internship (3-4 weeks) conducted during summer break after III semester and will be assessed during IV semester.													

SEMESTER- V

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1		Database Management System	3	1	0	30	20	50		100		150	4
2		Compiler Design	3	1	0	30	20	50		100		150	4
3		Design and Analysis of Algorithm	3	1	0	30	20	50		100		150	4
4	Deptt. Elective-I	Departmental Elective-I	3	0	0	30	20	50		100		150	3
5	Deptt. Elective-II	Departmental Elective-II	3	0	0	30	20	50		100		150	3
6		Database Management System Lab	0	0	2				25		25	50	1
7		Compiler Design Lab	0	0	2				25		25	50	1
8		Design and Analysis of Algorithm Lab	0	0	2				25		25	50	1
9		Mini Project or Internship Assessment*	0	0	2				50			50	1
10		Constitution of India, Law and Engineering / Indian Tradition, Culture and Society	2	0	0	15	10	25		50			
		Total	**17**	**3**	**8**							**950**	**22**

***The Mini Project or internship (4 weeks) conducted during summer break after IV semester and will be assessed during V semester.

SEMESTER- VI

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1		Software Engineering	3	1	0	30	20	50		100		150	4
2		Web Technology	3	1	0	30	20	50		100		150	4
3		Computer Networks	3	1	0	30	20	50		100		150	4
4	Deptt. Elective-III	Departmental Elective-III	3	0	0	30	20	50		100		150	3
5		Open Elective-I [Annexure - B(iv)]	3	0	0	30	20	50		100		150	3
6		Software Engineering Lab	0	0	2				25		25	50	1
7		Web Technology Lab	0	0	2				25		25	50	1
8		Computer Networks Lab	0	0	2				25		25	50	1
9		Constitution of India, Law and Engineering / Indian Tradition, Culture and Society	2	0	0	15	10	25		50			
		Total	**0**	**3**	**6**							**900**	**21**

Departmental Elective-I

1. Data Analytics
2. Web Designing
3. Computer Graphics
4. Object Oriented System Design

Departmental Elective-II

1. Machine Learning Techniques
2. Application of Soft Computing
3. Augmented & Virtual Reality
4. Human Computer Interface

Departmental Elective-III

1. Big Data
2. Image Processing
3. Real Time Systems
4. Data Compression

SEMESTER- VII

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1		HSMC -1 / HSMC-2	3	0	0	30	20	50		100		150	3
2		Departmental Elective-IV	3	0	0	30	20	50		100		150	3
3		Departmental Elective-V	3	0	0	30	20	50		100		150	3
4		Open Elective-II	3	0	0	30	20	50		100		150	3
5		The Department may conduct one Lab of either of the two Electives (4 or 5) based on the elective chosen for the curriculum. The Department shall on its own prepare complete list of practical for the Lab and arrange for proper setup and conduct accordingly.	0	0	2				25		25	50	1
6		Mini Project or Internship Assessment*****	0	0	2				50			50	1
7		Project	0	0	8				150			150	4
		Total	**12**	**0**	**12**							**850**	**18**

*****The Mini Project or internship (4 - 6 weeks) conducted during summer break after VI semester and will be assessed during VII semester.

SEMESTER- VIII

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1		HSMC-1#/HSMC-2#	3	0	0	30	20	50		100		150	3
2		Open Elective-III	3	0	0	30	20	50		100		150	3
3		Open Elective-IV	3	0	0	30	20	50		100		150	3
4		Project 1	0	0	18				100		300	400	9
		Total	**9**	**0**	**18**							**850**	**18**

Departmental Elective-IV

1. Artificial Intelligence
2. Natural language processing
3. High Performance Computing
4. Cryptography and Network Security
5. Design & Development of Applications
6. Software Testing
7. Distributed Systems

Departmental Elective-V

1. Deep Learning
2. Service Oriented Architecture
3. Quantum Computing
4. Mobile Computing
5. Internet of Things
6. Cloud Computing
7. Blockchain Architecture Design

STUDY AND EVALUATION SCHEME FOR

B.TECH. (COMMON TO ALL BRANCHES).

SEMESTER FIRST

BTAS101	**ENGINEERING PHYSICS**	**3L:1T:0P**	**4 Credits**

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

1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in variousprocesses
3. To formulate and solve the engineering problems on Electromagnetism & ElectromagneticFieldTheory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parentstreams.

Unit	**Topics**	**Lectures**
I	**Relativistic Mechanics:** Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson- Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein‟s mass energy relation, Relativistic relation between energy and momentum, Massless particle.	8
II	**Electromagnetic Field Theory:** Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell‟s equations in vacuum and in non conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.	8
III	**Quantum Mechanics:** Black body radiation, Stefan‟s law, Wien‟s law, Rayleigh-Jeans law and Planck‟s law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.	8
IV	**Wave Optics:** Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh‟s criterion of resolution, Resolving power of grating.	8
V	**Fibre Optics & Laser:** Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres. Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein‟s coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.	8

Reference Books:

1. Concepts of Modern Physics – Aurthur Beiser (McGraw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics – Brijlal & Subramanian (S. Chand)

4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

COURSE OBJECTIVE:

The objective of this course is to familiarize the graduate engineers with techniques in calculus, multivariate analysis, vector calculus and linear algebra. It aims to equip the students with standard concepts and tools from intermediate to advanced level that will enable them to tackle more advanced level of mathematics and applications that they would find useful in their disciplines.

The students will learn:

- To apply the knowledge of differential calculus in the field of engineering.
- To deal with functions of several variables that is essential in optimizing the results ofreallife problems.
- Multiple integral tools to deal with engineering problems involving centre ofgravity,volume etc.
- To deal with vector calculus that is required in different branches of Engineering tograduate engineers.
- The essential tools of matrices and linear algebra, Eigen values and diagonalization inaComprehensive manner are required.

BTAS103	ENGINEERING MATHMATICS I	3L:1T:0P	4 Credits

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

CO 1	Remember the concept of matrices and apply for solving linearsimultaneous equations.
CO 2	Understand the concept of limit , continuity and differentiability and apply in the study of Rolle,s , Lagrange,s and Cauchy mean valuetheorem and Leibnitz theorems .
CO 3	Identify the application of partial differentiation and apply forevaluating maxima, minima, series and Jacobians.
CO 4	Illustrate the working methods of multiple integral and apply forfinding area, volume, centre of mass and centre of gravity.
CO 5	Remember the concept of vector and apply for directional derivatives,tangent andnormal planes. Also evaluate line, surface and volume integrals.

Unit	Topics	Lectures
I	**Matrices:** Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, Rank-Nullity theorem; System of linear equations, Characteristic equation, Cayley-Hamilton Theorem and its application, Eigen values and eigenvectors; Diagonalisation of a Matrix	8
II	**Differential Calculus- I:** Introduction to limits, continuity and differentiability, Rolle's Theorem, Lagrange's Mean value theorem andCauchy mean value theorem, Successive Differentiation (n^{th} order derivatives), Leibnitz theorem and its application, Envelope of family of one and two parameter, Curve tracing: Cartesian and Polar co-ordinates	8
III	**Differential Calculus-II:** Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions, Taylor and Maclaurin's theorems for a function of two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians, Approximation of errors	8
IV	**Multivariable Calculus-I: Multiple integration:** Double integral, Triple integral, Change of order of integration, Change of variables, **Application:** Areas and volumes, Center of mass and center of gravity (Constant and variable densities)	8
V	**Vector Calculus:** Vector identities (without proof), Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives. Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem and Stoke's theorem (without proof) and their applications	8

Text Books:

1. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd.,2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House2002.

Reference Books:

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.

3. Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition,Pearson.
4. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
5. Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
6. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, McGraw-Hill;Sixth Edition.
7. P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition,Pearson Education.
8. Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.
9. Engineering Mathemathics – I. Reena Garg, 2018.

BTEE101	BASIC ELECTRICAL ENGINEERING	3L:0T:0P	3 Credits

	Course Outcome (CO)
CO 1	Remember the concept of matrices and apply for solving linearsimultaneous equations.
CO 2	Understand the concept of limit , continuity and differentiability and apply in the study of Rolle,s , Lagrange,s and Cauchy mean valuetheorem and Leibnitz theorems .
CO 3	Identify the application of partial differentiation and apply forevaluating maxima, minima, series and Jacobians.
CO 4	Illustrate the working methods of multiple integral and apply forfinding area, volume, centre of mass and centre of gravity.
CO 5	Remember the concept of vector and apply for directional derivatives,tangent andnormal planes. Also evaluate line, surface and volume integrals.

Unit	Topics	Lectures
I	**DC Circuits :** Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff‟s laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.	8
II	**Steady- State Analysis of Single Phase AC Circuits:** Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidal varying voltage and current. Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor. Three phase balanced circuits, voltage and current relations in star and delta connections.	8
III	**Transformers:** Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation andefficiency. Auto-transformer and three-phase transformer connections.	8
IV	**Electrical machines: DC machines:** Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems) **Three Phase Induction Motor:** Principle & Construction, Types, Slip- torque characteristics, Applications (Numerical problems related to slip only) **Single Phase Induction motor:** Principle of operation and introduction to methods of starting, applications. **Three Phase Synchronous Machines:** Principle of operation of alternator and synchronous motor and their applications.	8
V	**Electrical Installations:** Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries. Elementary calculations for energy consumption and savings, battery backup.	8

Text Book:

1. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, McGraw Hill.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill.
3. Ritu Sahdev, “Basic Electrical Engineering”, Khanna Publishing House.
4. S. Singh, P.V. Prasad, “Electrical Engineering: Concepts and Applications”Cengage

Reference Books:

1. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
2. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press.
3. V. D. Toro, “Electrical Engineering Fundamentals”, Pearson India.

Spoken Tutorial (MOOCs): Open Source Spice circuit Simulator Software

1. AC DC Circuit Analysis using NgSpice, Open Source Spice circuit Simulator Software (http://spoken- tutorial.org)

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

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behavior of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

BTCS101	PROGRAMMING FOR PROBLEM SOLVING	3L:0T:0P	3 Credits

Course Outcomes: At the end of this course students will be able to:

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete programusingdivide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs

Unit	Topics	Lectures
I	**Introduction to Programming: Introduction to components of a computer system:** Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker. **Idea of Algorithm:** Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code. **Programming Basics:** Structure of C program: writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language: Standard I/O in C, Fundamental data types, Variables and memory locations, Storageclasses.	8
II	**Arithmetic expressions & Conditional Branching: Arithmetic expressions and precedence:** Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associatively. **Conditional Branching:** Applying if and switch statements, nesting if and else, use of break and default with switch.	8
III	**Loops & Functions: Iteration and loops:** use of while, do while and for loops, multiple loop variables, use of break and continuestatements. **Functions:** Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.	8
IV	**Arrays & Basic Algorithms: Arrays:** Array notation and representation, manipulating array elements, using multi dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions. **Basic Algorithms:** Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.	8
V	**Pointer& File Handling: Pointers:** Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation) **File handling:** File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.	8

Text Books:

1. Schum‟s Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House.

BTMC101	ARTIFICAL INTELLIGENCE FOR ENGINEERS	2L:1T:0P	2 Credit

The students will be able to

CO1	Understand the evolution and various approaches of AI
CO2	Understand data storage, processing, visualization, and its usein regression,clustering etc.
CO3	Understand natural language processing and chatbots
CO4	Understand the concepts of neural networks
CO5	Understand the concepts of face, object, speech recognition androbots

Course	**Topics**
Unit 1	**An overview to AI**
1.1	The evolution of AI to the present
1.2	Various approaches to AI
1.3	What should all engineers know about AI?
1.4	Other emerging technologies
1.5	AI and ethical concerns
Unit 2	**Data & Algorithms**
2.1	History Of Data
2.2	Data Storage And Importance of Data and its Acquisition
2.3	The Stages of data processing
2.4	Data Visualization
2.5	Regression, Prediction & Classification
2.6	Clustering & Recommender Systems
Unit 3	**Natural Language Processing**
3.1	Speech recognition
3.2	Natural language understanding
3.3	Natural language generation
3.4	Chatbots
3.5	Machine Translation
Unit 4	**Artificial Neural Networks**
4.1	Deep Learning
4.2	Recurrent Neural Networks
4.3	Convolutional Neural Networks
4.4	The Universal Approximation Theorem
4.5	Generative Adversarial Networks
Unit 5	**Applications**
5.1	Image and face recognition
5.2	Object recognition
5.3	Speech Recognition besides Computer Vision
5.4	Robots
5.5	Applications

Reference Books:

1. Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig, Prentice Hall
2. Artificial Intelligence by Kevin Knight, Elaine Rich, Shivashankar B. Nair, Publisher : McGrawHill
3. Data Mining: Concepts and Techniques by Jiawei Han, Micheline Kamber, Jian Pei,Publisher: Elsevier Science.
4. Speech & Language Processing by Dan Jurafsky, Publisher : Pearson Education
5. Neural Networks and Deep Learning A Textbook by Charu C. Aggarwal, Publisher: SpringerInternational Publishing
6. Introduction to Artificial Intelligence By Rajendra Akerkar, Publisher : PHI Learning

BTNC101	SOFT SKILLS-I	2L:1T:0P

Course Outcome:

Unit 1- Students will be enabled to **understand** the correct usage of grammar.

Unit 2- Students will **apply** the fundamental inputs of communication skills in making speech delivery, individualconference, and group communication.

Unit 3-Students will **evaluate** the impact of interpersonal communication on their performance as a professionaland in obtaining professional excellence at the workplace.

Unit 4-Skills and techniques of persuasion and negotiation would **enhance** the level of students at multifariousadministrative and managerial platforms.

Unit 5-Student will be able to **equip** with basics of communication skills and will **apply** it for practical andoral purposes by being honed up in presentation skills and voice-dynamics.

UNIT I- Basics of Applied Grammar and usage

Tenses: Part of Speech, Active & Passive Voice, Articles, Subject-verb agreement, Antonyms, Synonyms, Prefix and Suffix, Narration, Conditional sentences, Concord, Tag questions, punctuation marks.

UNIT II- Presentation and Interaction Skills

Speech Delivery, Interjecting: Objectives& Methodology; Group Discussion: Objectives & Methods; Theme Presentation: Methods; Argumentative skills: Pattern and Ingredients; Debate & Discussion: Unity, Coherence & Emphasis. Public Speaking: Audience Analysis: Approach and Style. Interviews: Types; Focus & Objectives.

UNIT III- Interpersonal Communication Skills

Features: Methods; Principles; Requisites; Team- work; Skills: Empathy, Emotional Intelligence, empathy and listening skills. Time Management; Attitude; Responsibility. Leadership qualities: Integrity; Values; Trust; Self- Confidence & Courage; Communication and Networking; Speed reading; Problem Solving & Trouble- Shooting

UNIT IV- Persuasion and Negotiation Skills

Definition; Understanding Attitude, Beliefs, Values and Behavior; The process of Persuasion: Analysis of Audience; Classification of Audience; Egoistic and Non-Egoistic; Specific Techniques for Specific Audience; Skills of Persuasion, Steps to Persuasion/Influence, Negotiation: Definition; Process of Negotiation: Characteristics;Qualities of good negotiator; Approaches to Negotiation.

UNIT V- Communication Skills

Introduction to oral communication, Nuances & Modes of Speech Delivery, Public speaking: confidence, clarity, and fluency, Non-verbal Communication: Kinesics, Paralinguistic features of Voice-Dynamics, Proxemics, Chronemics, and Presentation Strategies: planning, preparation, organization, delivery.

Prescribed Books:

1. **Technical Communication, (Second Ed.); O.U.P.,** Meenakshi Raman & S.Sharma New Delhi, 2011
2. **Business Communication for Managers**, Payal Mehra, Pearson, Delhi, 2012.

3. **Personality Development,** Harold R. Wallace et. al, Cengage Learning India Pvt. Ltd; New Delhi 2006
4. **Practical Communication** by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, Delhi.2013,
5. **Personality Development & Soft Skills,** Barun K.Mitra, Oxford University Press, New Delhi, 2012.
6. **Public Speaking,** William S. Pfeiffer, Pearson, Delhi, 2012.
7. **Human Values,** A.N. Tripathi, New Age International Pvt. Ltd. Publishers New Delhi ,2005

BTAS151	PHYSICS LAB	0L:0T:2P	1 Credit

Course Outcomes:

1. To determine the wavelength of sodium light by Newton‟s ringexperiment
2. To determine the wavelength of sodium light with the help ofFresnel‟sbi-prism
3. To determine the variation of magnetic field with the distance along theaxisof a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformerand to determine its hysteresis loss.

SUGGESTIVE LIST OF EXPERIMENTS:

Group A

1. To determine the wavelength of sodium light by Newton‟s ring experiment.
2. To determine the wavelength of different spectral lines of mercury light usingplanetransmission grating.
3. To determine the specific rotation of cane sugar solution using polarimeter.
4. To determine the focal length of the combination of two lenses separated byadistance and verify the formula for the focal length of combination of lenses
5. To measure attenuation in an optical fiber.
6. To determine the wavelength of He-Ne laser light using single slit diffraction.
7. To study the polarization of light using He-Ne laser light.
8. To determine the wavelength of sodium light with the help of Fresnel‟s bi-prism.
9. To determine the coefficient of viscosity of a given liquid.
10. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

1. To determine the energy band gap of a given semiconductor material.
2. To study Hall Effect and determine Hall coefficient, carrier density and mobility of agiven semiconductor material using Hall effect setup.
3. To determine the variation of magnetic field with the distance along the axis of acurrent carrying coil and estimate the radius of the coil.
4. To verify Stefan‟s law by electric method.
5. To determine resistance per unit length and specific resistance of a givenresistanceusing Carey Foster's Bridge.
6. To study the resonance condition of a series LCR circuit.
7. To determine the electrochemical equivalent (ECE) of copper.
8. To calibrate the given ammeter and voltmeter by potentiometer.

9. To draw hysteresis (B-H curve) of a specimen in the form of a transformer andtodetermine its hysteresis loss.
10. To measure high resistance by leakage method.

List of Experiments: Any ten experiments (at least four from each group) with virtual link

	Group A	Virtual Lab Link	Alternate Lab Link
1	To determine the wavelength of sodium light by Newton's ring experiment.	https://vlab.amrita.edu/?sub=1&brch=189&sim=335&cnt=1	http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/engg_physics/labs/exp1/simulation/simulator4.html?medium=1
2	To determine the wavelength of different spectral lines of mercury light using plane transmission grating.	http://vlab.amrita.edu/?sub=1&brch=281&sim=334&cnt=1	
3	To determine the specific rotation of cane sugar solution using polarimeter		http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/cane-sugar-rotation-iitk/simulation.html
4	To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the Focal length of combination of lenses.		http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/focal-length-measurement-iitk/simulation.html
5	To measure attenuation in an optical fiber.	http://vlab.amrita.edu/index.php?sub=59&brch=269&sim=1369&cnt=2873	http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/numerical-aperture-measurement-iitk/simulation.html
6	To determine the wavelength of He-Ne laser light using single slit diffraction.	http://vlab.amrita.edu/index.php/index.php?sub=1&brch=189&sim=334&cnt=1	https://youtu.be/0qIN2qHCvvs (Laser diffraction grating)
7	To study the polarization of light using He-Ne laser light.		http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/he-ne-laser-polarization-iitk/simulation.html
8	To determine the wavelength of sodium light with the help of Fresnel's bi-prism	http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/fresnel-biprism-iitk/simulation.html	
9	To determine the coefficient of viscosity of a given liquid.	https://amrita.olabs.edu.in/?sub=1&brch=5&sim=225&cnt= 2	
10	To determine the value of acceleration due to gravity (g) using compound pendulum.	http://vlab.amrita.edu/?sub=1&brch=280&sim=210&cnt=2	
	Group B		
1	To determine the energy band gap of a given semiconductor material.	http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/energy-band-gap-iitk/simulation.html	http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/energy-band-gap-iitk/simulation.html
2	To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.	https://vlab.amrita.edu/?sub=1&brch=282&sim=879&cnt=1	https://youtu.be/lUugrqMOY7E (Hall Effect)
3	To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.	http://vlab.amrita.edu/?sub=1&brch=192&sim=972&cnt=1	https://youtu.be/v2B0QyW8XJ0 (Variation of Magnetic Field along the axis of circular coil carrying current)

4	To verify Stefan's law by electric method..	http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/vlabs_recbanda/labs/exp1/index.html	https://youtu.be/qvFQ31s-bAw(Stefans law verification)
5	To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.	https://vlab.amrita.edu/?sub=1&brch=192&sim=346&cnt=1	http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/carey-foster-bridge-iitk/simulation.html
6	To study the resonance condition of a series LCR circuit.	https://vlab.amrita.edu/?sub=1&brch=75&sim=330&cnt=1	
7	To determine the electrochemical equivalent (ECE) of copper.	http://learnphysics-dhruv.blogspot.com/2015/03/copper-voltameter-to-determine-electro.html	https://youtu.be/drV2nbDjR1k (ECEof Copper experiment)
8	To calibrate the given ammeter and voltmeter by potentiometer.		
9	To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.		
10	To measure high resistance by leakage method	http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/carey-foster-bridge-iitk/simulation.html	

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar & Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

BTEE151	BASIC ELECTRICAL ENGINEERING LAB	0L:0T:2P	1 Credit

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

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DCelectrical circuits.
2. Demonstrate the behaviour of AC circuits connected to single phase AC supply and measurepowerin single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase inductionmotor and Identify the type of DC and AC machines based on their construction.

SUGGESTIVE LIST OF EXPERIMENTS:

(A) Hardware based experiments

1. Verification of Kirchhoff‟s laws.
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit andstudyimprovement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination ofitspower factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit.
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phasetransformer.
10. Determination of efficiency of a dc shunt motor by load test.
11. To study running and speed reversal of a three phase induction motor and record speed inbothdirections.
12. Demonstration of cut-out sections of machines: dc machine, three phase inductionmachine,single phase induction machine and synchronous machine.

(B) Experiments available on virtual lab

1. Kirchhoff‟s laws.

Virtual lab link: http://vlab.amrita.edu/?sub=3&brch=75&sim=217&cnt=2

2. Thevenin Theorem.

Virtual lab link: https://vlab.amrita.edu/?sub=1&brch=75&sim=313&cnt=1

3. RLC series resonance.

Virtual lab link: https://vlab.amrita.edu/?sub=1&brch=75&sim=330&cnt=1

4. Measurement of power in 3- phase circuit by two wattmeter method and determination ofitspower factor for star as well as delta connected load.

Virtual lab link: http://vp-dei.vlabs.ac.in/Dreamweaver/measurement.html

5. Determination of parameters of ac single phase series RLC circuit.

Virtual lab link: https://vlab.amrita.edu/?sub=1&brch=75&sim=332&cnt=1

6. To observe the B-H loop of a ferromagnetic material in CRO.

Virtual lab link: https://vlab.amrita.edu/?sub=1&brch=282&sim=1507&cnt=2

7. Determination of the efficiency of a dc motor by loss summation method(Swinburne'stest).Virtual lab link: http://em-iitr.vlabs.ac.in/exp5/index.php?section=Theory

BTCS151	PROGRAMMING FOR PROBLEM SOLVING	0L:0T:2P	1 Credit

BTCS151- Programming for Problem Solving Lab

Course Outcome (CO)

At the end of course , the student will be able to:

CO 1	Able to implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems.
CO 2	Demonstrate an understanding of computer programming language concepts.
CO 3	Ability to design and develop Computer programs, analyzes, and interprets the concept of pointers, declarations, initialization, operationson pointersand their usage.
CO 4	Able to define data types and use them in simple data processing applications also he/she must be able to use theconcept of array ofstructures.
CO 5	Develop confidence for self education and ability for life-longlearning needed for Computer language.

LabNo.	Expt.	Program
LAB 1	**1**	Write a program to calculate the area of triangle using formula at=√s(s-a)(s-b)(s-c)
	2	Basic salary of an employee is input through the keyboard. The DA is 25%of the basic salary while the HRA is 15% of the basic salary. Provident Fund is deducted at the rate of 10% of the gross salary (BS+DA+HRA). Program to calculate the Net Salary.
	3	Write a program to determine the roots of quadratic equation.
	4	Write a program to find the largest of three numbers using nested if else.
	5	Write a program to receive marks of physics, chemistry & maths from user& check its eligibility for course if a) Marks of physics > 40 b) Marks of chemistry > 50 c) Marks of math's > 60 d) Total of physics & math's marks > 150or e) Total of three subjects marks > 200
LAB 2	**6**	Write a program to find the value of y for a particular value of n. The a, x,b, n is input by user if n=1 y=ax%b if n=2 y=ax2+b2if n=3 y=a-bx if n=4 y=a+x/b
	7	Write a program to construct a Fibonacci series upto n terms.
	8	Write a program to find whether the number is Armstrong number.
	9	Write a program to generate sum of series 1!+2!+3!+---------- n!
	10	Write a program to find the sum of following series 1-X1/1!+X2/2!-……Xn/n!.

LAB 3	**11**	Write a program to print the entire prime no between 1 and 300.
	12	Write a program to print out all the Armstrong number between 100 and 500.
	13	Write a program to draw the following figure:3 2 1 21 1 * ** ***
	14	Write a program to receive a five-digit no and display as like 24689:2 4 6 8 9
LAB 4	**15**	Write a function that return sum of all the odd digits of a given positive noentered through keyboard.
	16	Write a program to print area of rectangle using function & return its valueto main function.
	17	Write a program to calculate the factorial for given number using function.
	18	Write a program to find sum of Fibonacci series using function.
	19	Write factorial function & use the function to find the sum of series S=1!+2!+ ------n!.
LAB 5	**20**	Write a program to find the factorial of given number using recursion.
	21	Write a program to find the sum of digits of a 5 digit number usingrecursion.
	22	Write a program to calculate the GCD of given numbers using recursion.
	23	Write a program to convert decimal number in to binary number.
	24	Write a program to convert binary number in to decimal number.
LAB 6	**25**	Write a program to delete duplicate element in a list of 10 elements &display it on screen.
	26	Write a program to merge two sorted array & no element is repeated during merging.
	27	Write a program to evaluate the addition of diagonal elements of twosquare matrixes.
	28	Write a program to find the transpose of a given matrix & check whether itis symmetric or not.
	29	Write a program to print the multiplication of two N*N (Square) matrix.
LAB 7	**30**	Write a program in C to check whether the given string is a palindrome or
		not.
	31	Write program to sort the array of character (String) in alphabetical orderlike STRING in GINRST.

	32	Write a program to remove all the blank space from the string & print it,also count the no of characters.
	33	Write a program to store the following string “zero”, “one” --------- “five”. Print the no in words, given in figure as 3205.
LAB 8	**34**	Write a program to compare two given dates. To store a date uses a structure that contains three members namely day, month and year. If thedates are equal then display message equal otherwise unequal.
	35	Define a structure that can describe a hotel. It should have the member thatincludes the name, address, grade, room charge and number of rooms. Write a function to print out hotel of given grade in order of room charges.
	36	Define a structure called cricket with player name, team name, batting average, for 50 players & 5 teams. Print team wise list contains names ofplayer with their batting average.
LAB 9	**37**	Write a c program to copy & count the character content of one file saysa.txt to another file b.txt.
	38	Write a program to take 10 integers from file and write square of theseinteger in other file.
	39	Write a program to read number from file and then write all ‘odd’ numberto file ODD.txt & all even to file EVEN.txt.
	40	Write a program to print all the prime number, between 1 to 100 in fileprime.txt.
	41	Write the following C program using pointer: a) To sort the list of numbers through pointer b) To reverse the string through pointer.
LAB 10	**42**	Write a program to find the largest no among 20 integers array using dynamic memory allocation.
	43	Using Dynamic Memory Allocation, Write a program to find the transposeof given matrix.
	44	Write a program to find the factorial of given number using command line argument.
	45	Write a program to find the sum of digits of a 5 digit number using command line argument.

Note:

a) The Instructor may add/delete/modify/tune experiments, wherever he/she feels inajustified manner

b) It is also suggested that open source tools should be preferred to conduct the lab.Some open source online compiler to conduct the C lab are as follows:

- https://www.jdoodle.com/c-online-compiler/
- https://www.tutorialspoint.com/compile_c_online.php
- https://www.programiz.com/c-programming/online-compiler/
- https://www.hackerrank.com/

BTCS151- Programming for Problem Solving Lab: Mapping with Virtual Lab

Name of the Lab	Name of the Experiment
Problem Solving Lab	Numerical Representation
	Beauty of Numbers
	More on Numbers
	Factorials
	String Operations
	Recursion
	Advanced Arithmatic
	Searching and Sorting
	Permutation
	Sequences

BTCE151	ENGINEERING GRAPHICS AND DESIGN LAB	0L:0T:2P	1 Credits

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

1. Understanding of the visual aspects of engineering design
2. Understanding of engineering graphics standards and solid modelling
3. Effective communication through graphics
4. Applying modern engineering tools necessary for engineering practice
5. Appling computer-aided geometric design
6. Analysis of Isometric views
7. Creating working drawings

Unit	Topics	Lectures
I	**Introduction to Engineering Drawing, Orthographic Projections:** Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales –Plain and Diagonal Scales. Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes	8
II	**Projections and Sections of Regular Solids:** Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc. Prism, Cylinder, Pyramid, Cone–Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.	8
III	**Isometric Projections:** Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice- versa, Conversions.	8
IV	**Computer Graphics:** Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids]; Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles: Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two- dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multiview, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling.	8
V	**Demonstration of a simple team design project:** Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprintform and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis andtool-path generation for component manufacture; geometric dimensioning and tolerancing;Use of solid-modelling software for creating associative models at the component andassembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).	8

Text Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, PearsonEducation
3. Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, McGraw Publication
4. Engineering Graphics & Design, A.P. Gautam & Pradeep Jain, Khanna Publishing House
5. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.(Corresponding set of) CAD Software Theory and User Manuals.

B.TECH. (COMPUTER SCIENCE AND ENGINEERING)
THIRD SEMESTER (DETAILED SYLLABUS)

DATA STRUCTURE		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO 1	Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented in memory, used by the algorithms and their common applications.	
CO 2	Discuss the computational efficiency of the sorting and searching algorithms.	
CO 3	Implementation of Trees and Graphs and perform various operations on these data structure.	
CO 4	Understanding the concept of recursion, application of recursion and its implementation and removal of recursion.	
CO 5	Identify the alternative implementations of data structures with respect to its performance to solve a real world problem.	

Course Code:	**Programme Outcome (PO)**												**PSO**	**PSO**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	3	2	-	-	-	-	3	3	3	3	3
CO2	3	3	3	2	2	-	-	-	-	3	3	3	3	3
CO3	3	3	3	3	2	-	-	-	-	3	3	3	3	3
CO4	3	3	3	3	3	-	-	-	-	3	3	3	3	3
CO5	3	3	3	3	3	-	-	-	-	2	3	3	3	3
PO Target	3	3	3	2.8	2.4	**-**	**-**	**-**	**-**	2.8	3	3	3	3

DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction: Basic Terminology, Elementary Data Organization, Built in Data Types in C. Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big Oh, Big Theta and Big Omega, Time-Space trade-off. Abstract Data Types (ADT) Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D,2-D,3-D and n-D Array Application of arrays, Sparse Matrices and their representations. Linked lists: Array Implementation and Pointer Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition Subtraction & Multiplications of Single variable & Two variables Polynomial.	08
II	Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Iteration and Recursion- Principles of recursion, Tail recursion, Removal of recursion Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers. Tradeoffs between iteration and recursion. Queues: Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.	08
III	Searching: Concept of Searching, Sequential search, Index Sequential Search, Binary Search. Concept of Hashing & Collision resolution Techniques used in Hashing. Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Merge Sort, Heap Sort and Radix Sort.	08
IV	Graphs: Terminology used with Graph, Data Structure for Graph Representations: Adjacency Matrices, Adjacency List, Adjacency. Graph Traversal: Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm.	08
V	Trees: Basic terminology used with Tree, Binary Trees, Binary Tree Representation: Array Representation and Pointer(Linked List) Representation, Binary Search Tree, Strictly Binary Tree ,Complete Binary Tree . A Extended Binary Trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Constructing Binary Tree from given Tree Traversal, Operation of Insertation , Deletion, Searching & Modification of data in Binary Search . Threaded Binary trees, Traversing Threaded Binary trees. Huffman coding using Binary Tree. Concept & Basic Operations for AVL Tree , B Tree & Binary Heaps	08

Text books:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein, “Data Structures Using C and C++”,
2. PHI Learning Private Limited, Delhi India
3. Horowitz and Sahani, “Fundamentals of Data Structures”, Galgotia Publications Pvt Ltd Delhi India.
4. Lipschutz, “Data Structures” Schaum’s Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.
5. Thareja, “Data Structure Using C” Oxford Higher Education.
6. AK Sharma, “Data Structure Using C”, Pearson Education India.
7. Rajesh K. Shukla, “Data Structure Using C and C++” Wiley Dreamtech Publication.
8. Michael T. Goodrich, Roberto Tamassia, David M. Mount “Data Structures and Algorithms in C++”, Wiley India.
9. P. S. Deshpandey, “C and Data structure”, Wiley Dreamtech Publication.
10. R. Kruse etal, “Data Structures and Program Design in C”, Pearson Education.
11. Berztiss, AT: Data structures, Theory and Practice, Academic Press.
12. Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with applications”, McGraw Hill.
13. Adam Drozdek “Data Structures and Algorithm in Java”, Cengage Learning

Computer Organization and Architecture		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO 1	Study of the basic structure and operation of a digital computer system.	
CO 2	Analysis of the design of arithmetic & logic unit and understanding of the fixed point and floatingpoint arithmetic operations.	
CO 3	Implementation of control unit techniques and the concept of Pipelining	
CO 4	Understanding the hierarchical memory system, cache memories and virtual memory	
CO 5	Understanding the different ways of communicating with I/O devices and standard I/O interfaces	

Course Code:	Programme Outcome (PO)												PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO-1	3	2	2	3	2	-	-	-	-	-	-	2		2
CO-2	3	2	2	2	2	-	-	-	-	-	-	2		
CO-3	2	2	3	3	2	-	1	-	-	-	-	2	2	
CO-4	3	2	3	2	2	-	-	-	-	2	-	2		
CO-5	2	2	3	2	2	-	-	-	-	-	-	2		
PO Target	2.6	2	2.6	2.4	2	-	1	-	-	2	-	2	2	2

DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction: Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. Processor organization, general registers organization, stack organization and addressing modes.	08
II	Arithmetic and logic unit: Look ahead carries adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard for Floating Point Numbers	08
III	Control Unit: Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc), micro operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Pipelining. Hardwire and micro programmed control: micro programme sequencing, concept of horizontal and vertical microprogramming.	08
IV	Memory: Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues & performance, address mapping and replacement Auxiliary memories: magnetic disk, magnetic tape and optical disks Virtual memory: concept implementation.	08
V	Input / Output: Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.	08

Text books:
1. Computer System Architecture - M. Mano
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, Reprint 2012
3. John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, Third Edition, 1998. Reference books 4. William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventh edition, 2006.
5. Behrooz Parahami, "Computer Architecture", Oxford University Press, Eighth Impression, 2011.
6. David A. Patterson and John L. Hennessy, "Computer Architecture-A Quantitative Approach", Elsevier, a division of reed India Private Limited, Fifth edition, 2012
7. Structured Computer Organization, Tannenbaum(PHI)

Discrete Structures & Theory of Logic		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO 1	Write an argument using logical notation and determine if the argument is or is not valid.	
CO 2	Understand the basic principles of sets and operations in sets.	
CO 3	Demonstrate an understanding of relations and functions and be able to determine their properties.	
CO 4	Demonstrate different traversal methods for trees and graphs.	
CO 5	Model problems in Computer Science using graphs and trees.	
DETAILED SYLLABUS		3-0-0

Unit	Topic	Proposed Lecture
I	Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets. Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations. Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions. Growth of Functions. Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases. Proof Methods, Proof by counter – example, Proof by contradiction.	08
II	Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields.	08
III	Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice. Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.	08
IV	Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference. (8) Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.	08
V	Trees: Definition, Binary tree, Binary tree traversal, Binary search tree. Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring, Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences. Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle	08

Text books:
1.Koshy, Discrete Structures, Elsevier Pub. 2008 Kenneth H. Rosen, Discrete Mathematics and Its Applications, 6/e, McGraw-Hill, 2006.
2. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, 5/e, Prentice Hall, 2004.
3.E.R. Scheinerman, Mathematics: A Discrete Introduction, Brooks/Cole, 2000.
4.R.P. Grimaldi, Discrete and Combinatorial Mathematics, 5/e, Addison Wesley, 2004
5.Liptschutz, Seymour, " Discrete Mathematics", McGraw Hill.
6.Trembley, J.P & R. Manohar, "Discrete Mathematical Structure with Application to Computer Science", McGraw Hill.
4. Deo, 7.Narsingh, "Graph Theory With application to Engineering and Computer.Science.", PHI.
8. Krishnamurthy, V., "Combinatorics Theory & Application", East-West Press Pvt. Ltd., New Delhi

Course Code:	**Programme Outcome (PO)**												**PSO**	**PSO**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO-1	3	1	-	-	2	-	-	-	-	-	-	-	1	-
CO-2	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO-3	3	2	2	1	2	-	-	1	-	-	-	1	2	-
CO-4	3	-	-	3	2	2	-	1	-	-	-	1	1	1
CO-5	2	3	3	-	2	-	-	-	-	-	-	2	2	2
PO Target	**2.4**	**2.2**	**2.5**	**2**	**2**	**2**	**-**	**1**	**-**	**-**	**-**	**1.33**	**1.4**	**1.5**

Data Structure using C Lab

Write C Programs to illustrate the concept of the following:

1. Sorting Algorithms-Non-Recursive.
2. Sorting Algorithms-Recursive.
3. Searching Algorithm.
4. Implementation of Stack using Array.
5. Implementation of Queue using Array.
6. Implementation of Circular Queue using Array.
7. Implementation of Stack using Linked List.
8. Implementation of Queue using Linked List.
9. Implementation of Circular Queue using Linked List.
10. Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search Tree, Insertion and Deletion in BST.
11. Graph Implementation, BFS, DFS, Minimum cost spanning tree, shortest path algorithm. Computer

Course Outcome (Data Structure using C Lab)

CO No.	**Statement of Course Outcome**	**Bloom's Cognitive Process Level (BL)**	**Knowledge Category (KC)**
After completion of the course, the student will be able to			
CO1	Implement various operations on Array and Linked List.	Evaluate	Conceptual, Procedural
CO2	Implement the concept of Stack and Queue using Array and LinkedList.	Analyze	Conceptual, Procedural
CO3	Implement the concept of Tree Data Structure using Array and LinkedList.	Analyze	Conceptual, Procedural
CO4	Implement various application of Graph data Structure.	Analyze	Conceptual, Procedural
CO5	Implement various searching and Sorting Techniques.	Apply	Conceptual, Procedural

CO-PO Mapping (Data Structure using C Lab)

Course Code:	Programme Outcome (PO)												PSO	PSO
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO-1	2	3	2	3	2	-	-	-	-	3	2	3	3	3
CO-2	3	2	1	2	2	-	-	-	-	3	3	2	3	2
CO-3	3	1	3	3	2	-	-	-	-	3	2	3	2	3
CO-4	1	2	3	2	3	-	-	-	-	3	3	2	3	2
CO-5	3	3	3	2	3	-	-	-	-	2	2	3	2	3
PO Target	**2.4**	**2.2**	**2.4**	**2.4**	**2.4**	**-**	**-**	**-**	**-**	**2.8**	**2.4**	**2.6**	**2.6**	**2.6**

Computer Organization Lab

1. Implementing HALF ADDER, FULL ADDER using basic logic gates
2. Implementing Binary -to -Gray, Gray -to -Binary code conversions.
3. Implementing 3-8 line DECODER.
4. Implementing 4x1 and 8x1 MULTIPLEXERS.
5. Verify the excitation tables of various FLIP-FLOPS.
6. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
7. Design of an 8-bit ARITHMETIC LOGIC UNIT.
8. Design the data path of a computer from its register transfer language description.
9. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.
10. Implement a simple instruction set computer with a control unit and a data path.

Course Outcome (COA Lab)

CO No.	**Statement of Course Outcome**	**Bloom's Cognitive Process Level (BL)**	**Knowledge Category (KC)**
After completion of the course, the student will be able to			
CO1	Design basic digital circuits	Understand	Factual, Procedural
CO2	Design 8 bits I/O, ALU and Adder & Subtractor.	Evaluate	Factual, Conceptual, Procedural
CO3	Analyze the concept of control unit and Multiplexer/Decoder	Analyze	Conceptual, Procedural
CO4	Analyze the concept of binary to gray code converter & gray to binary code converter.	Apply	Conceptual, Procedural
CO5	Apply algorithm using simulators	Apply	Conceptual, Procedural

CO-PO Mapping (COA Lab)

Course Code:	Programme Outcome (PO)												PSO	PSO
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO-1	1	2	-	-	-	-	-	-	-	-	-	1	-	-
CO-2	2	2	1	-	-	2	-	-	-	-	-	2	-	-
CO-3	1	2	2	-	-	-	-	-	-	-	-	1	-	-
CO-4	1	2	1	2	-	-	-	-	-	-	-	1	-	-
CO-5	-	-	-	-	-	-	-	-	-	-				
PO Target	**1.25**	**2.00**	**1.33**	**2.00**		**2.00**						**1.25**		

Discrete Structure & Logic Lab

Programming Language/Tool Used: C and Mapple

1. Write a program in C to create two sets and perform the Union operation on sets.
2. Write a program in C to create two sets and perform the Intersectison operation on sets.
3. Write a program in C to create two sets and perform the Difference operation on sets.
4. Write a program in C to create two sets and perform the Symmetric Difference operation.
5. Write a program in C to perform the Power Set operation on a set.
6. Write a program in C to Display the Boolean Truth Table for AND, OR , NOT .
7. Write a C Program to find Cartesian Product of two sets
8. Write a program in C for minimum cost spanning tree.
9. Write a program in C for finding shortest path in a Graph

Note: Understanding of mathematical computation software Mapple to experiment the followings (exp. 10 to 25):

10. Working of Computation software
11. Discover a closed formula for a given recursive sequence vice-versa
12. Recursion and Induction
13. Practice of various set operations
14. Counting
15. Combinatorial equivalence
16. Permutations and combinations
17. Difference between structures, permutations and sets
18. Implementation of a recursive counting technique
19. The Birthday problem
20. Poker Hands problem
21. Baseball best-of-5 series: Experimental probabilities
22. Baseball: Binomial Probability
23. Expected Value Problems
24. Basketball: One and One
25. Binary Relations: Influence

Course Outcome - Discrete Structures & Theory of Logic Lab

CO No.	Statement of Course Outcome	Bloom's Cognitive Process Level (BL)	Knowledge Category (KC)
After completion of the course, the student will be able to			
CO1	Application of various operations of set and Boolean algebra.	Apply	Conceptual & Procedural
CO2	Apply the concept of minimum cost spanning tree and shortest path in graphs.	Apply	Conceptual & Procedural
CO3	Illustrate recursion and mathematical induction for natural numbers.	Analyze	Conceptual & Procedural
CO4	Compute premutation and combination for various counting problems.	Analyze	Conceptual & Procedural
CO5	Compute probability for various problems.	Analyze	Conceptual & Procedural

CO-PO Mapping - Discrete Structures & Theory of Logic Lab

Course Code:	Programme Outcome (PO)												PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO-1	2	2	-	-	3	-	-	-	2	-	-	-	3	-
CO-2	3	3	2	-	-	-	-	-	-	-	-	-	1	3
CO-3	3	3	-	3	-	-	-	-	-	-	-	-	-	3
CO-4	3	3	-	3	-	-	-	-	-	-	-	-	-	3
CO-5	2	-	-	3	-	-	-	-	-	-	-	-	-	2
PO Target	2	-	-	3	-	-	-	-	-	-	-	-	-	2

Course Outcome (Mini Project)

CO No.	Statement of Course Outcome	Bloom's Cognitive Process Level (BL)	Knowledge Category (KC)
After completion of the course, the student will be able to			
CO1	Discover potential research areas in the field of IT	Understand	Factual
CO2	Compare and contrast the several existing solutions for research challenge	Evaluate	Conceptual
CO3	Demonstrate an ability to work in teams and manage the conduct of the research study	Analyze	Procedural
CO4	Formulate and propose a plan for creating a solution for the research plan identified	Evaluate	Procedural
CO5	To report and present the findings of the study conducted in the preferred domain	Evaluate	Procedural

CO-PO Mapping (Mini Project)

Course Code:	Programme Outcome (PO)												PSO	PSO
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO-1	3	3	3	3	3	2	-	-	2	2	2	3	2	2
CO-2	3	3	3	3	3	-	-	-	2	-	2	3	2	3
CO-3	3	3	3	3	3	1	-	-	3	-	2	2	3	2
CO-4	3	3	3	3	3	2	-	-	3	-	2	3	2	2
CO-5	2	-	-	-	-	-	-	-	2	-	2	-	-	-
PO Target	**2.80**	**3**	**3**	**3**	**3**	**1.67**	**0**	**0**	**2.4**	**2**	**2**	**2.75**	**2.25**	**2.25**

B.TECH. (COMPUTER SCIENCE AND ENGINEERING)
FOURTH SEMESTER (DETAILED SYLLABUS)

Operating systems		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO 1	Understand the structure and functions of OS	
CO 2	Learn about Processes, Thre ads and Scheduling a lgorithms.	
CO 3	Understand the principles of concurrency and Deadlocks	
CO 4	Learn various memory management scheme	
CO 5	Study I/O management and File systems.	
DETAILED SYLLABUS		3-0-0

Unit	Topic	Proposed Lecture
I	Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.	08
II	Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.	08
III	CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.	08
IV	Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.	08
V	I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.	08

Text books:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education
3. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
4. D M Dhamdhere, "Operating Systems : A Concept based Approach", 2nd Edition,
5. TMH 5. William Stallings, "Operating Systems: Internals and Design Principles ", 6th Edition, Pearson Education

CO \ PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	1	1	1	1	1	3	3	3
CO2	3	3	2	3	2	2	2	1	1	1	1	3	3	3
CO3	3	3	3	3	3	3	1	1	1	1	1	3	3	3
CO4	3	3	2	3	2	3	3	2	1	1	2	3	3	3
CO5	3	2	2	2	2	3	3	2	1	1	2	3	3	3

Theory of Automata and Formal Languages		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO 1	Analyse and design finite automata, pushdown automata, Turing machines, formal languages, and grammars	
CO 2	Analyse and design, Turing machines, formal languages, and grammars	
CO 3	Demonstrate the understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving	
CO 4	Prove the basic results of the Theory of Computation.	
CO 5	State and explain the relevance of the Church-Turing thesis.	

CO \ PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO1	PSO2
CO1	3	2	2	2	1					1	1	1	2	2
CO2	2	3	3	2	1					1	1	1	2	2
CO3	2	2	3	3	1					1	1	1	2	2
CO4	2	3	3	2	1					1	1	1	1	1
CO5	1	3	2	3	1					1	1	1	1	1

DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Basic Concepts and Automata Theory: Introduction to Theory of Computation- Automata, Computability and Complexity, Alphabet, Symbol, String, Formal Languages, Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language, Non Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ε-Transition, Equivalence of NFA's with and without ε-Transition, Finite Automata with output- Moore Machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata, Myhill-Nerode Theorem, Simulation of DFA and NFA	08
II	Regular Expressions and Languages: Regular Expressions, Transition Graph, Kleen's Theorem, Finite Automata and Regular Expression- Arden's theorem, Algebraic Method Using Arden's Theorem, Regular and Non-Regular Languages- Closure properties of Regular Languages, Pigeonhole Principle, Pumping Lemma, Application of Pumping Lemma, Decidability- Decision properties, Finite Automata and Regular Languages, Regular Languages and Computers, Simulation of Transition Graph and Regular language.	08

III	Regular and Non-Regular Grammars: Context Free Grammar(CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into CFG and Regular grammar into FA, Simplification of CFG, Normal Forms- Chomsky Normal Form(CNF), Greibach Normal Form (GNF), Chomsky Hierarchy, Programming problems based on the properties of CFGs.	08
IV	Push Down Automata and Properties of Context Free Languages: Nondeterministic Pushdown Automata (NPDA)- Definition, Moves, A Language Accepted by NPDA, Deterministic Pushdown Automata(DPDA) and Deterministic Context free Languages(DCFL), Pushdown Automata for Context Free Languages, Context Free grammars for Pushdown Automata, Two stack Pushdown Automata, Pumping Lemma for CFL, Closure properties of CFL, Decision Problems of CFL, Programming problems based on the properties of CFLs.	08
V	Turing Machines and Recursive Function Theory : Basic Turing Machine Model, Representation of Turing Machines, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction, Modifications of Turing Machine, Turing Machine as Computer of Integer Functions, Universal Turing machine, Linear Bounded Automata, Church's Thesis, Recursive and Recursively Enumerable language, Halting Problem, Post's Correspondance Problem, Introduction to Recursive Function Theory.	08

Text books:

1. Introduction to Automata theory, Languages and Computation, J.E.Hopcraft, R.Motwani, and Ullman. 2nd edition, Pearson Education Asia
2. Introduction to languages and the theory of computation, J Martin, 3rd Edition, Tata McGraw Hill
3. Elements and Theory of Computation, C Papadimitrou and C. L. Lewis, PHI
4. Mathematical Foundation of Computer Science, Y.N.Singh, New Age Internationa

Microprocessor		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO 1	Apply a basic concept of digital fundamentals to Microprocessor based personal computer system.	
CO 2	Analyze a detailed s/w & h/w structure of the Microprocessor.	
CO 3	Illustrate how the different peripherals (8085/8086) are interfaced with Microprocessor.	
CO 4	Analyze the properties of Microprocessors(8085/8086)	
CO 5	Evaluate the data transfer information through serial & parallel ports.	

DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Microprocessor evolution and types, microprocessor architecture and operation of its components, addressing modes, interrupts, data transfer schemes, instruction and data flow, timer and timing diagram, Interfacing devices.	08
II	Pin diagram and internal architecture of 8085 microprocessor, registers, ALU, Control & status, interrupt and machine cycle. Instruction sets. Addressing modes. Instruction formats Instruction Classification: data transfer, arithmetic operations, logical operations, branching operations, machine control and assembler directives.	08
III	Architecture of 8086 microprocessor: register organization, bus interface unit, execution unit, memory addressing, and memory segmentation. Operating modes. Instruction sets, instruction format, Types of instructions. Interrupts: hardware and software interrupts.	08
IV	Assembly language programming based on intel 8085/8086. Instructions, data transfer, arithmetic, logic, branch operations, looping, counting, indexing, programming techniques, counters and time delays, stacks and subroutines, conditional call and return instructions	08
V	Peripheral Devices: 8237 DMA Controller, 8255 programmable peripheral interface, 8253/8254programmable timer/counter, 8259 programmable interrupt controller, 8251 USART and RS232C.	08

Text books:

1. Gaonkar, Ramesh S , "Microprocessor Architecture, Programming and Applications with
2. 8085", Penram International Publishing.
3. Ray A K , Bhurchandi K M , "Advanced Microprocessors and Peripherals", TMH
4. Hall D V ,"Microprocessor Interfacing', TMH
5. Liu and, " Introduction to Microprocessor", TMH
6. Brey, Barry B, "INTEL Microprocessors", PHI
7. Renu Sigh & B.P. Gibson G A , " Microcomputer System: The 8086/8088 family'' ,PHI
8. Aditya P Mathur Sigh, "Microprocessor, Interfacing and Applications M Rafiqzzaman, "Microprocessors, Theory and Applications
9. J.L. Antonakos, An Introduction to the Intel Family of Microprocessors, Pearson, 1999

Operating Systems Lab

1. Study of hardware and software requirements of different operating systems (UNIX,LINUX,WINDOWS XP, WINDOWS7/8
2. Execute various UNIX system calls for
   i. Process management
   ii. File management iii. Input/output Systems calls 3.
   Implement CPU Scheduling Policies:
   i. SJF
   ii. Priority
   iii. FCFS iv. Multi-level Queue
4. Implement file storage allocation technique:
   i. Contiguous(using array)
   ii. Linked –list(using linked-list) iii.
   Indirect allocation (indexing)
5. Implementation of contiguous allocation techniques:
   i. Worst-Fit
   ii. Best- Fit iii. First- Fit
6. Calculation of external and internal fragmentation
   i. Free space list of blocks from system ii.
   List process file from the system
7. Implementation of compaction for the continually changing memory layout and calculate total movement of data
8. Implementation of resource allocation graph RAG)
9. Implementation of Banker‟s algorithm
10. Conversion of resource allocation graph (RAG) to wait for graph (WFG) for each type of method used for storing graph.
11. Implement the solution for Bounded Buffer (producer-consumer)problem using inter process communication techniques-Semaphores
12. Implement the solutions for Readers-Writers problem using inter process communication technique -Semaphore

CO \ PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	3	2	1	1	1	1	1	3	3	3
CO2	3	3	2	3	2	2	2	1	1	1	1	3	3	3
CO3	3	3	3	3	3	1	1	1	1	1	1	3	3	3
CO4	3	3	2	3	2	3	3	2	1	1	2	3	3	3
CO5	3	2	2	2	2	3	3	2	1	1	2	3	3	3

Microprocessor Lab

1. Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
2. Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.
3. To perform multiplication and division of two 8 bit numbers using 8085.
4. To find the largest and smallest number in an array of data using 8085 instruction set.
5. To write a program to arrange an array of data in ascending and descending order.
6. To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085 instruction set.
7. To write a program to initiate 8251 and to check the transmission and reception of character.
8. To interface 8253 programmable interval timer to 8085 and verify the operation of 8253 in six different modes.
9. To interface DAC with 8085 to demonstrate the generation of square, saw tooth and triangular wave.
10. Serial communication between two 8085 through RS-232 C port.

Python Language Programming Lab

1. To write a python program that takes in command line arguments as input and print the number of arguments.
2. To write a python program to perform Matrix Multiplication.
3. To write a python program to compute the GCD of two numbers.
4. To write a python program to find the most frequent words in a text file.
5. To write a python program find the square root of a number (Newton's method).
6. To write a python program exponentiation (power of a number).
7. To write a python program find the maximum of a list of numbers.
8. To write a python program linear search.
9. To write a python program Binary search.
10. To write a python program selection sort. 11. To write a python program Insertion sort.
12. To write a python program merge sort.
13. To write a python program first n prime numbers.
14. To write a python program simulate bouncing ball in Pygame.

CO \ PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	2	1	3	-	-	-	-	-	-	1	1	1
CO2	3	2	2	2	3	-	-	-	-	-	-	2	2	2
CO3	3	3	2	2	3	-	-	-	-	-	-	2	2	2
CO4	3	2	2	2	3	-	-	-	-	-	-	2	2	2
CO5	3	2	2	3	3	-	-	-	-	-	-	2	2	2

Mathematics-IV
(PDE, Probability and Statistics)
Computer/Electronics/Electrical & Allied Branches, CS/IT, EC/IC, EE/EN, Mechanical& Allied Branches, (ME/AE/AU/MT/PE/MI/PL) Textile/Chemical & Allied Branches, TT/TC/CT, CHE/FT

Subject Code						
Category	Basic Science Course					
Subject Name	MATHEMATICS-IV					
Scheme and Credits	**L-T-P**	**Theory Marks**	**Sessional**		**Total**	**Credit**
			Test	**Assig/Att.**		
	3—1—0	100	30	20	150	4
Pre- requisites (if any)	Knowledge of Mathematics I and II of B. Tech or equivalent					

Course Outcomes

The objective of this course is to familiarize the students with partial differential equation, their application and statistical techniques. It aims to present the students with standard concepts and tools at an intermediate to superior level that will provide them well towards undertaking a variety of problems in the discipline.

The students will learn:

- The idea of partial differentiation and types of partial differential equations
- The idea of classification of second partial differential equations, wave , heat equation and transmission lines
- The basic ideas of statistics including measures of central tendency, correlation, regression and their properties.
- The idea s of probability and random variables and various discrete and continuous probability distributions and their properties.
- The statistical methods of studying data samples, hypothesis testing and statistical quality control, control charts and their properties.

Module I: Partial Differential Equations

Origin of Partial Differential Equations, Linear and Non Linear Partial Equations of first order,

Lagrange's Equations, Charpit's method, Cauchy's method of Characteristics, Solution of Linear Partial Differential Equation of Higher order with constant coefficients, Equations reducible to linear partial differential equations with constant coefficients.

Module II: Applications of Partial Differential Equations:

Classification of linear partial differential equation of second order, Method of separation of variables, Solution of wave and heat conduction equation up to two dimension, Laplace equation in two dimensions, Equations of Transmission lines.

Module III: Statistical Techniques I:

Introduction: Measures of central tendency, Moments, Moment generating function (MGF) , Skewness, Kurtosis, Curve Fitting , Method of least squares, Fitting of straight lines, Fitting of second degree parabola, Exponential curves

,Correlation and Rank correlation, Regression Analysis: Regression lines of y on x and x on y, regression coefficients, properties of regressions coefficients and non linear regression.

Module IV: Statistical Techniques II:

Probability and Distribution: Introduction, Addition and multiplication law of probability, Conditional probability, Baye's theorem, Random variables (Discrete and Continuous Random variable) Probability mass function and Probability density function, Expectation and variance, Discrete and Continuous Probability distribution: Binomial, Poission and Normal distributions.

Module V: **Statistical Techniques III:**

Sampling, Testing of Hypothesis and Statistical Quality Control: Introduction , Sampling Theory (Small and Large) , Hypothesis, Null hypothesis, Alternative hypothesis, Testing a

Hypothesis, Level of significance, Confidence limits, Test of significance of difference of means,

T-test, F-test and Chi-square test, One way Analysis of Variance (ANOVA).Statistical Quality Control (SQC) , Control Charts , Control Charts for variables ($\bar{X}$ and R Charts), Control Charts for Variables (p, np and C charts).

Text Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003(Reprint).
3. S. Ross: A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.

Reference Books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
2. T.Veerarajan : Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi.
3. R.K. Jain and S.R.K. Iyenger: Advance Engineering Mathematics; Narosa Publishing House, New Delhi.
4. J.N. Kapur: Mathematical Statistics; S. Chand & Sons Company Limited, New Delhi. 5. D.N.Elhance,V. Elhance & B.M. Aggarwal: Fundamentals of Statistics; Kitab Mahal Distributers, New Delhi.

	Course Outcome (CO)	**Bloom's Knowledge Level (KL)**
	At the end of this course, the students will be able to:	
CO 1	Remember the concept of partial differential equation and to solve partial differential equations	K_1& K_3
CO 2	Analyze the concept of partial differential equations to evaluate the problems concerned with partial differential equations	K_4 & K_5
CO 3	Understand the concept of correlation, moments, skewness and kurtosis and curve fitting	K_2
CO 4	Remember the concept of probability to evaluate probability distributions	K_1 & K_5
CO 5	Apply the concept of hypothesis testing and statistical quality control to create control charts	K_3 & K_6

K_1 – Remember, K_2 – Understand, K_3 – Apply, K_4 – Analyze, K_5 – Evaluate, K_6 – Create

Course Code:	Programme Outcome (PO)												PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO-1	3	2	-	-	-	-	-	-	-	-	-	2	1	2
CO-2	3	3	2	-	-	-	-	-	-	-	-	2	1	2
CO-3	3	3	2	3	2	-	-	-	-	-	-	2	2	2
CO-4	3	3	1	1	1	-	-	-	-	-	-	1	1	1
CO-5	3	3	2	3	3	2	2	-	-	-	-	2	2	3
PO Target	3	3	1.75	2.3	2.3	2	2					1.8	1.6	3.3

Evaluation methodology to be followed:

The evaluation and assessment plan consists of the following components:

a. Class attendance and participation in class discussions etc.
b. Quiz.
c. Tutorials and assignments.
d. Sessional examination.
e. Final examination.

Award of Internal/External Marks:

Assessment procedure will be as follows:

1. These will be comprehensive examinations held on-campus (Sessionals).
2. Quiz.
   a. Quiz will be of type multiple choice, fill-in-the-blanks or match the columns.
   b. Quiz will be held periodically.
3. Tutorials and assignments
   a. The assignments/home-work may be of multiple choice type or comprehensive type at least one assignment from each Module/Unit.
   b. The grades and detailed solutions of assignments (of both types) will be accessible online after the. submission deadline.
   c. Final examinations. These will be comprehensive external examinations held on-campus or off campus (External examination) on dates fixed by the university.

SEMESTER- III/IV													
Sl.No.	Subject Codes	Subject	Periods	Evaluation Scheme					End Semester			Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1		Engineering Mechanics	3	1	0	30	20	50		100		150	4
2		Material Science	3	1	0	30	20	50		100		150	4
3		Energy Science & Engineering	3	1	0	30	20	50		100		150	4
4		Sensor & Instrumentation	3	1	0	30	20	50		100		150	4
5		Basics Data Structure & Algorithms	3	1	0	30	20	50		100		150	4
6		Introduction to Soft Computing	3	1	0	30	20	50		100		150	4
7		Analog Electronics Circuits	3	1	0	30	20	50		100		150	4
8		Electronics Engineering	3	1	0	30	20	50		100		150	4

Engineering Science Courses for B.Tech.(AICTE Model Curriculum) 2nd Year

Sl.No.	Subject	
1	Engineering Mechanics	To be offered to any Engg. Branch except ME/CE/AG and allied branches
2	Material Science	
3	Energy Science & Engineering	To be offered to any Engg. Branch except EE and allied branches
4	Sensor & Instrumentation	
5	Basics Data Structure & Algorithms	To be offered to any Engg. Branch except CSE and allied branches
6	Introduction to Soft Computing	
7	Analog Electronics Circuits	To be offered to any Engg. Branch except EC and allied branches
8	Electronics Engineering	

Important Note: CH/BT/TX Engg. and allied branches can be offered any of the above listed ES.

ENGINEERING MECHANICS

UNIT-I:

Two-dimensional force systems: Basic concepts, Laws of motion, Principle of transmissibility of forces, transfer of a force to parallel position, resultant of a force system, simplest resultant of two dimensional concurrent and non-concurrent force systems, distribution of force systems, free body diagrams, equilibrium and equations of equilibrium.

Friction: Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction.

UNIT-II:

Beam: Introduction, shear force and bending moment, different equations of equilibrium, shear force and bending moment diagram for statically determined beams.

Trusses: Introduction, simple truss and solution of simple truss, methods of F-joint and methods of sections.

UNIT-III:

Centroid and moment of inertia: Centroid of plane, curve, area, volume and composite bodies, moment of inertia of plane area, parallel axis theorem, perpendicular axis theorem, principle moment of inertia, mass moment of inertia of circular ring, disc, cylinder, sphere, and cone about their axis of symmetry.

UNIT-IV:

Kinematics of rigid body: Introduction, plane motion of rigid body, velocity and acceleration under translational and rotational motion, relative velocity.

Kinetics of rigid body: Introduction, force, mass and acceleration, work and energy, impulse and momentum, D'Alembert's principle and dynamic equilibrium.

UNIT-V:

Simple stress and strain: Introduction, normal and shear stresses, stress-strain diagrams for ductile and brittle material, elastic constants, one-dimensional loading of members of varying cross sections, strain energy.

Pure bending of beams: Introduction, simple bending theory, stress in beams of different cross sections.

Torsion: Introduction, torsion of shafts of circular cross sections, torque and twist, shear stress due to torque.

Books and References:

1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004).
2. Vela Murali, "Engineering Mechanics", Oxford University Press (2010).
3. A Textbook of Engineering Mechanics, R.K. Bansal, Laxmi Publications.
4. Engineering Mechanics, R.S. Khurmi, S.Chand Publishing.
5. Meriam J.L. and Kraige L.G., "Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2", Third Edition, John Wiley & Sons (1993).
6. Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", 3 rd Edition, Vikas Publishing House Pvt. Ltd., (2005).
7. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, (1998).
8. Engineering mechanics by Irving H. Shames, Prentice-Hall.

MATERIAL SCIENCE

UNIT-I:

Phase Diagrams:

Solid solutions – Hume Rothery's rules – the phase rule – single component system – one-component system of iron – binary phase diagrams – isomorphous systems – the tie-line rule – the lever rule – application to isomorphous system – eutectic phase diagram – peritectic phase diagram – other invariant reactions – free energy composition curves for binary systems – microstructural change during cooling.

UNIT-II:

Ferrous Alloys:

The iron-carbon equilibrium diagram – phases, invariant reactions – microstructure of slowly cooled steels – eutectoid steel, hypo and hypereutectoid steels – effect of alloying elements on the Fe-C system – diffusion in solids – Fick's laws – phase transformations – T-T-T-diagram for eutectoid steel – pearlitic, baintic and martensitic transformations – tempering of martensite – steels – stainless steels – cast irons.

UNIT-III:

Mechanical Properties:

Tensile test – plastic deformation mechanisms – slip and twinning – role of dislocations in slip – strengthening methods – strain hardening – refinement of the grain size – solid solution strengthening – precipitation hardening – creep resistance – creep curves – mechanisms of creep – creep-resistant materials – fracture – the Griffith criterion – critical stress intensity factor and its determination – fatigue failure – fatigue tests – methods of increasing fatigue life – hardness – Rockwell and Brinell hardness – Knoop and Vickers microhardness.

UNIT-IV:

Magnetic, Dielectric & Superconducting Materials:

Ferromagnetism – domain theory – types of energy – hysteresis – hard and soft magnetic materials – ferrites – dielectric materials – types of polarization – Langevin-Debye equation – frequency effects on polarization – dielectric breakdown – insulating materials – Ferroelectric materials – superconducting materials and their properties.

UNIT-V:

New Materials:

Ceramics – types and applications – composites: classification, role of matrix and reinforcement, processing of fiber reinforced plastics – metallic glasses: types , glass forming ability of alloys, melt spinning process, applications – shape memory alloys: phases, shape memory effect, pseudoelastic effect, NiTi alloy, applications – nanomaterials: preparation (bottom up and top down approaches), properties and applications – carbon nanotubes: types.

Text Books & References:

1. Balasubramanian, R. ―Callister's Materials Science and Engineering‖. Wiley India Pvt. Ltd., 2014.
2. Raghavan, V. ―Physical Metallurgy: Principles and Practice‖. PHI Learning, 2015.
3. Raghavan, V. ―Materials Science and Engineering: A First course‖. PHI Learning, 2015.
4. Askeland, D. ―Materials Science and Engineering‖. Brooks/Cole, 2010.
5.Smith, W.F., Hashemi, J. & Prakash, R. ―Materials Science and Engineering‖. Tata McGraw Hill Education Pvt. Ltd., 2014.
6. Wahab, M.A. ―Solid State Physics: Structure and Properties of Materials‖. Narosa Publishing House, 2009.

Energy Science and Engineering

Unit-I Energy and its Usage: Units and scales of energy use, Mechanical energy and transport, Heat energy: Conversion between heat and mechanical energy, Electromagnetic energy: Storage, conversion, transmission and radiation, Introduction to the quantum, energy quantization, Energy in chemical systems and processes, flow of CO2, Entropy and temperature, carnot and Stirling heat engines, Phase change energy conversion, refrigeration and heat pumps, Internal combustion engines, Steam and gas power cycles, the physics of power plants. Solid-state phenomena including photo, thermal and electrical aspects

Unit-II Nuclear Energy: Fundamental forces in the universe, Quantum mechanics relevant for nuclear physics, Nuclear forces, energy scales and structure, Nuclear binding energy systematics, reactions and decays, Nuclear fusion, Nuclear fission and fission reactor physics, Nuclear fission reactor design, safety, operation and fuel cycles

Unit-III Solar Energy: Introduction to solar energy, fundamentals of solar radiation and its measurement aspects, Basic physics of semiconductors, Carrier transport, generation and recombination in semiconductors, Semiconductor junctions: metal-semiconductor junction & p-n junction, Essential characteristics of solar photovoltaic devices, First Generation Solar Cells, Second Generation Solar Cells, Third Generation Solar Cells

Unit-IV Conventional & non-conventional energy source: Biological energy sources and fossil fuels, Fluid dynamics and power in the wind, available resources, fluids, viscosity, types of fluid flow, lift, Wind turbine dynamics and design, wind farms, Geothermal power and ocean thermal energy conversion, Tidal/wave/hydro power

Unit-V Systems and Synthesis: Overview of World Energy Scenario, Nuclear radiation, fuel cycles, waste and proliferation, Climate change, Energy storage, Energy conservation. Engineering for Energy conservation: Concept of Green Building and Green Architecture; Green building concepts, LEED ratings; Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption

Reference/Text Books

1. Energy and the Challenge of Sustainability, World Energy Assessment, UNDP, New York, (2000).
2. Perspective of Modern Physics, A. Beiser, McGraw-Hill International Editions (1968).
3. Introduction to Modern Physics, H.S. Mani and G.K.Mehta, East-West Press (1988).
4. Introduction to Electrodynamics, D. J. Griffiths, Fourth Edition, Prentice Hall (2013).
5. Introductory Nuclear Physics, R. K. Puri and V.K. Babbar, Narosa Publishing House (1996).
6. Physics of Solar Cells: From Basic Principles to Advanced Concepts by Peter Wurfel, John Wiley & Sons, 2016

7. Principles of Solar Engineering, D.Y. Goswami, F.Kreith and J.F. Kreider, Taylor and Francis, Philadelphia, 2000.

SENSOR AND INSTRUMENTATION

Pre-requisites of course: Basic Electrical Engineering

Course Outcomes:		Knowledge Level, KL
Upon the completion of the course, the student will be able to:		
CO 1	Apply the use of sensors for measurement of displacement, force and pressure.	K_3
CO2	Employ commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level.	K_3
CO3	Demonstrate the use of virtual instrumentation in automation industries.	K_2
CO4	Identify and use data acquisition methods.	K_3
CO5	Comprehend intelligent instrumentation in industrial automation.	K_2

Detailed Syllabus:

Unit- I:
Sensors & Transducer: Definition, Classification & selection of sensors, Measurement of displacement using Potentiometer, LVDT & Optical Encoder, Measurement of force using strain gauge, Measurement of pressure using LVDT based diaphragm & piezoelectric sensor.

Unit-II:
Measurement of temperature using Thermistor, Thermocouple & RTD, Concept of thermal imaging, Measurement of position using Hall effect sensors, Proximity sensors: Inductive & Capacitive, Use of proximity sensor as accelerometer and vibration sensor, Flow Sensors: Ultrasonic & Laser, Level Sensors: Ultrasonic & Capacitive.

Unit -III:
Virtual Instrumentation: Graphical programming techniques, Data types, Advantage of Virtual Instrumentation techniques, Concept of WHILE & FOR loops, Arrays, Clusters & graphs,
Structures: Case, Sequence & Formula nodes, Need of software based instruments for industrial automation.

Unit-IV:
Data Acquisition Methods: Basic block diagram, Analog and Digital IO, Counters, Timers, Types of ADC: successive approximation and sigma-delta, Types of DAC: Weighted Resistor and R-2R Ladder type, Use of Data Sockets for Networked Communication.

Unit V:

Intelligent Sensors: General Structure of smart sensors & its components, Characteristic of smart sensors: Self calibration, Self-testing & self-communicating, Application of smart sensors: Automatic robot control & automobile engine control.

Text Books:

1. DVS Murthy, Transducers and Instrumentation, PHI 2nd Edition 2013
2. D Patranabis, Sensors and Transducers, PHI 2nd Edition 2013.
3. S. Gupta, J.P. Gupta / PC interfacing for Data Acquisition & Process Control, 2nd ED / Instrument Society of America, 1994.
4. Gary Johnson / Lab VIEW Graphical Programing II Edition / McGraw Hill 1997.

Reference Books:

1. Arun K. Ghosh, Introduction to measurements and Instrumentation, PHI, 4th Edition 2012.
2. A.D. Helfrick and W.D. cooper,Modern Electronic Instrumentation & Measurement Techniques, PHI – 2001
3. Hermann K.P. Neubert, “Instrument Transducers” 2nd Edition 2012, Oxford University Press.

Basics Data Structure and Algorithms

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO 1	Understand and analyze the time and space complexity of an algorithm	K_2, K_4
CO 2	Understand and implement fundamental algorithms (including sorting algorithms, graph algorithms, and dynamic programming)	K_2, K_3
CO 3	Discuss various algorithm design techniques for developing algorithms	K_1, K_2
CO 4	Discuss various searching, sorting and graph traversal algorithms	K_2, K_3
CO 5	Understand operation on Queue , Priority Queue , D-Queue.	K_2

K_1- Remember, K_2- Understand, K_3- Apply, K_4- Analyze, K_5- Evaluate, K6- Create

Course Code:	**Programme Outcome (PO)**												**PSO**	**PSO**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	3	2	-	-	-	-	3	3	3	3	3
CO2	3	3	3	2	2	-	-	-	-	3	3	3	3	3
CO3	3	3	3	3	2	-	-	-	-	3	3	3	3	3
CO4	3	3	3	3	3	-	-	-	-	3	3	3	3	3
CO5	3	3	3	3	3	-	-	-	-	2	3	3	3	3
PO Target	3	3	3	2.8	2.4	**-**	**-**	**-**	**-**	2.8	3	3	3	3

Basics Data Structure and Algorithms

Detailed Syllabus

Unit	Topic	Proposed Lecture
I	Introduction to data structure and Algorithms: Performance analysis of Algorithm, time complexity, Big-oh notation, Elementary data organization data structure operations, Recurrences, Arrays, Operation on arrays, representation of arrays in memory, single dimensional and multidimensional arrays, spare matrices, Character storing in C, String operations.	08
II	Stack And Queue and Link List: Stack operation, PUSH and POP, Array representation of stacks, Operation associated with stacks Application of stacks, Recursion, Polish experession, Representation Queue, operation on Queue , Priority Queue , D-Queue , Singly and circularly linked list, List operations Lists implementations	08
III	Trees : Basic terminology, Binary Trees, Binary tree representation, Algebraic/expressions, Complete Binary Trees, Extended binary tree, representing binary tress in memory, linked representation of Binary trees, Traversing binary trees & Searching in binary trees, Inserting in binary search trees, Complexity of searching algorithm, Heaps, general trees, Threaded binary tree.	08
IV	Graphs: Terminology & representations, Graphs & Multigraphs, Directed Graphs, Sequential representation of graphs, adjacency Matrices, Transversal, connected component and spanning trees, Minimum Cost spanning tree, Prims and Kruskal Algorithm, BFS, DFS, Shortest path and transitive closure, Activity networks, topological sort and critical paths.	08
V	Searching and Sorting: Linear search, binary Search, Internal and External sorting, Bubble sorting, selection sort, Insertion sort, quick sort, Two way merge sort, Heap sort, sorting on different keys, practical consideration for internal sorting, External Sorting, Storage Devices : Magnetic tapes, Disk Storage, Sorting with disks and Indexing techniques, introduction to B tree and B+ tree, File organization and storage management, Introduction to hoisting.	08

Text books:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, Introduction to Algorithms, PHI.
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication.
3. Weiss, "Data Structure & Algorithm Analysis in C", Addision Wesley.
4. Basse, "computer Algorithms: Introduction to Design & Analysis", Addision Wesley.
5. Lipschutz, "Data structure, "Schaum series.
6. Aho, hopcropt, Ullman, “Data Structure & Algorithm", Addision Wesley.
7. Aho, Hopcraft, Ullman, “The Design and Analysis of Computer Algorithms” Pearson Education, 2008

Introduction to Soft Computing

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO 1	Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.	K_1, K_2
CO 2	Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic	K_2, K_3
CO 3	Describe with genetic algorithms and other random search procedures useful while seeking global optimum in selflearning situations.	K_4
CO 4	Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications.	K_2, K_3
CO 5	Develop some familiarity with current research problems and research methods in Soft Computing Techniques.	K_5, K_6

Introduction to Soft Computing

Detailed Syllabus

Unit	Topic	Proposed Lecture
I	Introduction to Soft Computing, ARTIFICIAL NEURAL NETWORKS Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Back propagation networks - Kohnen's self-organizing networks - Hopfield network.	08
II	FUZZY SYSTEMS Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition - Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.	08
III	NEURO - FUZZY MODELING Adaptive networks based Fuzzy interface systems - Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls - Simulated annealing – Evolutionary computation	08
IV	GENETIC ALGORITHMS Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method - Rank space method.	08
V	APPLICATION OF SOFT COMPUTING Optimiation of traveling salesman problem using Genetic Algorithm, Genetic algorithm based Internet Search Techniques, Soft computing based hybrid fuzzy controller, Introduction to MATLAB Environment for Soft computing Techniques.	08

Text books:

1.An Introduction to Genetic Algorithm Melanic Mitchell (MIT Press)
2.Evolutionary Algorithm for Solving Multi-objective, Optimization Problems (2nd Edition), Collelo, Lament, Veldhnizer (Springer)
3.Fuzzy Logic with Engineering Applications Timothy J. Ross (Wiley)
4.Neural Networks and Learning Machines Simon Haykin (PHI)
5.Sivanandam, Deepa, " Principles of Soft Computing", Wiley
6.Jang J.S.R, Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall
7.Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill
8.Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall
9.D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley
10.Wang, "Fuzzy Logic", Springer

Course Code:													**APO**	**APO**
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2	2	2	2	2	1	-	-	-	-	-	2	2
CO2	2	2	3	1	2	2	1	-	1	1	-	-	2	2
CO3	2	2	2	2	3	3	1	-	-	-	-	-	2	2
CO4	2	2	3	1	3	3	1	-	1	1	3	-	2	2
CO5	2	2	3	2	2	2	1	-	1	1	-	-	2	2

Analog Electronics Circuits	3L:1T:0P	4 Credits

Unit	Topics	Lectures
I	Diode circuits, amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.	8
II	High frequency transistor models, frequency response of single stage and multistage amplifiers, cascode amplifier, various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues, feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.	8
III	Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators.	8
IV	Current mirror: Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load, differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR, Op-Amp design: Design of differential amplifier for a given specification, design of gain stages and output stages, compensation.	8
V	Op-Amp applications: Review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications, active filters: Low pass, high pass, band pass and band stop, design guidelines.	8

Text/Reference Books:

1. J.V. Wait, L.P. Huelsman and GA Korn, “Introduction to Operational Amplifier theory and applications,” McGraw Hill, 1992.
2. J. Millman and A. Grabel, “Microelectronics,” 2nd edition, McGraw Hill, 1988.
3. P. Horowitz and W. Hill, “The Art of Electronics,” 2nd edition, Cambridge University Press, 1989.
4. A.S. Sedra and K.C. Smith, “Microelectronic Circuits,”Saunder's College11 Publishing, 4th edition.
5. Paul R. Gray and Robert G. Meyer, “Analysis and Design of Analog Integrated Circuits,” John Wiley, 3rd edition.

6. Muhammad H. Rashid, “Electronic Devices and Circuits,” Cengage publication, 2014.

Course Outcomes:

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

1. Understand the characteristics of diodes and transistors.
2. Design and analyze various rectifier and amplifier circuits.
3. Design sinusoidal and non-sinusoidal oscillators.
4. Understand the functioning of OP-AMP and design OP-AMP based circuits.
5. Design LPF, HPF, BPF, BSF.

Electronics Engineering	3L:1T:0P	4 Credits

Unit	Topics	Lectures
I	PN junction diode: Introduction of semiconductor materials; Semiconductor diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, diode equivalent circuits, transition and diffusion capacitance, Zener diodes breakdown mechanism (Zener and avalanche).	8
II	Diode application: Series, parallel and series, parallel diode configuration, half and full wave rectification, clippers, clampers, Zener diode as shunt regulator, voltage-multiplier circuits special purpose two terminal devices : light-emitting diodes, Varactor (Varicap) diodes, tunnel diodes, liquidcrystal displays.	8
III	Bipolar junction transistors and field effect transistor: Bipolar junction transistor: Transistor construction, operation, amplification action, common base, common emitter, common collector configuration dc biasing BJTs: operating point, fixed-bias, emitter bias, voltage-divider bias configuration. Collector feedback, emitter-follower configuration. Bias stabilization. CE, CB, CC amplifiers and AC analysis of single stage CE amplifier (re Model), Field effect transistor: Construction and characteristic of JFETs. AC analysis of CS amplifier, MOSFET (depletion and enhancement) type, transfer characteristic.	8
IV	Operational amplifiers: Introduction and block diagram of Op-Amp, ideal & practical characteristics of Op-Amp, differential amplifier circuits, practical Op-Amp circuits (inverting amplifier, non-inverting amplifier, unity gain amplifier, summing amplifier, integrator, differentiator), OpAmp parameters: input offset voltage, output offset voltage, input biased current, input offset current differential and common-mode operation.	8
V	Electronic instrumentation and measurements: Digital voltmeter: Introduction, RAMP techniques digital multimeters: Introduction Oscilloscope: introduction, basic principle, CRT, block diagram of oscilloscope, simple, measurement of voltage, current phase and frequency using CRO, introduction of digital storage oscilloscope and comparison of DSO with analog oscilloscope.	8

Text /Reference Books:

1. Robert L. Boylestand / Louis Nashelsky, “Electronic Devices and Circuit Theory,” Latest Edition, Pearson Education.
2. H S Kalsi, “Electronic Instrumentation”, Latest Edition, TMH Publication.

3. Meetidehran/ A.K. singh “fundamental of electronics Engineering”, New age international publisher.

Course Outcomes:

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

1. Understand the concept of PN junction and special purpose diodes.
2. Study the application of conventional diode and semiconductor diode.
3. Analyse the I-V characteristics of BJT and FET.
4. Analyzethe of Op-Amp, amplifiers, integrator, and differentiator.
5. Understand the concept of digital storage oscilloscope and compare of DSO with analog oscilloscope

CO \ PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2
CO1	3	3	2	-	3	-	1	-	-	-	-	1	3	3
CO2	3	3	2	-	3	-	1	-	-	-	-	1	3	3
CO3	3	3	2	-	3	-	1	-	-	-	-	1	3	3
CO4	3	3	2	-	3	-	1	-	-	-	-	1	3	3
CO5	3	3	2	-	3	-	1	-	-	-	-	1	3	3

Universal Human Values and Professional Ethics

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

Course Outcome:

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

1. Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society
2. Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
3. Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society
4. Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.
5. Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

Catalogue Description

Every human being has two sets of questions to answer for his life: a) what to do? and, b) how to do?. The first set pertains to the value domain, and the other to the skill domain. Both are complimentary, but value domain has a higher priority. Today, education has become more and more skill biased, and hence, the basic aspiration of a human being, that is to live with happiness and prosperity, gets defeated, in spite of abundant technological progress. This course is aimed at giving inputs that will help to ensure the right understanding and right feelings in the students in their life and profession, enabling them to lead an ethical life. In this course, the students learn the process of selfexploration, the difference between the Self and the Body, the naturally acceptable feelings in relationships in a family, the comprehensive human goal in the society, the mutual fulfillment in the nature and the coexistence in existence. As a natural outcome of such inputs, they are able to evaluate an ethical life and profession ahead.

UNIT-1	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.
UNIT-2	Understanding Harmony in the Human Being - Harmony in Myself Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.
UNIT-3	Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship Understanding harmony in the Family- the basic unit of human interaction , Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family!.
UNIT-4	Understanding Harmony in the Nature and Existence - Whole existence as Co-existence Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.
UNIT-5	Implications of the above Holistic Understanding of Harmony on Professional Ethics Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly

	production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.		
Text Books:			
		1.	R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
References:			
		1.	Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
		2.	E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
		3.	Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
		4.	Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
		5.	A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
		6.	P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
		7.	A N Tripathy, 2003, Human Values, New Age International Publishers.
		8.	SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
		9.	E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press
		10.	M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
		11.	B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
		12.	B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

CO \ PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2
CO1	2	1	2	2	2	2	2	3	3	2	1	3	1	1
CO2	2	1	2	2	2	2	3	3	2	2	1	3	1	1
CO3	2	1	2	3	3	2	3	3	2	2	1	3	1	1
CO4	2	1	2	2	2	3	3	3	3	2	1	3	1	1
CO5	2	1	2	3	3	2	3	3	3	2	1	3	1	1

Mode of Evaluation:

Assignment/ Seminar/Continuous Assessment Test/Semester End Exam

Technical Communication

Course Outcomes

1. Students will be enabled to understand the nature and objective of Technical Communication relevant for the work place as Engineers.
2. Students will utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions.
3. Students would imbibe inputs by presentation skills to enhance confidence in face of diverse audience.
4. Technical communication skills will create a vast know-how of the application of the learning to promote their technical competence.
5. It would enable them to evaluate their efficacy as fluent & efficient communicators by learning the voice-dynamics.

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Unit -1 Fundamentals of Technical Communication:
Technical Communication: Features; Distinction between General and Technical Communication; Language as a tool of Communication; Dimensions of Communication: Reading & comprehension; Technical writing: sentences; Paragraph; Technical style: Definition, types & Methods; The flow of Communication: Downward; upward, Lateral or Horizontal; Barriers to Communication.

Unit - II Forms of Technical Communication:
Technical Report: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing; Expert Technical Lecture: Theme clarity; Analysis & Findings; 7 Cs of effective business writing: concreteness, completeness, clarity, conciseness, courtesy, correctness, consideration, C.V./Resume writing; Technical Proposal: Types, Structure & Draft.

Unit - III Technical Presentation: Strategies & Techniques
Presentation: Forms; interpersonal Communication; Class room presentation; style; method; Individual conferencing: essentials: Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; Modes of Presentation; Overcoming Stage Fear; Audience Analysis & retention of audience interest; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections.

Unit - IV Technical Communication Skills:
Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation skills: Focus; Content; Style; Argumentation skills: Devices: Analysis; Cohesion & Emphasis; Critical thinking; Nuances: Exposition narration & Description; effective business communication competence: Grammatical; Discourse competence: combination of expression & conclusion; Socio-linguistic competence: Strategic competence: Solution of communication problems with verbal and non verbal means.

Unit - V Dimensions of Oral Communication & Voice Dynamics:
Code and Content; Stimulus & Response; Encoding process; Decoding process; Pronunciation Etiquette; Syllables; Vowel sounds; Consonant sounds; Tone: Rising tone; Falling Tone; Flow in Speaking; Speaking with a purpose; Speech & personality; Professional Personality Attributes: Empathy; Considerateness; Leadership; Competence.

Reference Books

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi.
2. Personality Development and Soft Skills by Barun K. Mitra, OUP, 2012, New Delhi.
3. Spoken English- A Manual of Speech and Phonetics by R.K.Bansal & J.B.Harrison, Orient Blackswan, 2013, New Delhi.
4. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
5. Practical Communication: Process and Practice by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2014, Delhi.
6. Modern Technical Writing by Sherman, Theodore A (et.al); Apprentice Hall; New Jersey; U.S.
7. A Text Book of Scientific and Technical Writing by S.D. Sharma; Vikas Publication, Delhi.
8. Skills for Effective Business Communication by Michael Murphy, Harward University, U.S.
9. Business Communication for Managers by Payal Mehra, Pearson Publication, Delhi.

Course	**Programme Outcome (PO)**												**PSO**	**PSO**
Code:	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO-1	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO-2	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO-3	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO-4	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO-5	-	-	-	-	-	-	-	-	2	3	-	3	-	-
PO	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**-**	**3**	**-**	**-**

COMPUTER SYSTEM SECURITY		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	To discover software bugs that pose cyber security threats and to explain how to fix the bugs to mitigate such threats	**K_1, K_2**
CO 2	To discover cyber attack scenarios to web browsers and web servers and to explain how to mitigate such threats	**K_2**
CO 3	To discover and explain mobile software bugs posing cyber security threats, explain and recreate exploits, and to explain mitigation techniques.	**K_3**
CO 4	To articulate the urgent need for cyber security in critical computer systems, networks, and world wide web, and to explain various threat scenarios	**K_4**
CO 5	To articulate the well known cyber attack incidents, explain the attack scenarios, and explain mitigation techniques.	**K_5, K_6**

DETAILED SYLLABUS		**3-1-0**
Unit	**Topic**	**Proposed Lecture**
I	**Computer System Security Introduction**: Introduction, What is computer security and what to l earn? , Sample Attacks, The Marketplace for vulnerabilities, Error 404 Hacking digital India part 1 chase. **Hijacking & Defense:** Control Hijacking ,More Control Hijacking attacks integer overflow ,More Control Hijacking attacks format string vulnerabilities, Defense against Control Hijacking - Platform Defenses, Defense against Control Hijacking - Run-time Defenses, Advanced Control Hijacking attacks.	08
II	**Confidentiality Policies:** Confinement Principle ,Detour Unix user IDs process IDs and privileges , More on confinement techniques ,System call interposition ,Error 404 digital Hacking in India part 2 chase , VM based isolation ,Confinement principle ,Software fault isolation , Rootkits ,Intrusion Detection Systems	08
III	**Secure architecture principles isolation and leas:** Access Control Concepts , Unix and windows access control summary ,Other issues in access control ,Introduction to browser isolation . **Web security landscape :** Web security definitions goals and threat models , HTTP content rendering .Browser isolation .Security interface , Cookies frames and frame busting, Major web server threats ,Cross site request forgery ,Cross site scripting ,Defenses and protections against XSS , Finding vulnerabilities ,Secure development.	08
IV	**Basic cryptography:** Public key cryptography ,RSA public key crypto ,Digital signature Hash functions ,Public key distribution ,Real world protocols ,Basic terminologies ,Email security certificates ,Transport Layer security TLS ,IP security , DNS security.	08
V	**Internet Infrastructure:** Basic security problems , Routing security ,DNS revisited ,Summary of weaknesses of internet security ,.Link layer connectivity and TCP IP connectivity , Packet filtering firewall ,Intrusion detection.	08

Text books:

1. William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010.
2. Michael T. Goodrich and Roberto Tamassia, Introduction to Computer Security, Addison Wesley, 2011.
3. William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010.
4. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, Handbook of Applied Cryptography, CRC Press, 2001.

Mapped With : https://ict.iitk.ac.in/product/computer-system-security/

PYTHON PROGRAMMING		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	To read and write simple Python programs.	K_1, K_2
CO 2	To develop Python programs with conditionals and loops.	K_2, K_4
CO 3	To define Python functions and to use Python data structures –- lists, tuples, dictionaries	K_3
CO 4	To do input/output with files in Python	K_2
CO 5	To do searching ,sorting and merging in Python	K_2, K_4
DETAILED SYLLABUS		**3-1-0**

Unit	Topic	Proposed Lecture
I	**Introduction:** The Programming Cycle for Python , Python IDE, Interacting with Python Programs , Elements of Python, Type Conversion. **Basics:** Expressions, Assignment Statement, Arithmetic Operators, Operator Precedence, Boolean Expression.	**08**
II	**Conditionals:** Conditional statement in Python (if-else statement, its working and execution), Nested-if statement and Elif statement in Python, Expression Evaluation & Float Representation. **Loops:** Purpose and working of loops , While loop including its working, For Loop , Nested Loops , Break and Continue.	**08**
III	**Function:** Parts of A Function , Execution of A Function , Keyword and Default Arguments ,Scope Rules. **Strings :** Length of the string and perform Concatenation and Repeat operations in it. Indexing and Slicing of Strings. **Python Data Structure :** Tuples , Unpacking Sequences , Lists , Mutable Sequences , List Comprehension , Sets , Dictionaries **Higher Order Functions:** Treat functions as first class Objects , Lambda Expressions	**08**
IV	**Sieve of Eratosthenes:** generate prime numbers with the help of an algorithm given by the Greek Mathematician named Eratosthenes, whose algorithm is known as Sieve of Eratosthenes. **File I/O :** File input and output operations in Python Programming **Exceptions and Assertions** **Modules :** Introduction , Importing Modules , **Abstract Data Types :** Abstract data types and ADT interface in Python Programming. **Classes :** Class definition and other operations in the classes , Special Methods (such as _init_, _str_, comparison methods and Arithmetic methods etc.) , Class Example , Inheritance , Inheritance and OOP.	**08**
V	**Iterators & Recursion:** Recursive Fibonacci , Tower Of Hanoi **Search :** Simple Search and Estimating Search Time , Binary Search and Estimating Binary Search Time **Sorting & Merging:** Selection Sort , Merge List , Merge Sort , Higher Order Sort	**08**

Text books:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/)
2. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
3. John V Guttag, —Introduction to Computation and Programming Using Python‘‘, Revised and expanded Edition, MIT Press , 2013
4. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
5. Timothy A. Budd, —Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd.,, 2015.
6. Kenneth A. Lambert, —Fundamentals of Python: First Programs‖, CENGAGE Learning, 2012.
7. Charles Dierbach, —Introduction to Computer Science using Python: A Computational ProblemSolving Focus, Wiley India Edition, 2013.
8. Paul Gries, Jennifer Campbell and Jason Montojo, —Practical Programming: An Introduction to Computer Science using Python 3‖, Second edition, Pragmatic Programmers, LLC, 2013.

Mapped With : https://ict.iitk.ac.in/product/python-programming-a-practical-approach/

CO \ PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	1	2	1	3	-	-	-	-	-	-	1	1	1
CO2	3	2	2	2	3	-	-	-	-	-	-	2	2	2
CO3	3	3	2	2	3	-	-	-	-	-	-	2	2	2
CO4	3	2	2	2	3	-	-	-	-	-	-	2	2	2
CO5	3	2	2	3	3	-	-	-	-	-	-	2	2	2

FIFTH SEMESTER (DETAILED SYLLABUS)

Database Management System		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to:		
CO 1	Apply knowledge of database for real life applications.	K_3
CO 2	Apply query processing techniques to automate the real time problems of databases.	K_3, K_4
CO 3	Identify and solve the redundancy problem in database tables using normalization.	K_2, K_3
CO 4	Understand the concepts of transactions, their processing so they will familiar with broad range of database management issues including data integrity, security and recovery.	K_2, K_4
CO 5	Design, develop and implement a small database project using database tools.	K_3, K_6

Course Code: KCS-552	**Programme Outcome (PO)**												**PSO/ APO**	**PSO/ APO**
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	-	-	-	2	-	-	-	-	-	-	2	2	-
CO2	2	-	3	2	3	-	-	-	-	3	2	-	-	3
CO3	3	-	-	-	3	-	-	-	-	-	-	-	-	-
CO4	2	3	-	3	-	-	-	-	-	-	-	-	-	2
CO5	2	3	-	3	-	-	-	-	-	-	-	-	-	2
PO Target	**2.4**	**3**	**3**	**2.6**	**2.6**	**0**	**0**	**0**	**0**	**3**	**2**	**2**	**2**	**2.3**

DETAILED SYLLABUS **3-1-0**

Unit	Topic	Proposed Lecture
I	**Introduction:** Overview, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. Data Modeling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.	**08**

II	**Relational data Model and Language:** Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction on SQL: Characteristics of SQL, Advantage of SQL. SQl Data Type and Literals. Types of SQL Commands. SQL Operators and Their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL	**08**
III	**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, 8 third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design	**08**
IV	**Transaction Processing Concept:** Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Directory System.	**08**
V	**Concurrency Control Techniques:** Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of Oracle.	**08**

Text books:

1. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill
2. Date C J, "An Introduction to Database Systems", Addision Wesley 3. Elmasri, Navathe, " Fundamentals of Database Systems", Addision Wesley
4. O'Neil, Databases, Elsevier Pub.
5. RAMAKRISHNAN"Database Management Systems",McGraw Hill
6. Leon & Leon,"Database Management Systems", Vikas Publishing House
7. Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications
8. Majumdar & Bhattacharya, "Database Management System", TMH

Compiler Design		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to:		
CO 1	Acquire knowledge of different phases and passes of the compiler and also able to use the compiler tools like LEX, YACC, etc. Students will also be able to design different types of compiler tools to meet the requirements of the realistic constraints of compilers.	K_3, K_6
CO 2	Understand the parser and its types i.e. Top-Down and Bottom-up parsers and construction of LL, SLR, CLR, and LALR parsing table.	K_2, K_6
CO 3	Implement the compiler using syntax-directed translation method and get knowledge about the synthesized and inherited attributes.	K_4, K_5
CO 4	Acquire knowledge about run time data structure like symbol table organization and different techniques used in that.	K_2, K_3
CO 5	Understand the target machine's run time environment, its instruction set for code generation and techniques used for code optimization.	K_2, K_4

Course Code: KCS-552	**Programme Outcome (PO)**												**PSO/ APO**	**PSO/ APO**
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	-	-	-	2	-	-	-	-	-	-	2	2	-
CO2	2	-	3	2	3	-	-	-	-	3	2	-	-	3
CO3	3	-	-	-	3	-	-	-	-	-	-	-	-	-
CO4	2	3	-	3	-	-	-	-	-	-	-	-	-	2
CO5	2	3	-	3	-	-	-	-	-	-	-	-	-	2
PO Target	**2.4**	**3**	**3**	**2.6**	**2.6**	**0**	**0**	**0**	**0**	**3**	**2**	**2**	**2**	**2.3**

DETAILED SYLLABUS
3-0-0

Unit	Topic	Proposed Lecture
I	**Introduction to Compiler**: Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.	**08**

II	**Basic Parsing Techniques:** Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.	**08**
III	**Syntax-directed Translation:** Syntax-directed Translation schemes, Implementation of Syntaxdirected Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.	**08**
IV	**Symbol Tables**: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.	**08**
V	**Code Generation:** Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	**08**

Text books:

1. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
2. K. Muneeswaran,Compiler Design,First Edition,Oxford University Press
3. J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, McGraw-Hill,2003.
4. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001.
5. V Raghvan, " Principles of Compiler Design", McGraw-Hill,
6. Kenneth Louden," Compiler Construction", Cengage Learning.
7. Charles Fischer and Ricard LeBlanc," Crafting a Compiler with C", Pearson Education

Design and Analysis of Algorithm		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to:		
CO 1	Design new algorithms, prove them correct, and analyze their asymptotic and absolute runtime and memory demands.	K_4, K_6
CO 2	Find an algorithm to solve the problem (create) and prove that the algorithm solves the problem correctly (validate).	K_5, K_6
CO 3	Understand the mathematical criterion for deciding whether an algorithm is efficient, and know many practically important problems that do not admit any efficient algorithms.	K_2, K_5
CO 4	Apply classical sorting, searching, optimization and graph algorithms.	K_2, K_4
CO 5	Understand basic techniques for designing algorithms, including the techniques of recursion, divide-and-conquer, and greedy.	K_2, K_3

Course Code: KCS503	**Programme Outcome (PO)**												**PSO/ APO**	**PSO/ APO**
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	3	-	2	-	-	-	1	-	-	-	3	-	1
CO2	-	3	-	3	2	-	-	-	-	-	-	2	1	1
CO3	3	1	3	-	2	-	-	-	1	1	1	2	-	2
CO4	2	-	-	-	-	-	-	-	1	-	1	1	-	-
CO5	-	-	-	1	2	-	-	-	-	-	-	1	1	-
PO Target	**2.5**	**2.3**	**3**	**2**	**2**	**-**	**-**	**-**	**1**	**0.5**	**1**	**1.8**	**1**	**1.3**

DETAILED SYLLABUS
3-1-0

Unit	Topic	Proposed Lecture
I	**Introduction:** Algorithms, Analyzing Algorithms, Complexity of Algorithms, Growth of Functions, Performance Measurements, Sorting and Order Statistics - Shell Sort, Quick Sort, Merge Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time.	**08**
II	**Advanced Data Structures:** Red-Black Trees, B – Trees, Binomial Heaps, Fibonacci Heaps, Tries, Skip List	**08**
III	**Divide and Conquer** with Examples Such as Sorting, Matrix Multiplication, Convex Hull and Searching. **Greedy Methods** with Examples Such as Optimal Reliability Allocation, Knapsack, Minimum Spanning Trees – Prim's and Kruskal's Algorithms, Single Source Shortest Paths - Dijkstra's and Bellman Ford Algorithms.	**08**

IV	**Dynamic Programming** with Examples Such as Knapsack. All Pair Shortest Paths – Warshal's and Floyd's Algorithms, Resource Allocation Problem. Backtracking, Branch and Bound with Examples Such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of Subsets.	**08**
V	**Selected Topics:** Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NPCompleteness, Approximation Algorithms and Randomized Algorithms	**08**

Text books:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
3. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.
4. LEE "Design & Analysis of Algorithms (POD)",McGraw Hill
5. Richard E.Neapolitan "Foundations of Algorithms" Jones & Bartlett Learning
6. Jon Kleinberg and Éva Tardos, Algorithm Design, Pearson, 2005.
7. Michael T Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Wiley, 2006.
8. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins, 1997
9. Robert Sedgewick and Kevin Wayne, Algorithms, fourth edition, Addison Wesley, 2011.
10. Harsh Bhasin,"Algorithm Design and Analysis",First Edition,Oxford University Press.
11. Gilles Brassard and Paul Bratley,Algorithmics:Theory and Practice,Prentice Hall,1995.

Data Analytics		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to :		
CO 1	Describe the life cycle phases of Data Analytics through discovery, planning and building.	K1,K2
CO 2	Understand and apply Data Analysis Techniques.	K2, K3
CO 3	Implement various Data streams.	K3
CO 4	Understand item sets, Clustering, frame works & Visualizations.	K2
CO 5	Apply R tool for developing and evaluating real time applications.	K3,K5,K6

Course Code: KCS503	**Programme Outcome (PO)**												**PSO/ APO**	**PSO/ APO**
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	3	-	2	-	-	-	1	-	-	-	3	-	1
CO2	-	3	-	3	2	-	-	-	-	-	-	2	1	1
CO3	3	1	3	-	2	-	-	-	1	1	1	2	-	2
CO4	2	-	-	-	-	-	-	-	1	-	1	1	-	-
CO5	-	-	-	1	2	-	-	-	-	-	-	1	1	-
PO Target	**2.5**	**2.3**	**3**	**2**	**2**	**-**	**-**	**-**	**1**	**0.5**	**1**	**1.8**	**1**	**1.3**

DETAILED SYLLABUS
3-0-0

Unit	Topic	Proposed Lecture
I	**Introduction to Data Analytics:** Sources and nature of data, classification of data (structured, semi-structured, unstructured), characteristics of data, introduction to Big Data platform, need of data analytics, evolution of analytic scalability, analytic process and tools, analysis vs reporting, modern data analytic tools, applications of data analytics. **Data Analytics Lifecycle:** Need, key roles for successful analytic projects, various phases of data analytics lifecycle – discovery, data preparation, model planning, model building, communicating results, operationalization.	**08**

II	**Data Analysis:** Regression modeling, multivariate analysis, Bayesian modeling, inference and Bayesian networks, support vector and kernel methods, analysis of time series: linear systems analysis & nonlinear dynamics, rule induction, neural networks: learning and generalisation, competitive learning, principal component analysis and neural networks, fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, stochastic search methods.	**08**
III	**Mining Data Streams:** Introduction to streams concepts, stream data model and architecture, stream computing, sampling data in a stream, filtering streams, counting distinct elements in a stream, estimating moments, counting oneness in a window, decaying window, Real-time Analytics Platform (RTAP) applications, Case studies – real time sentiment analysis, stock market predictions.	**08**
IV	**Frequent Itemsets and Clustering:** Mining frequent itemsets, market based modelling, Apriori algorithm, handling large data sets in main memory, limited pass algorithm, counting frequent itemsets in a stream, clustering techniques: hierarchical, K-means, clustering high dimensional data, CLIQUE and ProCLUS, frequent pattern based clustering methods, clustering in non-euclidean space, clustering for streams and parallelism.	**08**
V	**Frame Works and Visualization:** MapReduce, Hadoop, Pig, Hive, HBase, MapR, Sharding, NoSQL Databases, S3, Hadoop Distributed File Systems, Visualization: visual data analysis techniques, interaction techniques, systems and applications. **Introduction to R** - R graphical user interfaces, data import and export, attribute and data types, descriptive statistics, exploratory data analysis, visualization before analysis, analytics for unstructured data.	**08**

Text books and References:

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press.
3. Bill Franks, Taming the Big Data Tidal wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & Sons.
4. John Garrett, Data Analytics for IT Networks : Developing Innovative Use Cases, Pearson Education.
5. David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big Data Analytics”, EMC Education Series, John Wiley
6. Frank J Ohlhorst, “Big Data Analytics: Turning Big Data into Big Money”, Wiley and SAS Business Series
7. Colleen Mccue, “Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis”, Elsevier
8. Michael Berthold, David J. Hand,” Intelligent Data Analysis”, Springer
9. Paul Zikopoulos, Chris Eaton, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGraw Hill
10. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer
11. Mark Gardner, “Beginning R: The Statistical Programming Language”, Wrox Publication
12. Pete Warden, Big Data Glossary, O’Reilly
13. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons
14. Pete Warden, Big Data Glossary, O’Reilly.
15. Peter Bühlmann, Petros Drineas, Michael Kane, Mark van der Laan, "Handbook of Big Data", CRC Press
16. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier

Web Designing		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to:		
CO 1	Understand principle of Web page design and about types of websites	K_3, K_4
CO 2	Visualize and Recognize the basic concept of HTML and application in web designing.	K_1, K_2
CO 3	Recognize and apply the elements of Creating Style Sheet (CSS).	K_2, K_4
CO 4	Understand the basic concept of Java Script and its application.	K_2, K_3
CO 5	Introduce basics concept of Web Hosting and apply the concept of SEO	K_2, K_3

CO \ PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2	1	1	1	1	1	1	2	3	3
CO2	2	1	2	1	1	1	1	1	1	1	2	2	3	3
CO3	3	1	3	2	2	1	1	1	1	1	2	1	3	3
CO4	3	1	3	1	1	1	1	1	1	1	1	2	3	3
CO5	3	1	3	1	2	1	1	1	1	1	1	1	3	3

DETAILED SYLLABUS

3-0-0

Unit	Topic	Proposed Lecture
I	**Introduction :** Basic principles involved in developing a web site, Planning process , Domains and Hosting, Responsive Web Designing , Types of Websites (Static and Dynamic Websites), Web Standards and W3C recommendations, **Introduction to HTML:** What is HTML , HTML Documents, Basic structure of an HTML document , Creating an HTML document , Mark up Tags , Heading-Paragraphs , Line Breaks	**08**
II	**Elements of HTML:** HTML Tags., Working with Text , Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Working with Forms and controls	**08**

III	**Concept of CSS:** Creating Style Sheet, CSS Properties , CSS Styling(Background, Text Format, Controlling Fonts) , Working with block elements and objects , Working with Lists and Tables , CSS Id and Class, Box Model(Introduction, Border properties, Padding Properties, Margin properties) CSS Advanced(Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector) , CSS Color , Creating page Layout and Site Designs.	**08**
IV	Introduction to Client Side Scripting , Introduction to Java Script , Javascript Types , Variables in JS, Operators in JS , Conditions Statements , Java Script Loops, JS Popup Boxes , JS Events , JS Arrays, Working with Arrays, JS Objects ,JS Functions , Using Java Script in Real time , Validation of Forms, Related Examples	**08**
V	**Web Hosting:** Web Hosting Basics , Types of Hosting Packages, Registering domains , Defining Name Servers , Using Control Panel, Creating Emails in Cpanel , Using FTP Client, Maintaining a Website **Concepts of SEO :** Basics of SEO, Importance of SEO, Onpage Optimization Basics	**08**

Text Books:

1. Steven M. Schafer, "HTML, XHTML, and CSS Bible, 5ed", Wiley India
2. Ian Pouncey, Richard York, "Beginning CSS: Cascading Style Sheets for Web Design", Wiley India

Computer Graphics		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to:		
CO 1	Understand the graphics hardware used in field of computer graphics.	
CO 2	Understand the concept of graphics primitives such as lines and circle based on different algorithms.	
CO 3	Apply the 2D graphics transformations, composite transformation and Clipping concepts.	
CO 4	Apply the concepts of and techniques used in 3D computer graphics, including viewing transformations.	
CO 5	Perform the concept of projections, curve and hidden surfaces in real life.	

Course	**Programme Outcome (PO)**												**PSO**	**PSO**
Code:	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO-1	2	3	3	3	2						1	2	2	2
CO-2	3	3	3	3	3						1	2	2	3
CO-3	3	2	3	3	3						1	2	2	3
CO-4	3	3	2	3	2					2	1	2	2	3
CO-5	3	3	3	3	3					2	1	2	2	2
PO Target	**2.8**	**2.8**	**2.8**	**3**	**2.6**	**0**	**0**	**0**	**0**	**2**	**1**	**2**	**2**	**2.6**

DETAILED SYLLABUS

3-0-0

Unit	Topic	Proposed Lecture
I	**Introduction and Line Generation:** Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid-point circle generating algorithm, and parallel version of these algorithms.	**08**
II	**Transformations:** Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing. **Windowing and Clipping:** Viewing pipeline, Viewing transformations, 2-D Clipping algorithms- Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping	**08**
III	**Three Dimensional:** 3-D Geometric Primitives, 3-D Object representation, 3-D Transformation, 3D viewing, projections, 3-D Clipping.	**08**
IV	**Curves and Surfaces:** Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.	**08**
V	**Hidden Lines and Surfaces:** Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models– Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.	**08**

Text books:

1. Donald Hearn and M Pauline Baker, "Computer Graphics C Version", Pearson Education
2. Foley, Vandam, Feiner, Hughes – "Computer Graphics principle", Pearson Education.
3. Rogers, " Procedural Elements of Computer Graphics", McGraw Hill
4. W. M. Newman, R. F. Sproull – "Principles of Interactive computer Graphics" – McGraw Hill.
5. Amrendra N Sinha and Arun D Udai," Computer Graphics", McGraw Hill. 6. R.K. Maurya, "Computer Graphics " Wiley Dreamtech Publication.
7. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI Learning Private Limited.
8. Donald Hearn and M Pauline Baker, "Computer Graphics with Open GL", Pearson education

Object Oriented System Design		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to:		
CO 1	Understand the application development and analyze the insights of object oriented programming to implement application	
CO 2	Understand, analyze and apply the role of overall modeling concepts (i.e. System, structural)	
CO 3	Understand, analyze and apply oops concepts (i.e. abstraction, inheritance)	
CO 4	Understand the basic concepts of C++ to implement the object oriented concepts	
CO 5	To understand the object oriented approach to implement real world problem.	

DETAILED SYLLABUS
3-0-0

Unit	Topic	Proposed Lecture
I	**Introduction:** The meaning of Object Orientation, object identity, Encapsulation, information hiding, polymorphism, generosity, importance of modelling, principles of modelling, object oriented modelling, Introduction to UML, conceptual model of the UML, Architecture.	**08**
II	**Basic Structural Modeling:** Classes, Relationships, common Mechanisms, and diagrams. Class &Object Diagrams: Terms, concepts, modelling techniques for Class & Object Diagrams. **Collaboration Diagrams:** Terms, Concepts, depicting a message, polymorphism in collaboration Diagrams, iterated messages, use of self in messages. Sequence Diagrams: Terms, concepts, depicting asynchronous messages with/without priority, call-back mechanism, broadcast messages. **Basic Behavioural Modeling:** Use cases, Use case Diagrams, Activity Diagrams, State Machine , Process and thread, Event and signals, Time diagram, interaction diagram, Package diagram. **Architectural Modeling:** Component, Deployment, Component diagrams and Deployment diagrams.	**08**
III	Object Oriented Analysis: Object oriented design, Object design, Combining three models, Designing algorithms, design optimization, Implementation of control, Adjustment of inheritance, Object representation, Physical packaging, Documenting design considerations. **Structured analysis and structured design (SA/SD),** Jackson Structured Development (JSD).Mapping object oriented concepts using non-object oriented language, Translating classes into data structures, Passing arguments to methods, Implementing inheritance, associations encapsulation. **Object oriented programming style:** reusability, extensibility, robustness, programming in the large. Procedural v/s OOP, Object oriented language features. Abstraction and Encapsulation.	**08**
IV	**C++ Basics :** Overview, Program structure, namespace, identifiers, variables, constants, enum, operators, typecasting, control structures **C++ Functions :** Simple functions, Call and Return by reference, Inline functions, Macro Vs. Inline functions, Overloading of functions, default arguments, friend functions, virtual functions	**08**

V	**Objects and Classes :** Basics of object and class in C++, Private and public members, static data and function members, constructors and their types, destructors, operator overloading, type conversion. Inheritance : Concept of Inheritance, types of inheritance: single, multiple, multilevel, hierarchical, hybrid, protected members, overriding, virtual base class **Polymorphism :** Pointers in C++, Pointes and Objects, this pointer, virtual and pure virtual functions, Implementing polymorphism	**08**

Text Books

1. James Rumbaugh et. al, "Object Oriented Modeling and Design", Pearson Education
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education 3. Object Oriented Programming With C++, E Balagurusamy, McGraw Hill.
4. C++ Programming, Black Book, Steven Holzner, dreamtech
5. Object Oriented Programming in Turbo C++, Robert Lafore, Galgotia
6. Object Oriented Programming with ANSI and Turbo C++, Ashok Kamthane, Pearson
7. The Compete Reference C++, Herbert Schlitz, McGraw Hill.

Machine Learning Techniques		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able:		
CO 1	To understand the need for machine learning for various problem solving	
CO 2	To understand a wide variety of learning algorithms and how to evaluate models generated from data	
CO 3	To understand the latest trends in machine learning	
CO 4	To design appropriate machine learning algorithms and apply the algorithms to a real-world problems	
CO 5	To optimize the models learned and report on the expected accuracy that can be achieved by applying the models	

CO\PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	2	2	3	2	3	2	3	2
CO2	2	1	1	3	1	1	2	1	2	2	2	3
CO3	2	3	3	1	2	2	1	2	1	1	3	3
CO4	2	2	3	1	2	1	1	2	2	2	2	3
CO5	2	1	2	3	1	1	1	2	1	2	3	2

DETAILED SYLLABUS
3-0-0

Unit	Topic	Proposed Lecture
I	**INTRODUCTION** – Learning, Types of Learning, Well defined learning problems, Designing a Learning System, History of ML, Introduction of Machine Learning Approaches – (Artificial Neural Network, Clustering, Reinforcement Learning, Decision Tree Learning, Bayesian networks, Support Vector Machine, Genetic Algorithm), Issues in Machine Learning and Data Science Vs Machine Learning;	**08**
II	**REGRESSION:** Linear Regression and Logistic Regression **BAYESIAN LEARNING -** Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm. **SUPPORT VECTOR MACHINE:** Introduction, Types of support vector kernel – (Linear kernel, polynomial kernel,and Gaussiankernel), Hyperplane – (Decision surface), Properties of SVM, and Issues in SVM.	**08**
III	**DECISION TREE LEARNING -** Decision tree learning algorithm, Inductive bias, Inductive inference with decision trees, Entropy and information theory, Information gain, ID-3 Algorithm, Issues in Decision tree learning. **INSTANCE-BASED LEARNING** – k-Nearest Neighbour Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning.	**08**

IV	**ARTIFICIAL NEURAL NETWORKS** – Perceptron's, Multilayer perceptron, Gradient descent and the Delta rule, Multilayer networks, Derivation of Backpropagation Algorithm, Generalization, Unsupervised Learning – SOM Algorithm and its variant; **DEEP LEARNING** - Introduction,concept of convolutional neural network , Types of layers – (Convolutional Layers , Activation function , pooling , fully connected) , Concept of Convolution (1D and 2D) layers, Training of network, Case study of CNN for eg on Diabetic Retinopathy, Building a smart speaker, Self-deriving car etc.	**08**
V	**REINFORCEMENT LEARNING**–Introduction to Reinforcement Learning , Learning Task,Example of Reinforcement Learning in Practice, Learning Models for Reinforcement – (Markov Decision process , Q Learning - Q Learning function, Q Learning Algorithm), Application of Reinforcement Learning,Introduction to Deep Q Learning. **GENETIC ALGORITHMS:** Introduction, Components, GA cycle of reproduction, Crossover, Mutation, Genetic Programming, Models of Evolution and Learning, Applications.	**08**

Text books:

1. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
2. Ethem Alpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
3. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009.
4. Bishop, C., Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.

Application of Soft Computing		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to :		
CO 1	Recognize the feasibility of applying a soft computing methodology for a particular problem	
CO 2	Understand the concepts and techniques of soft computing and foster their abilities in designing and implementing soft computing based solutions for real-world and engineering problems.	
CO 3	Apply neural networks to pattern classification and regression problems and compare solutions by various soft computing approaches for a given problem.	
CO 4	Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems	
CO 5	Apply genetic algorithms to combinatorial optimization problems	

CO \ PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3	2	2	1	1		1	3	3	
CO2	3	3	3	3	3	2	2		1		1	3	3	
CO3	3	3	3	3	3	2	2		1		1	2	3	
CO4	3	3	3	3	3	2	2		1		1	1	3	
CO5	3	3	3	3	3	2	2		1		1	1	3	

DETAILED SYLLABUS

3-0-0

Unit	Topic	Proposed Lecture
I	**Neural Networks-I (Introduction & Architecture) :** Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory.	**08**
II	**Neural Networks-II (Back propagation networks):** Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting backpropagation training, applications.	**08**
III	**Fuzzy Logic-I (Introduction):** Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.	**08**
IV	**Fuzzy Logic –II (Fuzzy Membership, Rules)** : Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications	**08**

V	**Genetic Algorithm(GA):** Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.	**08**

Text books:

1. S. Rajsekaran & G.A. Vijayalakshmi Pai, “Neural Networks,Fuzzy Logic and Genetic Algorithm:Synthesis and Applications” Prentice Hall of India.
2. N. P. Padhy, "Artificial Intelligence and Intelligent Systems” Oxford University Press. Reference Books:
3. Siman Haykin, "Neural Netowrks”, Pearson Education
4. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India.
5. Kumar Satish, “Neural Networks” McGraw Hill

Augmented & Virtual Reality		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able :		
CO 1	To make students know the basic concept and understand the framework of virtual reality.	
CO 2	To understand principles and multidisciplinary features of virtual reality and apply it in developing applications.	
CO 3	To know the technology for multimodal user interaction and perception VR, in particular the visual, audial and haptic interface and behavior.	
CO 4	To understand and apply technology for managing large scale VR environment in real time.	
CO 5	To understand an introduction to the AR system framework and apply AR tools in software development.	

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**VIRTUAL REALITY AND VIRTUAL ENVIRONMENTS:** The historical development of VR: Scientific landmarks Computer Graphics, Real-time computer graphics, Flight simulation, Virtual environments, Requirements for VR, benefits of Virtual reality. HARDWARE TECHNOLOGIES FOR 3D USER INTERFACES: Visual Displays Auditory Displays, Haptic Displays, Choosing Output Devices for 3D User Interfaces.	**08**
II	**3D USER INTERFACE INPUT HARDWARE:** Input device characteristics, Desktop input devices, Tracking Devices, 3D Mice, Special Purpose Input Devices, Direct Human Input, Home - Brewed Input Devices, Choosing Input Devices for 3D Interfaces.	**08**
III	**SOFTWARE TECHNOLOGIES:** Database - World Space, World Coordinate, World Environment, Objects - Geometry, Position / Orientation, Hierarchy, Bounding Volume, Scripts and other attributes, VR Environment - VR Database, Tessellated Data, LODs, Cullers and Occluders, Lights and Cameras, Scripts, Interaction - Simple, Feedback, Graphical User Interface, Control Panel, 2D Controls, Hardware Controls, Room / Stage / Area Descriptions, World Authoring and Playback, VR toolkits, Available software in the market	**08**

IV	**3D INTERACTION TECHNIQUES:** 3D Manipulation tasks, Manipulation Techniques and Input Devices, Interaction Techniques for 3D Manipulation, Deign Guidelines - 3D Travel Tasks, Travel Techniques, Design Guidelines - Theoretical Foundations of Wayfinding, User Centered Wayfinding Support, Environment Centered Wayfinding Support, Evaluating Wayfinding Aids, Design Guidelines - System Control, Classification, Graphical Menus, Voice Commands, Gestrual Commands, Tools, Mutimodal System Control Techniques, Design Guidelines, Case Study: Mixing System Control Methods, Symbolic Input Tasks, symbolic Input Techniques, Design Guidelines, Beyond Text and Number entry . **DESIGNING AND DEVELOPING 3D USER INTERFACES:** Strategies for Designing and Developing Guidelines and Evaluation. **VIRTUAL REALITY APPLICATIONS:** Engineering, Architecture, Education, Medicine, Entertainment, Science, Training.	**08**
V	Augmented and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.	**08**

Text books:

1. Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual Reality Applications: Foundations ofEffective Design", Morgan Kaufmann, 2009.
2. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005.
3. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, "3D User Interfaces, Theory and Practice",Addison Wesley, USA, 2005.
4. Oliver Bimber and Ramesh Raskar, "Spatial Augmented Reality: Meging Real and Virtual Worlds", 2005.
5. Burdea, Grigore C and Philippe Coiffet, "Virtual Reality Technology", Wiley Interscience, India, 2003.
6. John Vince, "Virtual Reality Systems", Addison Wesley, 1995.
7. Howard Rheingold, "Virtual Reality: The Revolutionary Technology and how it Promises to Transform Society", Simon and Schuster, 1991.
8. William R Sherman and Alan B Craig, "Understanding Virtual Reality: Interface, Application and Design (The MorganKaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002
9. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

Human Computer Interface		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to		
CO 1	Understand and analyze the common methods in the user-centered design process and the appropriateness of individual methods for a given problem.	
CO 2	Apply , adapt and extend classic design standards, guidelines, and patterns.	
CO 3	Employ selected design methods and evaluation methods at a basic level of competence.	
CO 4	Build prototypes at varying levels of fidelity, from paper prototypes to functional, interactive prototypes.	
CO 5	Demonstrate sufficient theory of human computer interaction, experimental methodology and inferential statistics to engage with the contemporary research literature in interface technology and design.	
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Importance of user Interface – definition, importance of 8 good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface	**08**
II	**Design process:** Human interaction with computers, importance of 8 human characteristics human consideration, Human interaction speeds, understanding business junctions. III Screen Designing : Design goals – Scre	**08**
III	**Screen Designing :** Design goals – Screen planning and purpose, 8 organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.	**08**
IV	**Windows :** New and Navigation schemes selection of window, 8 selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors	**08**
V	**Software tools :** Specification methods, interface – Building Tools. 8 Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.	**08**

Text books:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in HumanComputer Interaction, Wiley, 2010.
3. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0- 321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

Database Management Systems Lab		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to:		
CO 1	Understand and apply oracle 11 g products for creating tables, views, indexes, sequences and other database objects.	
CO 2	Design and implement a database schema for company data base, banking data base, library information system, payroll processing system, student information system.	
CO 3	Write and execute simple and complex queries using DDL, DML, DCL and TCL	
CO 4	Write and execute PL/SQL blocks, procedure functions, packages and triggers, cursors.	
CO 5	Enforce entity integrity, referential integrity, key constraints, and domain constraints on database.	

CO \ PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	3	2	2	2	1	1	2	1	2	2	3	3
CO2	3	3	2	2	3	1	2	1	2	2	3	3	3	3
CO3	3	2	2	2	2	2	1	1	2	1	2	2	3	3
CO4	2	2	3	2	2	2	2	1	2	2	3	2	3	3
CO5	3	3	2	2	3	1	1	1	2	1	2	3	3	3

1. Installing oracle/ MYSQL
2. Creating Entity-Relationship Diagram using case tools.
3. Writing SQL statements Using ORACLE /MYSQL:
    a)Writing basic SQL SELECT statements.
    b) Restricting and sorting data.
    c)Displaying data from multiple tables.
    d)Aggregating data using group function.
    e)Manipulating data.
    e)Creating and managing tables.
4. Normalization
5. Creating cursor
6. Creating procedure and functions
7. Creating packages and triggers
8. Design and implementation of payroll processing system
9. Design and implementation of Library Information System
10. Design and implementation of Student Information System
11. Automatic Backup of Files and Recovery of Files
12. Mini project (Design & Development of Data and Application) for following :
    a) Inventory Control System.
    b) Material Requirement Processing.
    c) Hospital Management System.
    d) Railway Reservation System.
    e) Personal Information System.
    f) Web Based User Identification System.
    g) Timetable Management System.
    h) Hotel Management System

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner

It is also suggested that open source tools should be preferred to conduct the lab (MySQL , SQL server , Oracle ,MongoDB ,Cubrid ,MariaDBetc)

Database Management Systems Lab: Mapping with Virtual Lab

Name of the Lab	Name of the Experiment
Database Management Lab	Data Definition Language(DDL) Statements: (Create table, Alter table, Drop table)
	Data Manipulation Language(DML) Statements
	Data Query Language(DQL) Statements: (Select statement with operations like Where clause, Order by, Logical operators, Scalar functions and Aggregate functions)
	Transaction Control Language(TCL) statements: (Commit(make changes permanent), Rollback (undo)
	Describe statement: To view the structure of the table created

COMPILER DESIGN LAB		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to:		
CO 1	Identify patterns, tokens & regular expressions for lexical analysis.	
CO 2	Design Lexical analyser for given language using C and LEX /YACC tools	
CO 3	Design and analyze top down and bottom up parsers.	
CO 4	Generate the intermediate code	
CO 5	Generate machine code from the intermediate code forms	

CO-PO Mapping (Compiler Design Lab

Course Code: KCS-552	Programme Outcome (PO)												PSO/ APO	PSO/ APO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	-	-	-	2	-	-	-	-	-	-	2	2	-
CO2	2	-	3	2	3	-	-	-	-	3	2	-	-	3
CO3	3	-	-	-	3	-	-	-	-	-	-	-	-	-
CO4	2	3	-	3	-	-	-	-	-	-	-	-	-	2
CO5	2	3	-	3	-	-	-	-	-	-	-	-	-	2
PO Target	**2.4**	**3**	**3**	**2.6**	**2.6**	**0**	**0**	**0**	**0**	**3**	**2**	**2**	**2**	**2.3**

DETAILED SYLLABUS

1. Design and implement a lexical analyzer for given language using C and the lexical analyzer should ignore redundant spaces, tabs and new lines.
2. Implementation of Lexical Analyzer using Lex Tool
3. Generate YACC specification for a few syntactic categories.
   a) Program to recognize a valid arithmetic expression that uses operator +, – , * and /.
   b) Program to recognize a valid variable which starts with a letter followed by any number of letters or digits. c) Implementation of Calculator using LEX and YACC
   d) Convert the BNF rules into YACC form and write code to generate abstract syntax tree
4. Write program to find ε – closure of all states of any given NFA with ε transition.
5. Write program to convert NFA with ε transition to NFA without ε transition.
6. Write program to convert NFA to DFA
7. Write program to minimize any given DFA.
8. Develop an operator precedence parser for a given language.
9. Write program to find Simulate First and Follow of any given grammar.
10. Construct a recursive descent parser for an expression.
11. Construct a Shift Reduce Parser for a given language.
12. Write a program to perform loop unrolling.
13. Write a program to perform constant propagation.
14. Implement Intermediate code generation for simple expressions.
15. Implement the back end of the compiler which takes the three address code and produces the 8086 assembly language instructions that can be assembled and run using an 8086 assembler. The target assembly instructions can be simple move, add, sub, jump etc.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner
It is also suggested that open source tools should be preferred to conduct the lab (C, C++ , Lex or Flex and YACC tools (Unix/Linux utilities)etc)

Design and Analysis of Algorithm Lab		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to:		
CO 1	Implement algorithm to solve problems by iterative approach.	
CO 2	Implement algorithm to solve problems by divide and conquer approach	
CO 3	Implement algorithm to solve problems by Greedy algorithm approach.	
CO 4	Implement algorithm to solve problems by Dynamic programming, backtracking, branch and bound approach.	
CO 5	Implement algorithm to solve problems by branch and bound approach.	

CO \ PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	1	1				1	3	3	3
CO2	3	3	3	3	2	1	1				1	3	2	3
CO3	3	3	2	2	3	1	1				1	2	2	2
CO4	3	3	3	3	3	1	1				1	2	3	2
CO5	3	3	3	3	3	1	1				1	3	2	2

Detailed Syllebus

1. Program for Recursive Binary & Linear Search.
2. Program for Heap Sort.
3. Program for Merge Sort.
4. Program for Selection Sort.
5. Program for Insertion Sort.
6. Program for Quick Sort.
7. Knapsack Problem using Greedy Solution
8. Perform Travelling Salesman Problem
9. Find Minimum Spanning Tree using Kruskal's Algorithm
10. Implement N Queen Problem using Backtracking
11. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide and- conquer method works along with its time complexity analysis: worst case, average case and best case.
12. Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 5000, and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate how the divide and- conquer method works along with its time complexity analysis: worst case, average case and best case.

13.6. Implement , the 0/1 Knapsack problem
using (a) Dynamic Programming method (b)
Greedy method.

14. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
15. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union-Find algorithms in your program.
16. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
17. Write programs to (a) Implement All-Pairs Shortest Paths problem using Floyd's algorithm.
(b) Implement Travelling Sales Person problem using Dynamic programming.
18. Design and implement to find a subset of a given set S = {Sl, S2,.....,Sn} of n positive integers whose SUM is

equal to a given positive integer d. For example, if S ={1, 2, 5, 6, 8} and d= 9, there are two solutions {1,2,6}and {1,8}. Display a suitable message, if the given problem instance doesn't have a solution.

19. Design and implement to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner
It is also suggested that open source tools should be preferred to conduct the lab (C, C++ etc)

B.TECH. (CSE & CS) SIXTH SEMESTER (DETAILED SYLLABUS)

Software Engineering		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course, the student will be able to		
CO 1	Explain various software characteristics and analyze different software Development Models.	
CO 2	Demonstrate the contents of a SRS and apply basic software quality assurance practices to ensure that design, development meet or exceed applicable standards.	
CO 3	Compare and contrast various methods for software design	
CO 4	Formulate testing strategy for software systems, employ techniques such as unit testing, Test driven development and functional testing.	
CO 5	Manage software development process independently as well as in teams and make use of Various software management tools for development, maintenance and analysis.	

CO \ PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3	2	2	1	1		1	3	3	3
CO2	3	3	3	3	3	2	2		1		1	3	3	3
CO3	3	3	3	3	3	2	2		1		1	2	3	3
CO4	3	3	3	3	3	2	2		1		1	1	3	3
CO5	3	3	3	3	3	2	2		1		1	1	3	3

DETAILED SYLLABUS		**3-1-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.	**08**
II	**Software Requirement Specifications (SRS):** Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.	**08**
III	**Software Design:** Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP)	**08**

	Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.	
IV	**Software Testing:** Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, TopDown and BottomUp Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.	**08**
V	**Software Maintenance and Software Project Management:** Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts,	**08**
	Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.	

Text books:

1.RS Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.

2. Pankaj Jalote, Software Engineering, Wiley

3. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.

4. KK Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.

5. Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.

6. Ian Sommerville, Software Engineering, Addison Wesley.

7. Kassem Saleh, "Software Engineering", Cengage Learning.

8. P fleeger, Software Engineering, Macmillan Publication

Web Technology		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to		
CO 1	Explain web development Strategies and Protocols governing Web.	
CO 2	Develop Java programs for window/web-based applications.	
CO 3	Design web pages using HTML, XML, CSS and JavaScript.	
CO 4	Creation of client-server environment using socket programming	
CO 5	Building enterprise level applications and manipulate web databases using JDBC	
CO6	Design interactive web applications using Servlets and JSP	

CO \ PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	2	2	2	1	1	1	1	1	1	2	3	3
CO2	2	1	2	1	1	1	1	1	1	1	2	2	3	3
CO3	3	1	3	2	2	1	1	1	1	1	2	1	3	3
CO4	3	1	3	1	1	1	1	1	1	1	1	2	3	3
CO5	3	1	3	1	2	1	1	1	1	1	1	1	3	3

DETAILED SYLLABUS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Introduction and Web Development Strategies, History of Web and Internet, Protocols Governing Web, Writing Web Projects, Connecting to Internet, Introduction to Internet services and tools, Introduction to client-server computing. Core Java: Introduction, Operator, Data type, Variable, Arrays, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Event handling, Introduction to AWT, AWT controls, Layout managers	**08**
II	**Web Page Designing:** HTML: List, Table, Images, Frames, forms, CSS, Document type definition, XML: DTD, XML schemes, Object Models, presenting and using XML, Using XML Processors: DOM and SAX, Dynamic HTML	**08**
III	**Scripting:** Java script: Introduction, documents, forms, statements, functions, objects; introduction to AJAX, **Networking :** Internet Addressing, InetAddress, Factory Methods, Instance Methods, TCP/IP Client Sockets, URL, URL Connection, TCP/IP Server Sockets, Datagram.	**08**
IV	**Enterprise Java Bean:** Preparing a Class to be a JavaBeans, Creating a JavaBeans, JavaBeans Properties, Types of beans, Stateful Session bean, Stateless Session bean, Entity bean **Java Database Connectivity (JDBC):** Merging Data from Multiple Tables: Joining, Manipulating, Databases with JDBC, Prepared Statements, Transaction Processing, Stored Procedures.	**08**
V	**Servlets:** Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, Handling HTTP get Requests, Handling HTTP post Requests, Redirecting Requests to Other Resources, Session Tracking, Cookies, Session Tracking with Http Session **Java Server Pages (JSP):** Introduction, Java Server Pages Overview, A First Java Server Page Example, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries..	**08**

Text books:

1. Burdman, Jessica, "Collaborative Web Development" Addison Wesley
2. Xavier, C, " Web Technology and Design" , New Age International
3. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication
4. Bhave, "Programming with Java", Pearson Education
5. Herbert Schieldt, "The Complete Reference:Java", McGraw Hill.
6. Hans Bergsten, "Java Server Pages", SPD O'Reilly
7. Margaret Levine Young, "The Complete Reference Internet", McGraw Hill.
8. Naughton, Schildt, "The Complete Reference JAVA2", McGraw Hill.
9. Balagurusamy E, "Programming in JAVA", McGraw Hill.

Computer Network		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to		
CO1	Explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media, Analog and digital data transmission	
CO2	Apply channel allocation, framing, error and flow control techniques.	
CO3	Describe the functions of Network Layer i.e. Logical addressing, subnetting & Routing Mechanism.	
CO4	Explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism.	
CO5	Explain the functions offered by session and presentation layer and their Implementation.	
CO6	Explain the different protocols used at application layer i.e. HTTP, SNMP, SMTP, FTP, TELNET and VPN.	

CO-PO Mapping (Computer Networks)

Course Code: KCS503	**Programme Outcome (PO)**												**PSO**	**PSO**
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2	1	2	-	-	-	-	-	1	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-	2	-	-	-
CO3	3	2	3	1	2	-	-	-	-	-	1	-	-	-
CO4	3	3	3	1	2	1	-	-	-	-	3	-	-	-
CO5	3	2	3	1	2	2	-	-	-	-	2	-	-	-
PO Target	**3**	**2.4**	**2.6**	**1**	**1.8**	**1.5**	**-**	**-**	**-**	**-**	**1.8**	**-**	**-**	**-**

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introductory Concepts**: Goals and applications of networks, Categories of networks, Organization of the Internet, ISP, Network structure and architecture (layering principles, services, protocols and standards), The OSI reference model, TCP/IP protocol suite, Network devices and components. **Physical Layer:** Network topology design, Types of connections, Transmission media, Signal transmission and encoding, Network performance and transmission impairments, Switching techniques and multiplexing.	**08**
II	**Link layer:** Framing, Error Detection and Correction, Flow control (Elementary Data Link Protocols, Sliding Window protocols). Medium Access Control and Local Area Networks: Channel allocation, Multiple access protocols, LAN standards, Link layer switches & bridges (learning bridge and spanning tree algorithms).	**08**

III	**Network Layer:** Point-to-point networks, Logical addressing, Basic internetworking (IP, CIDR, ARP, RARP, DHCP, ICMP), Routing, forwarding and delivery, Static and dynamic routing, Routing algorithms and protocols, Congestion control algorithms, IPv6.	**08**
IV	**Transport Layer:** Process-to-process delivery, Transport layer protocols (UDP and TCP), Multiplexing, Connection management, Flow control and retransmission, Window management, TCP Congestion control, Quality of service.	**08**
V	**Application Layer:** Domain Name System, World Wide Web and Hyper Text Transfer Protocol, Electronic mail, File Transfer Protocol, Remote login, Network management, Data compression, Cryptography – basic concepts.	**08**

Text books and References:

1. Behrouz Forouzan, "Data Communication and Networking", McGraw Hill
2. Andrew Tanenbaum "Computer Networks", Prentice Hall.
3. William Stallings, "Data and Computer Communication", Pearson.
4. Kurose and Ross, "Computer Networking- A Top-Down Approach", Pearson.
5. Peterson and Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann
6. W. A. Shay, "Understanding Communications and Networks", Cengage Learning.
7. D. Comer, "Computer Networks and Internets", Pearson.
8. Behrouz Forouzan, "TCP/IP Protocol Suite", McGraw Hill.

Big Data		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to		
CO 1	Demonstrate knowledge of Big Data Analytics concepts and its applications in business.	K_1,K_2
CO 2	Demonstrate functions and components of Map Reduce Framework and HDFS.	K_1,K_2
CO 3	Discuss Data Management concepts in NoSQL environment.	K_6
CO 4	Explain process of developing Map Reduce based distributed processing applications.	K_2,K_5
CO 5	Explain process of developing applications using HBASE, Hive, Pig etc.	K_2,K_5

CO-PO Mapping (Big Data)

Course Code:	Programme Outcome (PO)												PSO	PSO
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO-1	1	-	1	2	3	-	-	-	-	-	-	1	3	1
CO-2	2	3	3	3	3	-	-	-	-	-	-	2	3	2
CO-3	-	3	3	3	3	-	-	-	-	-	-	2	3	2
CO-4	-	1	3	3	3	-	-	-	-	-	-	2	3	2
CO-5	-	1	2	3	3	-	-	-	-	-	-	2	3	2
PO	**1.5**	**2**	**2.4**	**2.8**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**1.8**	**3**	**1.8**

DETAILED SYLLABUS		3-0-0
Unit	**Topic**	**Proposed Lectures**
I	**Introduction to Big Data**: Types of digital data, history of Big Data innovation, introduction to Big Data platform, drivers for Big Data, Big Data architecture and characteristics, 5 Vs of Big Data, Big Data technology components, Big Data importance and applications, Big Data features – security, compliance, auditing and protection, Big Data privacy and ethics, Big Data Analytics, Challenges of conventional systems, intelligent data analysis, nature of data, analytic processes and tools, analysis vs reporting, modern data analytic tools.	**06**
II	**Hadoop:** History of Hadoop, Apache Hadoop, the Hadoop Distributed File System, components of Hadoop, data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, Hadoop Echo System. **Map Reduce:** Map Reduce framework and basics, how Map Reduce works, developing a Map Reduce application, unit tests with MR unit, test data and local tests, anatomy of a Map Reduce job run, failures, job scheduling, shuffle and sort, task execution, Map Reduce types, input formats, output formats, Map Reduce features, Real-world Map Reduce	**08**
III	**HDFS (Hadoop Distributed File System):** Design of HDFS, HDFS concepts, benefits and challenges, file sizes, block sizes and block abstraction in HDFS, data replication, how does HDFS store, read, and write files, Java interfaces to HDFS, command line interface, Hadoop file system interfaces, data flow, data ingest with Flume and Scoop, Hadoop archives, Hadoop I/O: compression, serialization, Avro and file-based data structures. **Hadoop Environment:** Setting up a Hadoop cluster, cluster specification, cluster setup and installation, Hadoop configuration, security in Hadoop, administering Hadoop, HDFS monitoring & maintenance, Hadoop benchmarks, Hadoop in the cloud	**08**
IV	**Hadoop Eco System and YARN**: Hadoop ecosystem components, schedulers, fair and capacity, Hadoop 2.0 New Features - NameNode high availability, HDFS federation, MRv2, YARN, Running MRv1 in YARN. **NoSQL Databases:** Introduction to NoSQL **MongoDB:** Introduction, data types, creating, updating and deleing documents, querying, introduction to indexing, capped collections **Spark:** Installing spark, spark applications, jobs, stages and tasks, Resilient Distributed Databases, anatomy of a Spark job run, Spark on YARN **SCALA:** Introduction, classes and objects, basic types and operators, built-in control structures, functions and closures, inheritance.	**09**
V	**Hadoop Eco System Frameworks**: Applications on Big Data using Pig, Hive and HBase **Pig** - Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators,	**09**

	Hive - Apache Hive architecture and installation, Hive shell, Hive services, Hive metastore, comparison with traditional databases, HiveQL, tables, querying data and user defined functions, sorting and aggregating, Map Reduce scripts, joins & subqueries. **HBase** – Hbase concepts, clients, example, Hbase vs RDBMS, advanced usage, schema design, advance indexing, Zookeeper – how it helps in monitoring a cluster, how to build applications with Zookeeper. IBM Big Data strategy, introduction to Infosphere, BigInsights and Big Sheets, introduction to Big SQL.	

Text books and References:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley
2. Big-Data Black Book, DT Editorial Services, Wiley
3. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch, “Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill.
4. Thomas Erl, Wajid Khattak, Paul Buhler, “Big Data Fundamentals: Concepts, Drivers and Techniques”, Prentice Hall.
5. Bart Baesens “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)”, John Wiley & Sons
6. ArshdeepBahga, Vijay Madisetti, “Big Data Science & Analytics: A HandsOn Approach “, VPT
7. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, CUP
8. Tom White, "Hadoop: The Definitive Guide", O'Reilly.
9. Eric Sammer, "Hadoop Operations", O'Reilly.
10. Chuck Lam, “Hadoop in Action”, MANNING Publishers
11. Deepak Vohra, “Practical Hadoop Ecosystem: A Definitive Guide to Hadoop-Related Frameworks and Tools”, Apress
12. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilly
13. Lars George, "HBase: The Definitive Guide", O'Reilly.
14. Alan Gates, "Programming Pig", O'Reilly.
15. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer
16. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons
17. Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons
18. Pete Warden, “Big Data Glossary”, O’Reilly

Image Processing		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able:		
CO 1	Explain the basic concepts of two-dimensional signal acquisition, sampling, quantization and color model.	K_1, K_2
CO 2	Apply image processing techniques for image enhancement in both the spatial and frequency domains.	K_2, K_3
CO 3	Apply and compare image restoration techniques in both spatial and frequency domain.	K_2, K_3
CO 4	Compare edge based and region based segmentation algorithms for ROI extraction.	K_3, K_4
CO 5	Explain compression techniques and descriptors for image processing.	K_2, K_3

CO\PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	1	1	2	1	1	2	1	1	1	2	3	2
CO2	3	2	2	2	1	1	1	2	1	2	2	1	3	2
CO3	2	3	3	3	2	2	2	2	1	1	1	1	2	3
CO4	3	2	3	3	2	2	1	2	1	1	2	1	3	2
CO5	3	1	1	2	2	1	2	2	2	1	2	2	3	1

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**DIGITAL IMAGE FUNDAMENTALS:** Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – Color image fundamentals – RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms – DFT, DCT.	**08**
II	**IMAGE ENHANCEMENT:** Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.	**08**
III	**IMAGE RESTORATION:** Image Restoration – degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering	**08**
IV	**IMAGE SEGMENTATION:** Edge detection, Edge linking via Hough transform – Thresholding – Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.	**08**

V	**IMAGE COMPRESSION AND RECOGNITION:** Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.	**08**

Text books:

1. Rafael C. Gonzalez, Richard E. Woods,Digital Image Processing Pearson, Third Edition, 2010
2. Anil K. Jain,Fundamentals of Digital Image Processing Pearson, 2002.
3. Kenneth R. Castleman,Digital Image Processing Pearson, 2006.
4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,Digital Image Processing using MATLAB Pearson Education, Inc., 2011.
5. D,E. Dudgeon and RM. Mersereau,Multidimensional Digital Signal Processing Prentice Hall Professional Technical Reference, 1990.
6. William K. Pratt,Digital Image Processing John Wiley, New York, 2002
7. Milan Sonka et al Image processing, analysis and machine vision Brookes/Cole, Vikas Publishing House, 2nd edition, 1999

Real Time System		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able:		
CO 1	illustrate the need and the challenges in the design of hard and soft real time systems.	K_3
CO 2	Compare different scheduling algorithms and the schedulable criteria.	K_4
CO 3	Discuss resource sharing methods in real time environment.	K_3
CO 4	Compare and contrast different real time communication and medium access control techniques.	K_4, K_5
CO 5	Analyze real time Operating system and Commercial databases	K_2, K_4

CO \ PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	2	2	2			2	2	2	3	3	3
CO2	3	3	3	3	3	3			2	2	1	3	3	3
CO3	3	3	3	3	3	3	2		2	2	2	3	3	3
CO4	3	3	3	3	3	3	2	2	2	2	1	3	3	3
CO5	3	3	3	3	3	3	2	2	2	2	1	3	3	3

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction** Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.	**05**
II	**Real Time Scheduling** Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of EffectiveDeadlineFirst (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.	**09**
III	**Resources Sharing** Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.	**09**

IV	**Real Time Communication** Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols	**09**
V	**Real Time Operating Systems and Databases** Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases	**08**

Text books:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Phillip A Laplanta,SeppoJ.Ovaska Real time System Design and Analysis Tools for practitioner, Wiley
3. Mall Rajib, “Real Time Systems”, Pearson Education
4. Albert M. K. Cheng , “Real-Time Systems: Scheduling, Analysis, and Verification”, Wiley.

Data Compression		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to		
CO 1	Describe the evolution and fundamental concepts of Data Compression and Coding Techniques.	K_1, K_2
CO 2	Apply and compare different static coding techniques (Huffman & Arithmetic coding) for text compression.	K_2, K_3
CO 3	Apply and compare different dynamic coding techniques (Dictionary Technique) for text compression.	K_2, K_3
CO 4	Evaluate the performance of predictive coding technique for Image Compression.	K_2, K_3
CO 5	Apply and compare different Quantization Techniques for Image Compression.	K_2,K_3

CO \ PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	1	3	1	1	1	1	1	1	1	2	3	3
CO2	3	2	2	3	1	2	1	1	1	1	1	1	3	3
CO3	3	2	2	3	1	2	1	1	1	1	1	1	3	3
CO4	3	2	1	3	1	1	1	1	1	1	1	1	3	3
CO5	3	2	1	3	1	1	1	1	1	1	1	1	3	3

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical Preliminaries for Lossless compression: A brief introduction to information theory, Models: Physical models, Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.	**08**
II	The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.	**08**
III	Coding a sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Movetofront coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding,	**08**

	Dynamic Markoy Compression.	
IV	Distortion criteria, Models, Scalar Ouantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.	**08**
V	Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured VectorQuantizers.	**08**

Text books:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers
2. Elements of Data Compression,Drozdek, Cengage Learning
3. Introduction to Data Compression, Second Edition, Khalid Sayood,The Morgan aufmann Series
4.Data Compression: The Complete Reference 4th Edition byDavid Salomon, Springer
5.Text Compression1st Edition by Timothy C. Bell Prentice Hall

Software Engineering Lab

Course Outcome (CO)	Bloom's Knowledge Level (KL)
At the end of course , the student will be able to	
CO 1 Identify ambiguities, inconsistencies and incompleteness from a requirements specification and state functional and non-functional requirement	K_2, K_4
CO 2 Identify different actors and use cases from a given problem statement and draw use case diagram to associate use cases with different types of relationship	K_3, K_5
CO 3 Draw a class diagram after identifying classes and association among them	K_4, K_5
CO 4 Graphically represent various UML diagrams , and associations among them and identify the logical sequence of activities undergoing in a system, and represent them pictorially	K_4, K_5
CO 5 Able to use modern engineering tools for specification, design, implementation and testing	K_3, K_4

CO \ PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3	2	2	1	1		1	3	3	3
CO2	3	3	3	3	3	2	2		1		1	3	3	3
CO3	3	3	3	3	3	2	2		1		1	2	3	3
CO4	3	3	3	3	3	2	2		1		1	1	3	3
CO5	3	3	3	3	3	2	2		1		1	1	3	3

DETAILED SYLLABUS

For any given case/ problem statement do the following;

1. Prepare a SRS document in line with the IEEE recommended standards.
2. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, postcondition and function of each use case.
3. Draw the activity diagram.
4. Identify the classes. Classify them as weak and strong classes and draw the class diagram.
5. Draw the sequence diagram for any two scenarios.
6. Draw the collaboration diagram.
7. Draw the state chart diagram.
8. Draw the component diagram.
9. Perform forward engineering in java. (Model to code conversion)
10. Perform reverse engineering in java. (Code to Model conversion) 11. Draw the deployment diagram.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner
It is also suggested that open source tools should be preferred to conduct the lab (Open Office , Libra , Junit, Open Project , GanttProject , dotProject, AgroUML, StarUML etc.)

Software Engineering Lab : Mapping with Virtual Lab

Name of the Lab	Name of the Experiment
Software Engineering Lab (KCS-661)	Identifying the Requirements from Problem Statements
	Estimation of Project Metrics
	Modeling UML Use Case Diagrams and Capturing Use Case Scenarios
	E-R Modeling from the Problem Statements
	Identifying Domain Classes from the Problem Statements
	Statechart and Activity Modeling
	Modeling UML Class Diagrams and Sequence diagrams
	Modeling Data Flow Diagrams
	Estimation of Test Coverage Metrics and Structural Complexity
	Designing Test Suites

Web Technology Lab		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to		
CO 1	Develop static web pages using HTML	K_2, K_3
CO 2	Develop Java programs for window/web-based applications.	K_2, K_3
CO 3	Design dynamic web pages using Javascript and XML.	K_3, K_4
CO 4	Design dynamic web page using server site programming Ex. ASP/JSP/PHP	K_3, K_4
CO 5	Design server site applications using JDDC,ODBC and section tracking API	K_3, K_4

Course Code: KCS-552	**Programme Outcome (PO)**												**PSO/ APO**	**PSO/ APO**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3		3	3		3		2		3	3		3
CO2	3	3	3	2	2	3	3		2	3	3	3		3
CO3	3	2	3	3	3		3		2	3	3	2		3
CO4	3		2		3				2		3	2		3
CO5	3	3			3				2		2	3	2	3
PO Target	**3**	**2.7**	**2.7**	**2.7**	**2.8**	**3**	**3**		**2**	**3**	**2.8**	**2.6**	**2**	**3**

DETAILED SYLLABUS

This lab is based on the Web Technologies. Some examples are as follows:

1. Write HTML/Java scripts to display your CV in navigator, your Institute website, Department Website and Tutorial website for specific subject
2. Write an HTML program to design an entry form of student details and send it to store at database server like SQL,Oracle or MS Access.
3. Write programs using Java script for Web Page to display browsers information.
5. Write a Java applet to display the Application Program screen i.e. calculator and other.
6. Writing program in XML for creation of DTD, which specifies set of rules. Create a style sheet in CSS/ XSL & displaythe document in internet explorer.
7. Program to illustrate JDBC connectivity. Program for maintaining database by sending queries. Design and implementa simple servlet book query with the help of JDBC & SQL. Create MS Access Database, Create on ODBC link, Compile & execute JAVA JDVC Socket.
8. Install TOMCAT web server and APACHE. Access the above developed static web pages for books web site, usingthese servers by putting the web pages developed.
9. Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a servlet for doing the following. Create a Cookie and add these four user id's and passwords to this Cookie. 2. Read the user id and passwords entered in the Login form and authenticate with the values available in the cookies.
10. Install a database (Mysql or Oracle). Create a table which should contain at least the following fields: name, password,email-id, phone number Write a java program/servlet/JSP to connect to that database and extract data from the tables and display them. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.
11. Write a JSP which insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using the user name and password from the database
12. Design and implement a simple shopping cart example with session tracking API.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner
It is also suggested that open source tools should be preferred to conduct the lab (Java , JSP , Bootstrap Firebug , WampServer , MongoDB, etc)

Computer Networks Lab		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to		
CO 1	Simulate different network topologies.	K_3, K_4
CO 2	Implement various framing methods of Data Link Layer.	K_3, K_4
CO 3	Implement various Error and flow control techniques.	K_3, K_4
CO 4	Implement network routing and addressing techniques.	K_3, K_4
CO 5	Implement transport and security mechanisms	K_3, K_4

Course Code: KCS553	**Programme Outcome (PO)**												**PSO/ APO**	**PSO/ APO**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2	2	3	3	3	-	-	-	-	-	2	2	3	2
CO2	2		2	2	3	-	-	-	-	-	-	2	3	2
CO3	2	2	3	3	3	-	-	-	-	-	2	2	3	2
CO4	3	3	3	3	3	-	-	-	-	-	-	3	3	2
CO5	3	2	3	2	3	-	-	-	-	-	2	2	3	2
PO Target	**2.4**	**2.5**	**2.8**	**2.6**	**3.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**2.0**	**2.2**	**3.0**	**2.0**

DETAILED SYLLABUS

1. Implementation of Stop and Wait Protocol and Sliding Window Protocol.
2. Study of Socket Programming and Client – Server model
3. Write a code simulating ARP /RARP protocols.
4. Write a code simulating PING and TRACEROUTE commands5. Create a socket for HTTP for web page upload and download. 6. Write a program to implement RPC (Remote Procedure Call)
7. Implementation of Subnetting .
8. Applications using TCP Sockets like
   a. Echo client and echo server b. Chat c. File Transfer
9. Applications using TCP and UDP Sockets like d. DNS e. SNMP f. File Transfer
10. Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS
11. Perform a case study about the different routing algorithms to select the network path with its optimum andeconomical during data transfer. i. Link State routing ii. Flooding iii. Distance vector
12. To learn handling and configuration of networking hardware like RJ-45 connector, CAT-6 cable, crimping tool, etc.
13. Configuration of router, hub, switch etc. (using real devices or simulators)
14. Running and using services/commands like ping, traceroute, nslookup, arp, telnet, ftp, etc.
15. Network packet analysis using tools like Wireshark, tcpdump, etc.
16. Network simulation using tools like Cisco Packet Tracer, NetSim, OMNeT++, NS2, NS3, etc.
17. Socket programming using UDP and TCP (e.g., simple DNS, data & time client/server, echo client/server, iterative & concurrent servers)

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner It is also suggested that open source tools should be preferred to conduct the lab (C , C++ , Java , NS3, Mininet, Opnet, TCP Dump, Wireshark etc.

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Open Electives

B.Tech. VI Semester

OPEN ELECTIVE-I

	IDEA TO BUSINESS MODEL
	REAL TIME SYSTEMS
	EMBEDDED SYSTEM
	INTRODUCTION TO MEMS
	OBJECT ORIENTED PROGRAMMING
	COMPUTER BASED NUMERICAL TECHNIQUES
	GIS & REMOTE SENSING
	BASICS OF DATA BASE MANAGEMENT SYSTEM
	SOFTWARE PROJECT MANAGEMENT
	*UNDERSTANDING THE HUMAN BEING COMPREHENSIVELY-HUMAN ASPIRATIONS AND ITS FULFILLMENT

NOTE:

1. The Student shall choose an open Elective Subject from the list of open elective courses in such a manner that he/she has not studied the same course in any form during the degree programme.
2. The students shall choose an Open Elective course from the prescribed list of open elective courses available at University website for 3rd year (2020-21) in such a manner that he/she has not studied the same subject or allied subject in any semester during the entire degree program.
3. Subject to aforesaid condition, the open Elective courses may be offered from the department to all students irrespective of branch. There is no restriction related to branch. The students of any branch (irrespective of department) can select the open elective subjects from the prescribed list of open elective courses.
4. * It is mandatory that for subjects (KOE069) only trained Faculty (who had done the FDP for these courses) will teach the courses.

IDEA TO BUSINESS MODEL

Course Objectives:

1. This course can motivate students to have an overall idea how to start and sustain a business enterprise.
2. The students will learn basics of choosing an idea of a business model.
3. The core areas of choosing a business model are encompassed with Entrepreneurship development, PPC & communication system. The students will thus develop basic competencies how to run a business enterprise.

Course Code:	Programme Outcome (PO)												PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO-1	-	-	-	-	-	2	2	2	-	-	1	2	-	-
CO-2	-	-	-	-	-	1	1	1	-	-	-	1	-	-
CO-3	-	-	-	-	-	1	1	1	-	-	-	1	-	-
CO-4	-	-	-	-	-	2	3	2	2	-	1	2	-	-
CO-5	-	-	-	-	-	2	3	2	2	-	1	2	-	-
PO Target	**-**	**-**	**-**	**-**	**-**	**1.6**	**2**	**1.6**	**2**	**-**	**1**	**1.6**	**-**	**-**

Unit	Topics	Lectures
I	**Introduction** Search for a business idea- How to choose an idea- Product idea- selection of product- The adoption process- Product innovation- Production , planning and development strategy- New product idea.	8
II	Introduction to Entrepreneurship - Meaning and concept of entrepreneurship- Difference between Entrepreneurship & wage employment - Functions of an Entrepreneur.- Entrepreneur vs Manager- role of entrepreneurship in economic development – Barriers to entrepreneurship.	8
III	The Entrepreneur - types of entrepreneurs- Competencies required to become an entrepreneur - Creative and Design Thinking, the entrepreneurial decision process- The process of Entrepreneurial development prog (EDP)- Evaluation of EDP - Entrepreneur development training.	8
IV	Production system- Design of production system- Types of production system- Production, planning & control (PPC) - Steps of PPC.	8
V	Communication- Importance of communication system - barriers to communication - listening to people- the power of talk - personal selling - risk taking & resilience - negotiation.	8

Text Books:

1. Entrepreneurship Development- Sangeeta Sharma, Kindle edition
2. Production & operations Management- Kanishka Bedi, 3. Marketing Management- Philip Kotler.
4. The Business Model Book: Design, build and adapt business ideas that drive business growth: Adam Bock , Gerard George

REAL TIME SYSTEM

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

1. Describe concepts of Real-Time systems and modeling.
2. Recognize the characteristics of a real-time system in context with real time scheduling.
3. Classify various resource sharing mechanisms and their related protocols.
4. Interpret the basics of real time communication by the knowledge of real time models and protocols.
5. Apply the basics of RTOS in interpretation of real time systems.

CO \ PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2			2	2	2	3	3	3
CO2	3	3	3	3	3	3			2	2	1	3	3	3
CO3	3	3	3	3	3	3	2		2	2	2	3	3	3
CO4	3	3	3	3	3	3	2	2	2	2	1	3	3	3

REAL TIME SYSTEMS

Unit	Topics	Lectures
I	**Introduction** Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Dead-lines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.	8
II	**Real Time Scheduling** Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.	8

III	**Resources Sharing** Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority- Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Module Resources, Controlling Concurrent Accesses to Data Objects.	8
IV	**Real Time Communication** Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority- Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols.	
V	**Real Time Operating Systems and Databases** Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Con-currency Control, Overview of Commercial Real Time databases.	8

Text Books:

1. Real Time Systems – Jane W. S. Liu, Pearson Education Publication.

Reference Books:

1. Real Time Systems – Mall Rajib, Pearson Education
2. Real-Time Systems: Scheduling, Analysis, and Verification – Albert M. K. Cheng, Wiley.

EMBEDDED SYSTEM

COURSE OBJECTIVE: *After completion of the course student will be able to:*

1. Attain the knowledge of embedded system and its development environment.
2. Gain the knowledge of RTOS based embedded system design and its applications.

COURSE OUTCOME: *After completion of the course student will be able to:*

CO1: Understand the basics of embedded system and its structural units.

CO2: Analyze the embedded system specification and develop software programs.

CO3: Evaluate the requirements of the programming embedded systems, related software architecture.

CO4: Understand the RTOS based embedded system design.

CO5: Understand all the applications of the embedded system and designing issues.

CO/PO MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	3	3	1	-	-	-	-	-	3	3
CO2	2	2	3	2	3	3	1	-	2	-	-	-	3	3
CO3	2	2	3	2	3	3	1	-	2	-	-	-	3	3
CO4	2	2	3	2	3	3	1	-	2	-	-	3	3	3
CO5	2	2	3	2	3	3	1	-	2	-	-	3	3	3
Avg	**2**	**2**	**3**	**2**	**3**	**3**	**1**	**-**	**2**		**-**	**3**	**3**	**3**

EMBEDDED SYSTEM		
Unit	**Topic**	**Lectures**
1	Introduction to Embedded Systems: Introduction to Embedded Systems – The build process for embedded systems- Structural units in Embedded processor , selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.	**8**
2	Embedded Networking: Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols – RS232 standard – RS422 – RS485 – CAN Bus - Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) –need for device drivers.	**8**
3	Embedded Firmware Development Environment: Embedded Product Development Life Cycle objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, Sequential Program Model, concurrent Model, object oriented Model.	**8**

4	RTOS Based Embedded System Design: Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non preemptive scheduling, Task communication shared memory, message passing-, Inter process Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance, comparison of Real time Operating systems: Vx Works, чC/OS-II, RT Linux.	**8**
5	Embedded System Application Development: Design issues and techniques Case Study of Washing Machine- Automotive Application- Smart card System Application.	**8**

Text Books:

1. Wayne Wolf, "Computers as Components: Principles of Embedded Computer System Design", Elsevier, 2006.
2. Michael J. Pont, "Embedded C", Pearson Education , 2007.
3. Steve Heath, "Embedded System Design", Elsevier, 2005.
4. Muhammed Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, "The 8051
5. Microcontroller and Embedded Systems", Pearson Education, Second edition, 2007.

INTRODUCTION TO MEMS

COURSE OBJECTIVE: *After completion of the course student will be able to:*

1. Understand the Basic concept of MEMS, Mechanics of Beam and Diaphragm Structures, Air Damping and Electrostatic Actuation.
2. Know the knowledge of Thermal Effects and the Applications of MEMS in RF.

COURSE OUTCOME: *After completion of the course student will be able to:*

CO1: Understand the Basic concept of MEMS Fabrication Technologies, Piezoresistance Effect, Piezoelectricity, Piezoresistive Sensor.

CO2: Explain Mechanics of Beam and Diaphragm Structures.

CO3: Understand the Basic concept of Air Damping and Basic Equations for Slide-film Air Damping, Couette-flow Model, Stokes-flow Model. CO4: Know the concept of Electrostatic Actuation.

CO4: Understand the applications of MEMS in RF

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2									2			2	
CO2	3									3			3	
CO3	2				2					2			2	
CO4		3			3				3	2			2	
Average* (Roundedto nearest integer)	3	3			3				3	2			2	

INTRODUCTION TO MEMS		
Unit	**Topic**	**Lectures**
1	**Introduction to MEMS:** MEMS Fabrication Technologies, Materials and Substrates for MEMS, Processes for Micromachining, Characteristics, Sensors/Transducers, Piezoresistance Effect, Piezoelectricity, Piezoresistive Sensor.	**8**
2	**Mechanics of Beam and Diaphragm Structures:** Stress and Strain, Hooke's Law. Stress and Strain of Beam Structures: Stress, Strain in a Bent Beam, Bending Moment and the Moment of Inertia, Displacement of Beam Structures Under Weight, Bending of Cantilever Beam Under Weight.	**8**
3	**Air Damping:** Drag Effect of a Fluid: Viscosity of a Fluid, Viscous Flow of a Fluid, Drag Force Damping, The Effects of Air Damping on Micro-Dynamics. Squeeze-film Air Damping: Reynolds' Equations for Squeeze-film Air Damping, Damping of Perforated Thick Plates. Slide-film Air Damping: Basic Equations for Slide-film Air Damping, Couette-flow Model, Stokes-flow Model.	**8**
4	**Electrostatic Actuation:** Electrostatic Forces, Normal Force, Tangential Force, Fringe Effects, Electrostatic Driving of Mechanical Actuators: Parallel-plate Actuator, Capacitive sensors. Step and Alternative Voltage Driving: Step Voltage Driving, Negative Spring Effect and Vibration Frequency.	**8**
5	**Thermal Effects:** Temperature coefficient of resistance, Thermo-electricity, Thermocouples, Thermal and temperature sensors. **Applications of MEMS in RF** MEMS Resonator Design Considerations, One-Port Micromechanical Resonator Modeling Vertical Displacement Two-Port Microresonator Modeling, Micromechanical Resonator Limitations.	**8**

Text & Reference Books:

1. G. K. Ananthasuresh, K. J. Vinoy, S. Gopalakrishnan, K. N. Bhat and V. K. Atre, “Micro and smart systems”, Wiley India, 2010.
2. S.M. Sze, “Semiconductor Sensors”, John Wiley & Sons Inc., Wiley Interscience Pub.
3. M.J. Usher, “Sensors and Transducers”, McMillian Hampshire.
4. RS Muller, Howe, Senturia and Smith, “Micro sensors”, IEEE Press.

OBJECT ORIENTED PROGRAMMING

COURSE OBJECTIVE: After completion of the course student will be able to:

1. Understand the Basic concept of Object Orientation, object identity and Encapsulation.
2. Know the knowledge of Basic Structural Modeling, Object Oriented Analysis and C++ Basics.

COURSE OUTCOME: After completion of the course student will be able to:

CO1: Understand the Basic concept of Object Orientation, object identity and Encapsulation.
CO2: Understand the Basic concept of Basic Structural Modeling.
CO3: Know the knowledge of Object oriented design, Object design.
CO4: Know the knowledge of C++ Basics.
CO5: Understand the Basics of object and class in C++.

Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	–	–	–	–	–	–	–	–	–	–	–	–	–
CO2	3	–	–	–	–	–	–	–	–	–	–	–	–	–
CO3	3	–	–	–	–	–	–	–	–	–	–	–	–	–
CO4	3	2	3	–	–	–	–	–	–	–	–	–	–	2
CO5	3	3	3	2	–	–	–	–	–	–	–	–	–	2
AVG	3	2.6	3	2.5	–	–	–	–	–	–	–	–	–	

OBJECT ORIENTED PROGRAMMING		
Unit	**Topic**	**Lectures**
1	Introduction: The meaning of Object Orientation, object identity, Encapsulation, information hiding, polymorphism, generosity, importance of modelling, principles of modelling, object oriented modelling, Introduction to UML, conceptual model of the UML, Architecture.	**8**

2	Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Class &Object Diagrams: Terms, concepts, modelling techniques for Class & Object Diagrams. Collaboration Diagrams: Terms, Concepts, depicting a message, polymorphism in collaboration Diagrams, iterated messages, use of self in messages. Sequence Diagrams: Terms, concepts, depicting asynchronous messages with/without priority, call-back mechanism, broadcast messages. Basic Behavioural Modeling: Use cases, Use case Diagrams, Activity Diagrams, State Machine , Process and thread, Event and signals, Time diagram, interaction diagram, Package diagram. Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams	**8**
3	Object Oriented Analysis: Object oriented design, Object design, Combining three models, Designing algorithms, design optimization, Implementation of control, Adjustment of inheritance, Object representation, Physical packaging, Documenting design considerations. Structured analysis and structured design (SA/SD), Jackson Structured Development (JSD).Mapping object oriented concepts using non-object oriented language, Translating classes into data structures, Passing arguments to methods, Implementing inheritance, associations encapsulation. Object oriented programming style: reusability, extensibility, robustness, programming in the large. Procedural v/s OOP, Object oriented language features. Abstraction and Encapsulation.	**8**
4	C++ Basics : Overview, Program structure, namespace, identifiers, variables, constants, enum, operators, typecasting, control structures C++ Functions : Simple functions, Call and Return by reference, Inline functions, Macro Vs. Inline functions, Overloading of functions, default arguments, friend functions, virtual functions	**8**
5	Objects and Classes : Basics of object and class in C++, Private and public members, static data and function members, constructors and their types, destructors, operator overloading, type conversion. Inheritance : Concept of Inheritance, types of inheritance: single, multiple, multilevel, hierarchical, hybrid, protected members, overriding, virtual base class Polymorphism : Pointers in C++, Pointes and Objects, this pointer, virtual and pure virtual functions, Implementing polymorphism	**8**

Text Books:

1. James Rumbaugh et. al, “Object Oriented Modeling and Design”, PHI
2. Grady Booch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language User Guide”, Pearson Education
3. Object Oriented Programming with C++, E Balagurusamy, TMH

Reference Books:

1. R. S. Salaria, Mastering Object Oriented Programming with C++, Khanna Publishing House
2. C++ Programming, Black Book, Steven Holzner, dreamtech
3. Object Oriented Programming in Turbo C++, Robert Lafore, Galgotia
4. Object Oriented Programming with ANSI and Turbo C++, Ashok Kamthane, Pearson
5. The Compete Reference C++, Herbert Schlitz, TMH
6. C++ and Object Oriented Programming Paradigm, PHI
7. C++ : How to Program, 9th Edition, Deitel and Deitel, PHI

COMPUTER BASED NUMERICAL TECHNIQUES

Course Objectives:
The objective of this course is to familiarize the graduate engineers with techniques in errors, approximations, approximates roots, Interpolation, finite differences, numerical differentiation and integration programming, numerical solution of differential equations and boundary value problems. It aims to equip the students with standard concepts and tools from previously gained knowledge to an advanced level that will enable them to tackle more advanced level of Optimization techniques and applications that they would find useful in their disciplines.

COURSE OUTCOME : The students will learn:

	Course Outcome (CO)	**Bloom's Knowledge Level (KL)**
CO 1	Understand the concept of errors to evaluate approximate roots of several types of equations	K_2& K_5
CO 2	Analyze the problem and evaluate data by different interpolation methods and creating interpolating graphs	K_4, K_5&K_6
CO 3	Understand the concept of interpolation to analyze and evaluate the numerical differentiation and integration	K_2 & K_5
CO 4	Remember the concept of formula based the solution of ordinary differential equations to evaluate differential equations withy initial conditions	K_1&K_5

K_1 – Remember, K_2 – Understand, K_3 – Apply, K_4 – Analyze

CO-PO Mapping												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**3**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO2	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO3	**2**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO4	**3**	**3**	**1**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**3**

COMPUTER BASED NUMERICAL TECHNIQUES		
Unit	**Topic**	**Lectures**
1	**Error and roots of Algrabraic and Transcendental Equations:** Introduction of Numbers and their accuracy, Computer Arithmetic, Mathematical preliminaries, Errors and their Computation, General error formula, Error in a series approximation. Solution of Algebraic and Transcendental Equation**:** Bisection Method, Iteration method, Method of false position, Newton-Raphson method, Methods of finding real and complex roots, Muller's method, Rate of convergence of Iterative methods, Polynomial Equations.	**8**
2	**Interpolation:** Introduction Finite Differences, Difference tables Polynomial Interpolation: Newton's forward and backward formula Central Difference Formulae: Gauss forward and backward formula, Stirling's, Bessel's, Everett's formula. Interpolation with unequal intervals: Lagrange's Interpolation, Newton Divided difference formula, Hermite's Interpolation.	**8**
3	**Numerical Integration and Differentiation**: Introduction: Numerical differentiation of Newton's forward and backward formula, Stirling's, Bessel's, Everett's formula, Lagrange's Interpolation and Newton Divided difference formula. **Numerical Integration**: Newton cotes formula, Trapezoidal rule, Simpson's 1/3 and 3/8 rules, Boole's rule, Waddle's rule.	**8**
4	**Solution of differential Equations:** Introduction, Picard's Method, Euler's Method, Taylor's Method, Runge-Kutta Methods, Predictor Corrector Methods, Automatic Error Monitoring and Stability of solution.	**8**
5	**Boundary Value problems:** Introduction, Finite difference method, solving Eigen value problems, polynomial method and power methods. Numerical solution of Partial Differential equations. Elliptic, Parabolic and hyperbolic PDEs. Distillation in a Plate Column, Unsteady-state Operation, Starting a Stirred-tank Reactor, Rate at which a Plate Absorber Approaches Steady State.	**8**

Note: PS: Practice session: Students should practice the Flow Charts and algorithm of some important programs

Text Books:

1. Jain, Iyengar and Jain, "Numerical Methods for Scientific and Engineering Computations", New Age International.
2. Grewal B S, "Numerical methods in Engineering and Science", Khanna Publishers, Delhi**.**

Reference Books

1. Rajaraman V, Computer Oriented Numerical Methods, Pearson Education
2. T Veerarajan, T Ramachandran, "Theory and Problems in Numerical Methods, McGraw Hill
3. Pradip Niyogi, Numerical Analysis and Algorithms, McGraw Hill.
4. Francis Scheld, Numerical Analysis, McGraw Hill.
5. Sastry S. S, Introductory Methods of Numerical Analysis, Pearson Education.
6. Kiusalaas, J.: Numerical methods in engineering with MATLAB, Cambridge University Press
7. Woodford, C and Phillips, C: Numerical methods with worked examples: MATLAB Edition, Springer

GIS & REMOTE SENSING

COURSE OBJECTIVE: *Students undergoing this course are expected to-*

1. Understand about the principles of GIS, Remote Sensing, Spatial Systems, and its applications to Engineering Problems.

COURSE OUTCOME: *After completion of the course student will be able to-*

CO1: Understand about the principles of Remote Sensing and its advantages and limitations.

CO2: Retrieve the information content of remotely sensed data.

CO3: Apply problem specific remote sensing data for engineering applications.

CO4: Analyze spatial and attribute data for solving spatial problems.

CO5: Create GIS and cartographic outputs for presentation

CO-PO Mapping:

Course Objectives	Program Outcomes											Program Specific Outcomes				
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PSO1	PSO2	PSO3
	1	2	3	4	5	6	7	8	9	10	1	2				
CO1	S	H											H			S
CO2	H	S											H	S		
CO3				H			S						H	S		
CO4											S		S	H		
CO5			H	S						S			S	H		S

N – Not Applicable S – Supportive H - Highly Related

GIS & REMOTE SENSING		
Unit	**Topic**	**Lectures**
1	Basic component of remote sensing (RS), advantages and limitations of RS, possible use of RS techniques in assessment and monitoring of land and water resources; electromagnetic spectrum, energy interactions in the atmosphere and with the Earth's surface; major atmospheric windows; principal applications of different wavelength regions; typical spectral reflectance curve for vegetation, soil and water, spectral signatures.	**8**
2	Different types of sensors and platforms; contrast ratio and possible causes of low contrast; aerial photography; types of aerial photographs, scale of aerial photographs, planning aerial photography- end lap and side lap; stereoscopic vision, requirements of stereoscopic photographs; air-photo interpretation- interpretation elements;	**8**

3	Photogrammetry- measurements on a single vertical aerial photograph, measurements on a stereo-pair- vertical measurements by the parallax method; ground control for aerial photography; satellite remote sensing, multispectral scanner- whiskbroom and push-broom scanner; different types of resolutions; analysis of digital data- image restoration; image enhancement; information extraction, image classification, unsupervised classification, supervised classification, important consideration in the identification of training areas, vegetation indices.	**8**
4	Microwave remote sensing. GI Sand basic components, different sources of spatial data, basic spatial entities, major components of spatial data, Basic classes of map projections and their properties. .	**8**
5	Methods of data input into GIS, Data editing, spatial data models and structures, Attribute data management, integrating data (map overlay) in GIS, Application of remote sensing and GIS for the management of land and water resources.	**8**

Text & Reference Books:

1. Reddy Anji, M. 2006. Textbook of Remote Sensing and Geographical Information Systems. BS Publications, Hyderabad.
2. Elangovan, K. 2006. GIS Fundamentals Applications and Implementations. New India Publication Agency, New Delhi.
3. George Joseph. 2005. Fundamentals of Remote Sensing. 2nd Edition. Universities Press (India) Private Limited, Hyderabad.
4. Jensen, J.R. 2013. Remote Sensing of the Environment: An Earth Resource Perspective. Pearson Education Limited, UK.
5. Lillesand, T., R.W. Kiefer and J. Chipman. 2015. Remote Sensing and Image Interpretation. 7th Edition, John Wiley and Sons Singapore Pvt. Ltd., Singapore.
6. Sabins, F.F. 2007. Remote Sensing: Principles and Interpretation. Third Edition, Waveland Press Inc., Illinois, USA.

BASICS OF DATA BASE MANAGEMENT SYSTEM

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to:		
CO 1	Describe the features of a database system and its application and compare various types of data models.	K_2
CO 2	Construct an ER Model for a given problem and transform it into a relation database schema.	K_5, K_6
CO 3	Formulate solution to a query problem using SQL Commands, relational algebra, tuple calculus and domain calculus.	K_5, K_6
CO 4	Explain the need of normalization and normalize a given relation to the desired normal form.	K_2, K_3
CO 5	Explain different approaches of transaction processing and concurrency control.	K_2

CO \ PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	2	2	1	1	2	1	2	2	3	3
CO2	3	3	2	2	3	1	2	1	2	2	3	3	3	3
CO3	3	2	2	2	2	2	1	1	2	1	2	2	3	3
CO4	2	2	3	2	2	2	2	1	2	2	3	2	3	3
CO5	3	3	2	2	3	1	1	1	2	1	2	3	3	3

DETAILED SYLLABUS		3-0-0
Unit		**Lecture**
I	**Introduction:** An overview of database management system, database system vs file system, database system concepts and architecture, views of data – levels of abstraction, data models, schema and instances, data independence, database languages and interfaces, data definition languages, DML, overall database structure, transaction management, storage management, database users and administrator. **Data Modeling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, concepts of super key, candidate key, primary key, generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.	**08**

II	**Relational Database Concepts:** Introduction to relational database, relational database structure, relational model terminology – domains, attributes, tuples, relations & relational database schema, integrity constraints, entity integrity, referential integrity, keys constraints, domain constraints, Relational algebra - relational calculus, tuple and domain calculus, basic operations – selection and projection, set-theoretic operations, join operations. **Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, & third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design	**08**
III	**Structured Query Language (SQL):** Basics of SQL, DDL, DML, DCL, advantage of SQL, SQL data type and literals, types of SQL commands, SQL operators and their procedure, tables – creation & alteration, defining constraints, views and indexes, queries and sub queries, aggregate functions, built-in functions, insert, update and delete operations, joins, unions, intersection, minus, transaction control commands. **PL/SQL:** Introduction, features, syntax and constructs, SQL within Pl/SL, DML in PL/SQL Cursors, stored procedures, stored function, database triggers, indices	**08**
IV	**Transaction Processing Concepts:** Transaction concepts, properties of transaction, testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, recovery from transaction failures, two-phase commit protocol, log based recovery, checkpoints, deadlock handling. **Concurrency Control Techniques:** Concurrency control, locking techniques for concurrency control, time stamping protocols for concurrency control, validation based protocol, multiple granularity, multi-version schemes, recovery with concurrent transaction.	**08**
V	**Database Security** – Types of security, system failure, backup & recovery techniques, authorization & authentication, system policies, levels of security – physical, OS, network & DBMS, privileges – grant & revoke. **Recent Trends in Database Management Systems:** Centralized and Client-Server Architectures, Distributed Databases, Object-Oriented Database, Spatial & Temporal Databases, Decision Support Systems, Data Analysis, Data Mining & Warehousing, Data Visualization, Mobile Databases, OODB & XML Databases, Multimedia & Web Databases, Spatial and Geographical Databases, Web and Mobile Databases, Active Databases	**08**

Text books:

1.Elmasri, Navathe, "Fundamentals of Database System", Addision Wesley.

1. Korth, Silbertz, Sudarshan, "Database Concepts", Mc Graw Hill.
2. Bipin C. Desai, "An Introduction to Database System", Galgotia Publication.
3. Majumdar & Bhattacharya, "Database Management System", McGraw Hill.
4. Date C.J., "An Introduction to Database System", Addision Wesley.
5. Ramakrishnan, Gehrke, "Database Management System", McGraw Hill.
6. Atul Kahate, "Introduction to Database Management Systems", Pearson Education.
7. Paul Beynon Davies, "Database System", Palgrave Macmillan.
8. Bharti P.K., " An Introduction to Database Systems", JPNP.
9. Rajesh Narang, "Database Management System", PHI.
10. Singh, S.K., "Database System Concepts – design & application", Pearson Education.
11. Leon & Leon, "Database Management Systems", Vikas Publishing House.
12. O'Neil, "Databases", Elsevier Pub.
13. Ivan Bayross, "SQL, PL/SQL – The Programming Language of Oracle", BPB Publications.
14. P.S. Deshpande, "SQL and PL/SQL for Oracle 10g, Black Book", Dreamtech Press.
15. George Koch, Kevin Loney, "Oracle: The Complete Reference", McGraw Hill.
16. Coronel, Morris and Rob, "Database Principles: Fundamentals of Design, Implementation and Management", Cengage Learning.
17. Gillenson, Paulraj Ponniah, "Introduction to Database Management", Wiley.

SOFTWARE PROJECT MANAGEMENT		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able :		
CO 1	Identify project planning objectives, along with various cost/effort estimation models.	K_3
CO 2	Organize & schedule project activities to compute critical path for risk analysis.	K_3
CO 3	Monitor and control project activities.	K4, K5
CO 4	Formulate testing objectives and test plan to ensure good software quality under SEI-CMM.	K_6
CO 5	Configure changes and manage risks using project management tools.	K_2, K_4

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO 1	3												1	
CO 2	3	2											2	
CO 3		3											3	
CO 4	3	2											1	
CO5			3					1	2	1	2		3	

DETAILED SYLLABUS		**3-0-0**
Unit		**Lecture**
I	**Project Evaluation and Project Planning :** Importance of Software Project Management – Activities – Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.	**08**
II	**Project Life Cycle and Effort Estimation :** Software process and Process Models – Choice of Process models – Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points – COCOMO II – a Parametric Productivity Model.	**08**

III	**Activity Planning and Risk Management :** Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning – Risk Management – – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules.	**08**
IV	**Project Management and Control:** Framework for Management and control Collection of data Visualizing progress – Cost monitoring Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control Software Configuration Management – Managing contracts – Contract Management.	**08**
V	**Staffing in Software Projects :** Managing people – Organizational behavior – Best methods of staff selection Motivation – The Oldham Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams Decision making Organizational structures Dispersed and Virtual teams – Communications genres Communication plans Leadership.	**08**

Text books:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, McGraw Hill, New Delhi, 2012.
2. Robert K. Wysocki ―Effective Software Project Management – Wiley Publication, 2011.
3. Walker Royce: ―Software Project Management- Addison-Wesley, 1998.
4. Gopalaswamy Ramesh, ―Managing Global Software Projects – McGraw Hill Education (India), Fourteenth Reprint 2013.

UNDERSTANDING THE HUMAN BEING COMPREHENSIVELY – HUMAN ASPIRATIONS AND ITS FULFILLMENT

Course Objectives:

1. To help the students having the clarity about human aspirations, goal, activities and purpose of life.
2. To facilitate the competence to understand the harmony in nature/existence and participation of human being in the nature/existence.
3. To help the students to develop the understanding of human tradition and its various components.

Course Methodology:

1. The methodology of this course is exploration and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. It is free from any dogma or set of do's and don'ts related to values.
3. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated and encouraged to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.
4. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.
5. This self-exploration also enables them to critically evaluate their preconditioning and present beliefs.

CO-PO& PSO Mapping:

Course Outcomes	PO3	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO2
CO1	2	3	3	2	1	2	2	3	2
CO2	2	2	3	2	1	2	1	3	2
CO3	2	2	3	3	2	2		3	2
CO4	2	3	3	2	1	1		3	2
CO5	2	2	3	2	1	2		3	2
Course	**2.00**	**2.40**	**3.00**	**2.20**	**1.20**	**1.80**	**1.50**	**3.00**	**2.00**

UNDERSTANDING THE HUMAN BEING COMPREHENSIVELY- HUMAN ASPIRATIONS AND ITS FULFILLMENT		
Unit	**Topic**	**Lectures**
1	**Introduction:** The basic human aspirations and their fulfillment through Right understanding and Resolution; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution.	**8**

2	**Understanding Human being and its expansion:** The domain of right understanding starts from understanding the human being (the knower, the experience and the doer); and extends up to understanding nature/existence – its interconnectedness and co-existence; and finally understanding the role of human being in existence (human conduct).	**8**
3	**Activities of the Self:** Understanding the human being comprehensively is the first step and the core theme of this course; human being as co-existence of the self and the body; the activities and potentialities of the self; Reasons for harmony/contradiction in the self.	**8**
4	**Understanding Co-existence with other orders:** The need and the process of inner evolution (through self-exploration, selfawareness and self-evaluation)- particularly awakening to activities of the Self: Realization, Understanding and Contemplation in the Self (Realization of Co-Existence, Understanding of Harmony in Nature and Contemplation of Participation of Human in this harmony/ order leading to comprehensive knowledge about the existence).	**8**
5	**Expansion of harmony from self to entire existence:** Understanding different aspects of All-encompassing Resolution (understanding, wisdom, science etc.), Holistic way of living for Human Being with All-encompassing Resolution covering all four dimensions of human endeavour viz., realization, thought, behavior and work (participation in the larger order) leading to harmony at all levels from self to Nature and entire Existence.	**8**

Reference Books:

1. A Foundation Course in Human Values and Profession Ethics (Text Book and Teachers' Manual), R. R. Gaur, R. Sangal, G. P. Bagaria (2010), Excel Books, New Delhi [ISBN 978-8-174-46781-2]
2. Avartansheel Arthshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India
3. Economy of Permanence – (a quest for social order based on non-violence), J. C. Kumarappa (2010), Sarva-Seva-Sangh-Prakashan, Varansi, India
4. Energy and Equity, Ivan Illich (1974), The Trinity Press, Worcester & Harper Collins, USA
5. Ishandi Nau Upnishad, Shankaracharya, Geeta press, Gorakhpur,
6. Manav Vyavahar Darshan, A. Nagraj, Divya Path Sansthan, Amarkantak, India
7. Manaviya Sanvidhan, A. Nagraj, Divya Path Sansthan, Amarkantak, India

COMMOM NON CREDIT COURSE (NC)

(V & VI Semester)

1	**KNC501/ KNC601**	**CONSTITUTION OF INDIA, LAW AND ENGINEERING**
2	**KNC502/ KNC602**	**INDIAN TRADITION, CULTURE AND SOCIETY**

[Effective from the Session: 2020-21]

SYLLABUS

1	KNC501/ KNC601	CONSTITUTION OF INDIA, LAW AND ENGINEERING

CONSTITUTION OF INDIA, LAW AND ENGINEERING

L:T: P: 2: 0:0

Module 1--Introduction and Basic Information about Indian Constitution:

Meaning of the constitution law and constitutionalism, Historical Background of the Constituent Assembly, Government of India Act of 1935 and Indian Independence Act of 1947,Enforcement of the Constitution, Indian Constitution and its Salient Features, The Preamble of the Constitution, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy,

Parliamentary System, Federal System, Centre-State Relations, Amendment of the Constitutional Powers and Procedure, The historical perspectives of the constitutional amendments in India, Emergency Provisions: National Emergency, President Rule, Financial Emergency, and Local Self Government – Constitutional Scheme in India.

Module 2-Union Executive and State Executive:

Powers of Indian Parliament Functions of Rajya Sabha, Functions of Lok Sabha, Powers and Functions of the President, Comparison of powers of Indian President with the United States,

Powers and Functions of the Prime Minister, Judiciary – The Independence of the Supreme

Court, Appointment of Judges, Judicial Review, Public Interest Litigation, Judicial Activism,

LokPal, Lok Ayukta, The Lokpal and Lok ayuktas Act 2013, State Executives – Powers and Functions of the Governor, Powers and Functions of the Chief Minister, Functions of State Cabinet, Functions of State Legislature, Functions of High Court and Subordinate Courts.

Module 3- Introduction and Basic Information about Legal System:

The Legal System: Sources of Law and the Court Structure: Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law, Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courtiers (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court). Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration. Contract law, Tort, Law at workplace.

Module 4- Intellectual Property Laws and Regulation to Information:
Intellectual Property Laws: Introduction, Legal Aspects of Patents, Filing of Patent

Applications, Rights from Patents, Infringement of Patents, Copyright and its Ownership,

Infringement of Copyright, Civil Remedies for Infringement, Regulation to Information- Introduction, Right to Information Act, 2005, Information Technology Act, 2000, Electronic Governance, Secure Electronic Records and Digital Signatures, Digital Signature Certificates, Cyber Regulations Appellate Tribunal, Offences, Limitations of the Information Technology Act.

Module 5 -Business Organizations and E-Governance:
Sole Traders, Partnerships: Companies: The Company's Act: Introduction, Formation of a Company, Memorandum of Association, Articles of Association, Prospectus, Shares, Directors, General Meetings and Proceedings, Auditor, Winding up.

E-Governance and role of engineers in E-Governance, Need for reformed engineering serving at the Union and State level, Role of I.T. professionals in Judiciary, Problem of Alienation and Secessionism in few states creating hurdles in Industrial development.

COURSE OBJECTIVE:

- To acquaint the students with legacies of constitutional development in India and help those to understand the most diversified legal document of India and philosophy behind it.
- To make students aware of the theoretical and functional aspects of the Indian Parliamentary System.
- To channelize students' thinking towards basic understanding of the legal concepts and its implications for engineers.
- To acquaint students with latest intellectual property rights and innovation environment with related regulatory framework.
- To make students learn about role of engineering in business organizations and e-governance.

COURSE OUTCOME: At the end of the course, learners should be able to-

1. Identify and explore the basic features and modalities about Indian constitution.
2. Differentiate and relate the functioning of Indian parliamentary system at the center and state level.
3. Differentiate different aspects of Indian Legal System and its related bodies.
4. Discover and apply different laws and regulations related to engineering practices.
5. Correlate role of engineers with different organizations and governance models

Pedagogy: Lecture, Problem based learning, Group discussions, Visual media, Films, Documentaries, Debate forums.

Suggested Readings:

- Brij Kishore Sharma: *Introduction to the Indian Constitution*, 8th Edition, PHI Learning Pvt. Ltd.
- Granville Austin: *The Indian Constitution: Cornerstone of a Nation (Classic Reissue)*, Oxford University Press.
- S.G Subramanian: *Indian Constitution and Indian Polity*, 2nd Edition, Pearson Education 2020.
- Subhash C. Kashyap: *Our Constitution: An Introduction to India's Constitution and constitutional Law*, NBT, 2018.
- Madhav Khosla: *The Indian Constitution*, Oxford University Press.
- PM Bakshi: *The Constitution of India*, Latest Edition, Universal Law Publishing.
- V.K. Ahuja: *Law Relating to Intellectual Property Rights* (2007)
- Suresh T. Viswanathan: *The Indian Cyber Laws, Bharat Law House*, New Delhi-88
- P. Narayan: Intellectual Property Law, Eastern Law House, New Delhi
- Prabudh Ganguli: *Gearing up for Patents: The Indian Scenario*, Orient Longman.
- BL Wadehra: Patents, Trademarks, *Designs and Geological Indications Universal Law* Publishing - LexisNexis.
- *Intellectual Property Rights: Law and Practice, Module III* by ICSI (only relevant sections)
- Executive programme study material Company Law, Module II, by ICSI (The Institute of Companies Secretaries of India) (Only relevant sections i.e., Study 1, 4 and 36).https://www.icsi.edu/media/webmodules/publications/Company%20Law.pdf
- Handbook on e-Governance Project Lifecycle, Department of Electronics & Information Technology, Government of India, https://www.meity.gov.in/writereaddata/files/e-Governance_Project_Lifecycle_Participant_Handbook-5Day_CourseV1_20412.pdf
- Companies Act, 2013 Key highlights and analysis by PWC. https://www.pwc.in/assets/pdfs/publications/2013/companies-act-2013-key-highlightsand-analysis.pdf

Referred Case Studies:

- Keshavanand Bharati V. State of Kerala, AIR 1973 SC 1461.
- Maneka Gandhi V. Union of India AIR, 1978 SC 597.
- S.R. Bammai V. Union of India, AIR 1994 SC 1918.
- Kuldip Nayyar V. Union of India, AIR 2006 SC312.
- A.D.M. Jabalpur V. ShivkantShakla, AIR 1976 SC1207.
- Remshwar Prasad V. Union of India, AIR 2006 SC980.
- Keshav Singh in re, AIR 1965 SC 745.

- Union of India V. Talsiram, AIR 1985 SC 1416.
- Atiabari Tea Estate Co.V. State of Assam, AIR 1961SC232.
- SBP & Co. Vs. Patel Engg. Ltd. 2005 (8) SCC 618.
- Krishna Bhagya Jala Nigam Ltd. Vs. G. Arischandra Reddy (2007) 2 SCC 720.
- Oil & Natural Gas Corporation Vs. Saw Pipes Ltd. 2003 (4) SCALE 92 – 185.

**** (Other relevant case studies can be consulted by the teacher as per the topic).**

Prescribed Legislations:

1. Information Technology Act, 2000 with latest amendments.
2. RTI Act 2005 with latest amendments.
3. Information Technology Rules, 2000
4. Cyber Regulation Appellate Tribunal Rules, 2000

Suggested aid for Students and Pedagogic purpose

- RSTV debates on corporate law, IPR and patent issues
- NPTEL lectures on IPR and patent rights

Episodes of 10 -part mini TV series "Samvidhan: The Making of Constitution of India" by RSTV.

SYLLABUS

2	KNC502/ KNC602	INDIAN TRADITION, CULTURE AND SOCIETY

INDIAN TRADITIONS, CULTURAL AND SOCIETY

L: T:P: 2: 0:0

Module 1- Society State and Polity in India

State in Ancient India: Evolutionary Theory, Force Theory, Mystical Theory Contract Theory,

Stages of State Formation in Ancient India, Kingship , Council of Ministers Administration

Political Ideals in Ancient India Conditions' of the Welfare of Societies, The Seven Limbs of the State, Society in Ancient India, Purusārtha, Varnāshrama System, Āshrama or the Stages of Life, Marriage, Understanding Gender as a social category, The representation of Women in Historical traditions, Challenges faced by Women. Four-class Classification, Slavery.

Module 2- Indian Literature, Culture, Tradition, and Practices

Evolution of script and languages in India: Harappan Script and Brahmi Script. The Vedas, the Upanishads, the Ramayana and the Mahabharata, Puranas, Buddhist And Jain Literature in Pali,Prakrit And Sanskrit, Kautilya's Arthashastra, Famous Sanskrit Authors, Telugu Literature, Kannada Literature,Malayalam Literature ,Sangama Literature Northern Indian Languages &

Literature, Persian And Urdu ,Hindi Literature

Module 3- Indian Religion, Philosophy, and Practices

Pre-Vedic and Vedic Religion, Buddhism, Jainism, Six System Indian Philosophy, Shankaracharya, Various Philosophical Doctrines , Other Heterodox Sects, Bhakti Movement, Sufi movement, Socio religious reform movement of 19th century, Modern religious practices.

Module 4-Science, Management and Indian Knowledge System

Astronomy in India, Chemistry in India, Mathematics in India, Physics in India, Agriculture in

India, Medicine in India ,Metallurgy in India, Geography, Biology, Harappan Technologies, Water Management in India, Textile Technology in India ,Writing Technology in India Pyrotechnics in India Trade in Ancient India/,India's Dominance up to Pre-colonial Times

Module 5- Cultural Heritage and Performing Arts

Indian Architect, Engineering and Architecture in Ancient India, Sculptures, Seals, coins,

Pottery, Puppetry, Dance, Music, Theatre, drama, Painting, Martial Arts Traditions, Fairs and

Festivals, Current developments in Arts and Cultural, Indian's Cultural Contribution to the World. Indian Cinema

COURSE OBJECTIVES:

- The course aims at imparting basic principles of thought process, reasoning and inference to identify the roots and details of some of the contemporary issues faced by our nation and try to locate possible solutions to these challenges by digging deep into our past.
- To enable the students to understand the importance of our surroundings and encourage the students to contribute towards sustainable development.
- To sensitize students towards issues related to 'Indian' culture, tradition and its composite character.

- To make students aware of holistic life styles of Yogic-science and wisdom capsules in Sanskrit literature that are important in modern society with rapid technological advancements and societal disruptions.
- To acquaint students with Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.

COURSE OUTCOMES: Ability to understand, connect up and explain basics of Indian Traditional knowledge modern scientific perspective.

Suggested Pedagogy for Teachers

- Project based learning
- Case studies
- Group discussion
- Presentations

Suggested Text & Reference Books

1. V. Sivaramakrishna (Ed.), *Cultural Heritage of India-Course Material*, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2. S. Baliyan, *Indian Art and Culture*, Oxford University Press, India
3. Swami Jitatmanand, *Modern Physics and Vedant*, Bharatiya Vidya Bhavan
4. Romila Thapar, *Readings In Early Indian History* Oxford University Press , India
5. Fritz of Capra, Tao of Physics
6. Fritz of Capra, The wave of Life
7. V N Jha (English Translation), *Tarkasangraha of Annam Bhatta*, Inernational Chinmay Foundation,Velliarnad,Amaku,am
8. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta
9. GN Jha (Eng. Trans.) Ed. R N Jha, *Yoga-darshanam with Vyasa Bhashya*, Vidyanidhi Prakasham, Delhi,2016
10. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016
11. P R Sharma (English translation), Shodashang Hridayam
12. Basham, A.L., *The Wonder that was India* (34th impression), New Delhi, Rupa & co
13. Sharma, R.S., *Aspects of Political Ideas and Institutions in Ancient India*(fourth edition), Delhi, Motilal Banarsidass,

Artificial Intelligence		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Understand the basics of the theory and practice of Artificial Intelligence as a discipline and about intelligent agents.	K_2
CO 2	Understand search techniques and gaming theory.	K_2, K_3
CO 3	The student will learn to apply knowledge representation techniques and problem solving strategies to common AI applications.	K_3 , K_4
CO 4	Student should be aware of techniques used for classification and clustering.	K_2 , K_3
CO 5	Student should aware of basics of pattern recognition and steps required for it.	K_2 , K_4

CO \ PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	3	2	2	2	2	2	3	3	3
CO2	3	3	3	3	3	3	1		2	2	1	3	3	3
CO3	3	3	2	3	3	3	2		2	2	1	3	3	3
CO4	3	3	2	3	3	3	2	1	2	2	2	3	3	3
CO5	3	3	3	3	3	3	2	1	2	2	2	3	3	3

DETAILED SYLLABUS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**INTRODUCTION :** Introduction–Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.	**08**
II	**PROBLEM SOLVING METHODS:** Problem solving Methods – Search Strategies- Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems – Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games	**08**
III	**KNOWLEDGE REPRESENTATION:** First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering-Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories – Reasoning with Default Information	**08**

IV	**SOFTWARE AGENTS:** Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.	**08**
V	**APPLICATIONS:** AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving	**08**

Text books:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2009.
2. I. Bratko, "Prolog: Programming for Artificial Intelligence", Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.
3. M. Tim Jones, ―Artificial Intelligence: A Systems Approach(Computer Science)‖, Jones and Bartlett Publishers, Inc.First Edition, 2008
4. Nils J. Nilsson, ―The Quest for Artificial Intelligence‖, Cambridge University Press, 2009.
5. William F. Clocksin and Christopher S. Mellish,‖ Programming in Prolog: Using the ISO Standard‖, Fifth Edition, Springer, 2003.
6. Gerhard Weiss, ―Multi Agent Systems‖, Second Edition, MIT Press, 2013.
7. David L. Poole and Alan K. Mackworth, ―Artificial Intelligence: Foundations of Computational Agents‖, Cambridge University Press, 2010.

Natural Language Processing	
Course Outcome (CO)	**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able :	

CO 1	To learn the fundamentals of natural language processing	K_1 , K_2
CO 2	To understand the use of CFG and PCFG in NLP	K_1 , K_2
CO 3	To understand the role of semantics of sentences and pragmatic	K_2
CO 4	To Introduce Speech Production And Related Parameters Of Speech.	K_1 , K_2
CO 5	To Show The Computation And Use Of Techniques Such As Short Time Fourier Transform, Linear Predictive Coefficients And Other Coefficients In The Analysis Of Speech.	K_3, K_4

CO-PO MAPPING:

PO	**PO**											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1		2		1	1					
CO2	2		2	1	1		1					
CO3	2	1		2	1	1		1				
CO4	3	2	1	1		2	1					
CO5	1	1	3		2		1	1				

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**INTRODUCTION:** Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance **WORD LEVEL ANALYSIS :** Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.	**08**
II	**SYNTACTIC ANALYSIS:** Context Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures.	**08**
III	**SEMANTICS AND PRAGMATICS:** Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.	**08**
IV	**BASIC CONCEPTS of Speech Processing :** Speech Fundamentals: Articulatory Phonetics – Production And Classification Of Speech Sounds; Acoustic Phonetics – Acoustics Of Speech Production; Review Of Digital Signal Processing Concepts; Short-Time Fourier Transform, FilterBank And LPC Methods.	**08**

V	**SPEECH-ANALYSIS**: Features, Feature Extraction And Pattern Comparison Techniques: Speech Distortion Measures– Mathematical And Perceptual – Log–Spectral Distance, Cepstral Distances, Weighted Cepstral Distances And Filtering, Likelihood Distortions, Spectral Distortion Using A Warped Frequency Scale, LPC, PLP And MFCC Coefficients, Time Alignment And Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths. **SPEECH MODELING** : Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-Estimation, Implementation Issues.	**08**

Text books:

1. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, OReilly Media, 2009.
3. Lawrence Rabiner And Biing-Hwang Juang, "Fundamentals Of Speech Recognition", Pearson Education, 2003.
4. Daniel Jurafsky And James H Martin, "Speech And Language Processing – An Introduction To Natural Language Processing, Computational Linguistics, And Speech Recognition", Pearson Education, 2002.
5. Frederick Jelinek, "Statistical Methods Of Speech Recognition", MIT Press, 1997.
6. Breck Baldwin, —Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015 7. Richard M Reese, —Natural Language Processing with Java, OReilly Media, 2015.
8. Nitin Indurkhya and Fred J. Damerau, —Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
9. Tanveer Siddiqui, U.S. Tiwary, —Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

High Performance Computing		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Able to understand the basic concept of Computer architecture and Modern Processor	K2
CO 2	Able to understand the basic concepts of access optimization and parallel computers	K2, K3
CO 3	Able to describe different parallel processing platforms involved in achieving high performance computing	K3 , K4
CO 4	Develop efficient and high performance parallel programming.	K2 , K3
CO 5	Able to learn parallel programming using message passing paradigm.	K2 , K4

PO	PO											
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1			1	1	1	1				
CO 2	2	1		2	1		1					
CO3	2			2	1	1		1				
CO4	1	2	3	2		1	1					
CO5	2	1		2	1	1		1				

DETAILED SYLLABUS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Overview of Grid Computing Technology**, History of Grid Computing, High Performance Computing, Cluster Computing. Peer-to-Peer Computing, Internet Computing, Grid Computing Model and Protocols, Types of Grids: Desktop Grids, Cluster Grids, Data Grids, High-Performance Grids, Applications and Architectures of High Performance Grids, High Performance Application Development Environment.	**08**
II	**Open Grid Services Architecture**: Introduction, Requirements, Capabilities, Security Considerations, GLOBUS Toolkit	**08**
III	**Overview of Cluster Computing:** Cluster Computer and its Architecture, Clusters Classifications, Components for Clusters, Cluster Middleware and SSI, Resource Management and Scheduling, Programming, Environments and Tools, Cluster Applications, Cluster Systems,	**08**
IV	**Beowulf Cluster**: The Beowulf Model, Application Domains, Beowulf System Architecture, Software Practices, Parallel Programming with MPL, Parallel Virtual Machine (PVM).	**08**
V	**Overview of Cloud Computing**: Types of Cloud, Cyber infrastructure, Service Oriented Architecture Cloud Computing Components: Infrastructure, Storage, Platform, Application, Services, Clients, Cloud Computing Architecture.	**08**

Text books:

1. Laurence T.Yang, Minyi Guo – High Performance Computing Paradigm and Infrastructure John Wiley
2. Ahmar Abbas, "Grid Computing: Practical Guide to Technology & Applications", Firewall Media, 2004.
3. Joshy Joseph and Craig Fellenstein , "Grid Computing" Pearson Education, 2004.
4. lan Foster, et al.,"The Open Grid Services Architecture", Version 1.5 (GFD.80). Open Grid Forum, 2006.
5. RajkumarBuyya. High Performance Cluster Computing: Architectures and Systems. PrenticeHall India, 1999.

Cryptography & Network Security		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Classify the symmetric encryption techniques and Illustrate various Public key cryptographic techniques.	K2 , K3
CO 2	Understand security protocols for protecting data on networks and be able to digitally sign emails and files.	K1 , K2
CO 3	Understand vulnerability assessments and the weakness of using passwords for authentication	K4
CO 4	Be able to perform simple vulnerability assessments and password audits	K3
CO 5	Summarize the intrusion detection and its solutions to overcome the attacks.	K2

CO \ PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	2	1	3	1	3	3	1	1	1	2	3	3
CO2	3	3	2	2	3	3	3	1	1	1	1	2	3	3
CO3	3	3	2	2	3	3	3	2	1	1	1	2	3	3
CO4	3	1	1	1	3	1	3	1	1	1	1	2	3	3
CO5	3	3	2	2	3	3	3	2	1	1	1	2	3	3

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	Introduction to security attacks, services and mechanism, Classical encryption techniquessubstitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers. Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES	**08**
II	Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm, Advanced Encryption Standard (AES) encryption and decryptionFermat's and Euler's theorem, Primarily testing, Chinese Remainder theorem, Discrete Logarithmic Problem,Principals of public key crypto systems, RSA algorithm, security of RSA	**08**
III	Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA) Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,	**08**
IV	Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure. Authentication Applications: Kerberos, Electronic mail security: pretty good privacy (PGP), S/MIME.	**08**

V	IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Introduction to Secure Socket Layer, Secure electronic, transaction (SET) System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls	**08**

Text books: 1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, McGraw Hill .
3. C K Shyamala, N Harini, Dr. T.R.Padmnabhan Cryptography and Security ,Wiley
4. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
5. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
6. AtulKahate, "Cryptography and Network Security", McGraw Hill

Design & Development Of Applications		
Course Outcome (CO)		
	At the end of course , the student will be able to understand	
CO 1	Be exposed to technology and business trends impacting mobile applications	K1 , K2
CO 2	Be competent with the characterization and architecture of mobile applications.	K3
CO 3	Be competent with understanding enterprise scale requirements of mobile applications.	K1 , K2
CO 4	Be competent with designing and developing mobile applications using one application development framework.	K3
CO 5	Be exposed to Android and iOS platforms to develop the mobile applications	K1 , K2
	DETAILED SYLLABUS	
Unit	**Topic**	**Proposed Lecture**
I	**INTRODUCTION:** Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications	**08**
II	**BASIC DESIGN:** Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability	**08**
III	**ADVANCED DESIGN:** Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.	**08**
IV	HNOLOGY I – ANDROID: Introduction – Establishing the development environment – oid architecture – Activities and views – Interacting with UI – Persisting data using SQLite – aging and deployment – Interaction with server side applications – Using Google Maps, GPS Wi-Fi – Integration with social media applications.	**08**
V	TECHNOLOGY II –iOS: Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wi-Fi - iPhone marketplace. Swift: Introduction to Swift, features of swift	**08**
	Text books: 1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012 2. AnubhavPradhan , Anil V Despande Composing Mobile Apps,Learn ,explore,apply 3. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012 4. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012 5. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6. Development: Exploring the iOS SDK”, Apress, 2013.	

Software Testing		
Course Outcome (CO)	**Bloom's Knowledge Level (KL)**	
At the end of course , the student will be able to understand		
CO 1	Have an ability to apply software testing knowledge and engineering methods.	K2 , K3
CO 2	Have an ability to design and conduct a software test process for a software testing project.	K3, K4
CO 3	Have an ability to identify the needs of software test automation, and define and develop a test tool to support test automation.	K1 , K2
CO 4	Have an ability understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.	K1 , K2
CO 5	Have basic understanding and knowledge of contemporary issues in software testing, such as component-based software testing problems.	K2

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	1	3	2	1	1						
CO2	1	3	3	2	1		1					
CO3		2	3		2	1		1				
CO4	1	2	3	3	3		1					
CO5		1	2	2	3	1		1				

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	Review of Software Engineering: Overview of Software Evolution, SDLC, Testing Process, Terminologies in Testing: Error, Fault, Failure, Verification, Validation, Difference Between Verification and Validation, Test Cases, Testing Suite, Test ,Oracles, Impracticality of Testing All Data; Impracticality of Testing AllPaths. Verification: Verification Methods, SRS Verification, Source Code Reviews, User Documentation Verification, Software, Project Audit, Tailoring Software Quality Assurance Program by Reviews, Walkthrough, Inspection and Configuration Audits	**08**
II	Functional Testing: Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique. Structural Testing: Control Flow Testing, Path Testing, Independent Paths, Generation of Graph from Program, Identification of Independent Paths, Cyclomatic Complexity, Data Flow Testing, Mutation Testing	**08**
III	Regression Testing: What is Regression Testing? Regression Test cases selection, Reducing the number of test cases, Code coverage prioritization technique. Reducing the number of test cases: Prioritization guidelines, Priority category, Scheme, Risk Analysis	**08**

IV	Software Testing Activities: Levels of Testing, Debugging, Testing techniques and their applicability, Exploratory Testing Automated Test Data Generation: Test Data, Approaches to test data generation, test data generation using genetic algorithm, Test Data Generation Tools, Software Testing Tools, and Software test Plan.	**08**
V	Object Oriented Testing: Definition, Issues, Class Testing, Object Oriented Integration and System Testing. Testing Web Applications: Web Testing, User Interface Testing, Usability Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing	**08**

Text books:

1. Yogesh Singh, "Software Testing", Cambridge University Press, New York, 2012
2. K..K. Aggarwal & Yogesh Singh, "Software Engineering", New Age International Publishers, New Delhi, 2003.
3. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Fifth Edition, McGraw-Hill International Edition, New Delhi,2001.
4. Marc Roper, "Software Testing", McGraw-Hill Book Co., London, 1994.
5. M.C. Trivedi, Software Testing & Audit, Khanna Publishing House 6. Boris Beizer, "Software System Testing and Quality Assurance", Van Nostrand Reinhold, New York, 1984

DISTRIBUTED SYSTEM		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	To provide hardware and software issues in modern distributed systems.	K1 , K2
CO 2	To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.	K2
CO 3	To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.	K4
CO 4	To know about Shared Memory Techniques and have Sufficient knowledge about file access	K1
CO 5	Have knowledge of Synchronization and Deadlock.	K1

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1	2	1		1						
CO2	1	2	1	1	1		1					
CO3	1	1	2	2	1	1	1					
CO4	2	2		2	1		1					
CO5	1	2	2	1	2	1						

DETAILED SYLLABUS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Characterization of Distributed Systems**: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models. Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks ,Lamport's & vectors logical clocks. Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.	**08**
II	**Distributed Mutual Exclusion:** Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms. Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.	**08**
III	**Agreement Protocols:** Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system. Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.	**08**
IV	Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems. Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols	**08**

V	**Transactions and Concurrency Control**: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control. Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.	**08**

Text books:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", McGraw Hill
3. Vijay K.Garg Elements of Distributed Computing , Wiley
4. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education 5. Tenanuanbaum, Steen," Distributed Systems", PHI

Deep Learning		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able :		
CO 1	To present the mathematical, statistical and computational challenges of building neural networks	K_1 , K_2
CO 2	To study the concepts of deep learning	K_1 , K_2
CO 3	To introduce dimensionality reduction techniques	K_2
CO 4	To enable the students to know deep learning techniques to support real-time applications	K_2 , K_3
CO 5	To examine the case studies of deep learning techniques	K_3, K_6
DETAILED SYLLABUS		**3-0-0**

Unit	Topic	Proposed Lecture
I	INTRODUCTION : Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates	**08**
II	DEEP NETWORKS : History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks-Convolutional Networks- Generative Adversarial Networks (GAN), Semisupervised Learning	**08**
III	DIMENTIONALITY REDUCTION 9 Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyper parameter optimization	**08**
IV	OPTIMIZATION AND GENERALIZATION : Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience	**08**
V	CASE STUDY AND APPLICATIONS : Image net- Detection-Audio Wave Net-Natural Language Processing Word2Vec - Joint Detection-Bioinformatics- Face Recognition- Scene Understanding- Gathering Image Captions	**08**

Text books:

1. Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
2. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
3. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
4. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.

Mapping with MOOCS: https://onlinecourses.nptel.ac.in/noc18_cs41/preview

Service Oriented Architecture		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able :		
CO 1	Comprehend the need for SOA and its systematic evolution.	K1 , K2
CO 2	Apply SOA technologies to enterprise domain.	K3
CO 3	Design and analyze various SOA patterns and techniques.	K4
CO 4	Compare and evaluate best strategies and practices of SOA.	K2
CO 5	Understand the business case for SOA	K1

Correlation between Outcomes (COs) and Program Outcomes (POs)

	Programme Outcome (POs)														
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
				-	-	-	-	-	-	-	-	-			
CO1	2	1	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	1	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	1	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-	2	3	-
CO5	2	1	1										2	2	

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** SOA and MSA Basics: Service Orientation in Daily Life, Evolution of SOA and MSA. Service oriented Architecture and Microservices architecture – Drivers for SOA, Dimensions of SOA, Conceptual Model of SOA, Standards and Guidelines for SOA, Emergence of MSA. **Enterprise-Wide SOA:** Considerations for Enterprise-wide SOA, Strawman Architecture for Enterprise-wide SOA, Enterprise SOA Reference Architecture, Object-oriented Analysis and Design (OOAD) Process, Service-oriented Analysis and Design (SOAD) Process, SOA Methodology for Enterprise	**08**
II	**Service-Oriented Applications:** Considerations for Service-oriented Applications, Patterns for SOA, Pattern-based Architecture for Service-oriented Applications, Composite Applications, Composite Application Programming Model. **Service-Oriented Analysis and Design:** Need for Models, Principles of Service Design, Nonfunctional Properties for Services, Design of Activity Services (or Business Services), Design of Data Services, Design of Client Services, Design of Business Process Services.	
III	**Technologies for SOA:** Technologies for Service Enablement, Technologies for Service Integration, Technologies for Service Orchestration. **SOA Governance and Implementation:** Strategic Architecture Governance, Service Design-time Governance, Service Run-time Governance, Approach for Enterprise-wide SOA Implementation.	

IV	**Big Data and SOA:** Concepts, Big Data and its characteristics, Technologies for Big Data, Service-orientation for Big Data Solutions. **Business Case for SOA:** Stakeholder Objectives, Benefits of SOA, Cost Savings, Return on Investment (ROI), Build a Case for SOA
V	**SOA Best Practices:** SOA Strategy – Best Practices, SOA Development – Best Practices, SOA Governance – Best Practices. **EA and SOA for Business and IT Alignment:** Enterprise Architecture, Need for Business and It Alignment, EA and SOA for Business and It Alignment

Text books:

1. Shankar Kambhampaty; Service - Oriented Architecture & Microservices Architecture: For Enterprise, Cloud, Big Data and Mobile; Wiley; 3rd Edition; 2018; ISBN: 9788126564064.
2. Icon Group International; The 2018-2023 World Outlook for Service-Oriented Architecture (SOA) Software and Services; ICON Group International; 1st Edition, 2017; ASIN: B06WGPN8YD.
3. Thomas Erl; Service Oriented Architecture Concepts Technology & Design; Pearson Education Limited; 2015; ISBN-13: 9788131714904.
4. Guido Schmutz, Peter Welkenbach, Daniel Liebhart; Service Oriented Architecture An Integration Blueprint; Shroff Publishers & Distributors; 2010; ISBN-13: 9789350231081

Quantum Computing		
Course Outcome (CO)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Distinguish problems of different computational complexity and explain why certain problems are rendered tractable by quantum computation with reference to the relevant concepts in quantum theory.	K_1 , K_2
CO 2	Demonstrate an understanding of a quantum computing algorithm by simulating it on a classical computer, and state some of the practical challenges in building a quantum computer.	K_2 , K_3
CO 3	Contribute to a medium-scale application program as part of a co-operative team, making use of appropriate collaborative development tools (such as version control systems).	K_2 , K_3
CO 4	Produce code and documentation that is comprehensible to a group of different programmers and present the theoretical background and results of a project in written and verbal form.	K_3 , K_4
CO 5	Apply knowledge, skills, and understanding in executing a defined project of research, development, or investigation and in identifying and implementing relevant outcomes.	K_3, K_6

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1		1		1	1					
CO2	2	1		1	1	2		1				
CO3	1	2		2		1						
CO4	2	1	2	1		1	1					

DETAILED SYLLABUS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Fundamental Concepts:** Global Perspectives, Quantum Bits, Quantum Computation, Quantum Algorithms, Quantum Information, Postulates of Quantum Mechanisms.	**08**
II	**Quantum Computation**: Quantum Circuits – Quantum algorithms, Single Orbit operations, Control Operations, Measurement, Universal Quantum Gates, Simulation of Quantum Systems, Quantum Fourier transform, Phase estimation, Applications, Quantum search algorithms – Quantum counting – Speeding up the solution of NP – complete problems – Quantum Search for an unstructured database.	**08**
III	**Quantum Computers:** Guiding Principles, Conditions for Quantum Computation, Harmonic Oscillator Quantum Computer, Optical Photon Quantum Computer – Optical cavity Quantum electrodynamics, Ion traps, Nuclear Magnetic resonance	**08**

IV	**Quantum Information:** Quantum noise and Quantum Operations – Classical Noise and Markov Processes, Quantum Operations, Examples of Quantum noise and Quantum Operations – Applications of Quantum operations, Limitations of the Quantum operations formalism, Distance Measures for Quantum information.	**08**
V	**Quantum Error Correction:** Introduction, Shor code, Theory of Quantum Error –Correction, Constructing Quantum Codes, Stabilizer codes, Fault – Tolerant Quantum Computation, Entropy and information – Shannon Entropy, Basic properties of Entropy, Von Neumann, Strong Sub Additivity, Data Compression, Entanglement as a physical resource .	**08**

Text books:

1. Micheal A. Nielsen. &Issac L. Chiang, "Quantum Computation and Quantum Information", Cambridge University Press, Fint South Asian edition, 2002.
2. Eleanor G. Rieffel, Wolfgang H. Polak , "Quantum Computing - A Gentle Introduction" (Scientific and Engineering Computation) Paperback – Import, Oct 2014
3. Computing since Democritus by Scott Aaronson, Computer Science: An Introduction by N. DavidMermin 5. Yanofsky's and Mannucci, Quantum Computing for Computer Scientists.

Mobile Computing		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course, the student will be able to understand		
CO 1	Explain and discuss issues in mobile computing and illustrate overview of wireless telephony and channel allocation in cellular systems.	K1, K4
CO 2	Explore the concept of Wireless Networking and Wireless LAN.	K1
CO 3	Analyse and comprehend Data management issues like data replication for mobile computers, adaptive clustering for mobile wireless networks and Disconnected operations.	K4
CO 4	Identify Mobile computing Agents and state the issues pertaining to security and fault tolerance in mobile computing environment.	K1, K2
CO 5	Compare and contrast various routing protocols and will identify and interpret the performance of network systems using Adhoc networks.	K2

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	2	3	1	2	1	1	1	1	1	3	
CO2	3			3	3				2	1		
CO3	1	3	2	3		1		1				
CO4	2	1	2		3	3	3		1		2	
CO5	2	1	3	1			3		2		3	

DETAILED SYLLABUS		3-1-0
Unit	**Topic**	**Proposed Lecture**
I	Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.	**08**
II	Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.	**08**
III	Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.	**08**
IV	Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.	**08**
V	Ad Hoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.	**08**

Text books:

1. J. Schiller, Mobile Communications, Addison Wesley.
2. A. Mehrotra, GSM System Engineering.
3. M. V. D. Heijden, M. Taylor, Understanding WAP, Artech House.
4. Charles Perkins, Mobile IP, Addison Wesley.
5. Charles Perkins, Ad hoc Networks, Addison Wesley.

Internet of Things		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course, the student will be able to understand		
CO 1	Demonstrate basic concepts, principles and challenges in IoT.	K1,K2
CO 2	Illustrate functioning of hardware devices and sensors used for IoT.	K2
CO 3	Analyze network communication aspects and protocols used in IoT.	K4
CO 4	Apply IoT for developing real life applications using Ardunio programming.	K3
CP 5	To develop IoT infrastructure for popular applications	K_2, K_3

CO PO MAPPING:

PO	**PO**											
CO	**PO I**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1		2	1	1	1	1				
CO2	1	2	1	2	1		1				1	
CO3	2	1		2	1	1		1				
CO4	1	2	1	1		2	1					
CO5	2		1	2	1	2	1	1				

DETAILED SYLLABUS		**3-1-0**
Unit	**Topic**	**Proposed Lecture**
I	**Internet of Things (IoT):** Vision, Definition, Conceptual Framework, Architectural view, technology behind IoT, Sources of the IoT, M2M Communication, IoT Examples. Design Principles for Connected Devices: IoT/M2M systems layers and design standardization, communication technologies, data enrichment and consolidation, ease of designing and affordability	**08**
II	**Hardware for IoT:** Sensors, Digital sensors, actuators, radio frequency identification (RFID) technology, wireless sensor networks, participatory sensing technology. Embedded Platforms for IoT: Embedded computing basics, Overview of IOT supported Hardware platforms such as Arduino, NetArduino, Raspberry pi, Beagle Bone, Intel Galileo boards and ARM cortex.	**08**
III	**Network & Communication aspects in IoT:** Wireless Medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination	**08**
IV	**Programming the Ardunio:** Ardunio Platform Boards Anatomy, Ardunio IDE, coding, using emulator, using libraries, additions in ardunio, programming the ardunio for IoT.	**08**

V	**Challenges in IoT Design challenges:** Development Challenges, Security Challenges, Other challenges IoT Applications: Smart Metering, E-health, City Automation, Automotive Applications, home automation, smart cards, communicating data with H/W units, mobiles, tablets, Designing of smart street lights in smart city.	**08**

Text books:

1. Olivier Hersent,David Boswarthick, Omar Elloumi "The Internet of Things key applications and protocols", wiley
2. Jeeva Jose, Internet of Things, Khanna Publishing House
3. Michael Miller "The Internet of Things" by Pearson
4. Raj Kamal "INTERNET OF THINGS", McGraw-Hill, 1ST Edition, 2016
5. ArshdeepBahga, Vijay Madisetti "Internet of Things (A hands on approach)" 1ST edition, VPI publications,2014
6. Adrian McEwen,Hakin Cassimally "Designing the Internet of Things" Wiley India

Cloud Computing		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Describe architecture and underlying principles of cloud computing.	K_3
CO 2	Explain need, types and tools of Virtualization for cloud.	K_3, K_4
CO 3	Describe Services Oriented Architecture and various types of cloud services.	K_2, K_3
CO 4	Explain Inter cloud resources management cloud storage services and their providers Assess security services and standards for cloud computing.	K_2, K_4
CO 5	Analyze advanced cloud technologies.	K_3, K_6

CO/PO MAPPING:

CO \ PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	2	2	2	1	2	2	3	3	3	3
CO2	3	3	3	2	2	2	2	1	2	2	3	3	3	3
CO3	3	3	2	2	2	2	2	1	2	2	3	3	3	3
CO4	3	3	2	2	3	3	2	1	2	2	3	3	3	3
CO5	3	3	3	3	3	2	2	1	2	2	3	3	3	3

DETAILED SYLLABUS		3-1-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction To Cloud Computing:** Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.	**08**
II	**Cloud Enabling Technologies Service Oriented Architecture:** REST and Systems of Systems – Web Services – Publish, Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices –Virtualization Support and Disaster Recovery.	**08**
III	**Cloud Architecture, Services And Storage:** Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds – IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.	**08**
IV	**Resource Management And Security In Cloud:** Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.	**08**

V	**Cloud Technologies And Advancements Hadoop:** MapReduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine —- Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.	**08**

Text books:

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, John W., and James F. Ransome, —Cloud Computing: Implementation, Management and Security, CRC Press, 2017.
3. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, —Mastering Cloud Computing, Tata Mcgraw Hill, 2013.
4. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing – A Practical Approach, Tata Mcgraw Hill, 2009.
5. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), O'Reilly, 2009.

Block chain Architecture Design		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to		
CO 1	Describe the basic understanding of Blockchain architecture along with its primitive.	K_1, K_2
CO 2	Explain the requirements for basic protocol along with scalability aspects.	K_2, K_3
CO 3	Design and deploy the consensus process using frontend and backend.	K_3, K_4
CO 4	Apply Blockchain techniques for different use cases like Finance, Trade/Supply and Government activities.	K_4, K_5

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	3	2	2	1	1					
CO2	3		2	1		1		1				
CO3	2	1	3	1	2	1	1					
CO4	1	1	2	2		1		1				
CO5	3	2		2	1		1	1				

DETAILED SYLLABUS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to Blockchain**: Digital Money to Distributed Ledgers , Design Primitives: Protocols, Security, Consensus, Permissions, Privacy. Blockchain Architecture and Design: Basic crypto primitives: Hash, Signature,) Hashchain to Blockchain, Basic consensus mechanisms	**08**
II	**Consensus:** Requirements for the consensus protocols, Proof of Work (PoW), Scalability aspects of Blockchain consensus protocols Permissioned Blockchains:Design goals, Consensus protocols for Permissioned Blockchains	**08**
III	**Hyperledger Fabric (A):** Decomposing the consensus process , Hyperledger fabric components, Chaincode Design and Implementation **Hyperledger Fabric (B):** Beyond Chaincode: fabric SDK and Front End (b) Hyperledger composer tool	**08**
IV	**Use case 1 :** Blockchain in Financial Software and Systems (FSS): (i) Settlements, (ii) KYC, (iii) Capital markets, (iv) Insurance **Use case 2:** Blockchain in trade/supply chain: (i) Provenance of goods, visibility, trade/supply chain finance, invoice management discounting, etc	**08**

V	**Use case 3**: Blockchain for Government: (i) Digital identity, land records and other kinds of record keeping between government entities, (ii) public distribution system social welfare systems Blockchain Cryptography, Privacy and Security on Blockchain	**08**

Text books:

1. Mstering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos
2. Blockchain by Melanie Swa, O'Reilly
3. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric
4. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits - https://www.redbooks.ibm.com/ Redbooks.nsf/RedbookAbstracts/crse0401.html

Mini Project or Internship Assessment		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Developing a technical artifact requiring new technical skills and effectively utilizing a new software tool to complete a task	K_4 , K_5
CO 2	Writing requirements documentation, Selecting appropriate technologies, identifying and creating appropriate test cases for systems.	K_5 , K_6
CO 3	Demonstrating understanding of professional customs & practices and working with professional standards.	K_4 , K_5
CO 4	Improving problem-solving, critical thinking skills and report writing.	K_4 , K_5
CO 5	Learning professional skills like exercising leadership, behaving professionally, behaving ethically, listening effectively, participating as a member of a team, developing appropriate workplace attitudes.	K_2, K_4

CO \ PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	2	3	3	2	1	3	3	3	3	2	1
CO2	3	3	3	2	3	3	2	1	3	3	3	3	3	2
CO3	3	3	3	3	3	3	2	1	3	3	3	3	1	2
CO4	3	3	2	2	3	3	2	1	3	3	3	3	2	3
CO5	3	3	2	2	3	3	2	1	3	3	3	3	2	3

Project		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Analyze and understand the real life problem and apply their knowledge to get programming solution.	K_4 , K_5
CO 2	Engage in the creative design process through the integration and application of diverse technical knowledge and expertise to meet customer needs and address social issues.	K_4 , K_5
CO 3	Use the various tools and techniques, coding practices for developing real life solution to the problem.	K_5 , K_6
CO 4	Find out the errors in software solutions and establishing the process to design maintainable software applications	K_4 , K_5
CO 5	Write the report about what they are doing in project and learning the team working skills	K_5, K_6

CO\PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	1	1	3	3	3	3	3	3
CO2	3	3	3	3	2	2	1	1	3	2	3	3	3	3
CO3	3	3	3	3	2	2	1	1	3	2	3	3	3	3
CO4	3	3	3	3	2	2	1	1	3	2	2	3	3	3
CO5	3	3	3	3	2	2	1	1	3	2	1	2	3	3

Note:

1. The Student shall choose an open Elective from the list in such a manner that he/she has not studied the same course in any form during the degree programme.
2. * It is mandatory that for these subjects (KOE069, KOE076, KOE087,KOE097 & KOE098) only Trained Faculty (who had done the FDP for these courses) will teach the courses.

Open Elective List II (VII Semester) 2021-22

B.Tech. VII Semester (2021-22)

OPEN ELECTIVE-II

	FILTER DESIGN
	BIOECONOMICS
	MACHINE LEARNING
	RENEWABLE ENERGY RESOURCES
	OPERATIONS RESEARCH
	VISION FOR HUMANE SOCIETY
	DESIGN THINKING
	SOIL AND WATER CONSERVATION ENGINEERING
	INTRODUCTION TO WOMEN'S AND GENDER STUDIES

	FILTER DESIGN	3L:0T:0P	3 Credits

COURSE OBJECTIVE: Students undergoing this course are expected to:

1. Understand about the characteristics of different filters.
2. Understand the concept of Approximation Theory.
3. Learn about the switched capacitor filter.

COURSE OUTCOME: After completion of the course student will be able to:

CO1	Choose an appropriate transform for the given signal.
CO2	Choose appropriate decimation and interpolation factors for high performance filters.
CO3	Model and design an AR system.
CO4	Implement filter algorithms on a given DSP processor platform.

Unit	Topics	Lectures
I	Introduction: Fundamentals, Types of filters and descriptive terminology, why we use Analog Filters, Circuit elements and scaling, Circuit simulation and modelling. Operational amplifiers: Op-amp models, Op-amp slew rate, Operational amplifiers with resistive feedback: Noninverting and Inverting, Analysing Op-amp circuits, Block diagrams and feedback, The Voltage follower, Addition and subtraction, Application of Op-amp resistor circuits.	8
II	First order filter: Bilinear transfer functions and frequency response – Bilinear transfer function and its parts, realization of passive elements, Bode plots, Active realization, The effect of A(s), cascade design.	8
III	Second order low pass and band pass filters: Design parameters, Second order circuit, frequency response of low pass and band pass circuits, Integrators and others biquads.	8
IV	Second order filters with arbitrary transmission zeros: By using summing, By voltage feed forward, cascade design revisited. Low pass filters with maximally flat magnitude: the ideal low pass filter, Butterworth response, Butterworth pole locations, low pass filter specifications, arbitrary transmission zeros.	8
V	Low pass filter with equal ripple (Chebyshev) magnitude response: The chebyshev polynomial ,The chebyshev magnitude response, Location of chebyshev poles, Comparison of maximally flat & equal–ripple responses, Chebyshev filter design Inverse chebyshev and cauer filters: Inverse chebyshev response, From specifications to pole and zero locations, Cauer magnitude response, Chebyshev rational functions, Cauer filter design.	8

Text Book:
1. Rolf. Schaumann, Haiqiao Xiao, Mac. E. Van Valkenburg, "Analog Filter Design", 2ndIndian Edition, Oxford University Press.

Reference Books:
1. J. Michael Jacob, "Applications and Design with Analog Integrated Circuits", Second edition, Pearson.
2. T. Deliyannis, Yichuang Sun, J.K. Fidler, "Continuous-Time Active Filter Design",CRC Press.

OPEN ELECTIVES II LIST 2021-22

	BIOECONOMICS	3L:0T:0P	3 Credits

OBJECTIVE:

This course is designed with an objective to provide an understanding of the basic knowledge of bioecomics to students so that they can explore entrepreneurship opportunities in the bio based industry. This course also serves interdisciplinary innovation in terms of sustainable bioeconomy

COURSE OUTCOME: After completion of the course student will be able to:

1. Students will be able to understand basic concept of Bioeconomics, challenges, opportunities& regulations
2. Students will be able to understand development and innovation in terms of bioeconomy towards sustainable development
3. Students will be able to understand Inter- and transdisciplinarity in bioeconomy &research approaches
4. Students will be able to explain biobased resources ,value chain, innovative use of biomass and biological knowledge to provide food, feed, industrial products

Unit	Topics	Lectures
I	Introduction: Fundamentals, Types of filters and descriptive terminology, why we use Analog Filters, Circuit elements and scaling, Circuit simulation and modelling. Operational amplifiers: Op-amp models, Op-amp slew rate, Operational amplifiers with resistive feedback: Noninverting and Inverting, Analysing Op-amp circuits, Block diagrams and feedback, The Voltage follower, Addition and subtraction, Application of Op-amp resistor circuits.	8
II	Economic Growth, Development, and Innovation in terms of bioeconomy, Environmental Economics and the Role of , Modelling and Tools Supporting the Government Transition to a Economy in sustainable Bioeconomy lopment.	8

III	Inter- and transdisciplinarity in Bioeconomy &research approaches, primary production, processing of biobased resources,Markets, Sustainability Management and Entrepreneurshi in biobased products.	8
IV	Biobased Resources and Value Chains, Processing of Biobased Resources, Markets, Sustainability Management and Entrepreneurship opportunity in biobased product. Food Security and Healthy Nutrition in the Context of the Bioeconomy, Use of Biomass for the Production of Fuel and Chemicals, The importance of Biotechnology for the Bioeconomy.	8
V	sustainable and innovative use of biomass and biological knowledge to provide food, feed, industrial products, bioenergy and ecological services, importance of bioeconomyrelated concepts in public, scientific, and political discourse, Dynamic Management of Fossil Fuel, Biofuel.	8

Text Book:

1. Principles of Bioeconomics by I. Sundar, Vedams eBooks (P) Ltd New Delhi, India
2. Bioeconomy:Shaping the Transition to a Sustainable, Biobased Economy by Iris Lewandowski, Springer.
3. Sociobiology and Bioeconomics by Koslowski, Peter
4. Modeling, Dynamics, Optimization and Bioeconomics I, by Pinto, Alberto Adrego, Zilberman,
   David, Springer.

	MACHINE LEARNING	3L:0T:0P	3 Credits

MACHINE LEARNING		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Identify and understand the learning and hypothesis testing	K1,K2
CO 2	Identify and apply learning methods of Decision Tree and artificial neural networks in real world classification	K2,K3
CO 3	Able to understand the Bayes theorem and apply on the learning	K1,K, K4
CO 4	Understand the theory of Computational learning and apply the concepts to handle engineering problems	J5,K3
CO 5	Apply genetic algorithms to combinatorial optimization problems and recognize the feasibility of applying a softcomputing methodology for a particular problem	K2,K, K6

CO/PO MAPPING:

CO\PO Mapping	PO1	PO 2	PO3	PO4	PO 5	PO 6	PO 7	PO8	PO 9	PO10	PO 11	PO 12	PS O1	PS O2
CO1	3	2	2	1	2	2	3	2	3	2	3	2	3	3
CO2	2	1	1	3	1	1	2	1	2	2	2	3	3	3
CO3	2	3	3	1	2	2	1	2	1	1	3	3	3	2
CO4	2	2	3	1	2	1	1	2	2	2	2	3	1	3
CO5	2	1	2	3	1	1	1	2	1	2	3	2	3	3

DETAILED SYLLEBUS

Unit	Topics	Lectures
I	INTRODUCTION – Well defined learning problems, Designing a Learning System, Issues in Machine Learning; THE CONCEPT LEARNING TASK - General-to-specific ordering of hypotheses, Find-S, List then eliminate algorithm, Candidate elimination algorithm, Inductive bias.	8

II	DECISION TREE LEARNING - Decision tree learning algorithmInductive bias- Issues in Decision tree learning; ARTIFICIAL NEURAL NETWORKS – Perceptrons, Gradient descent and the Delta rule, Adaline, Multilayer networks, Derivation of backpropagation rule Backpropagation AlgorithmConvergence, Generalization.	8
III	Evaluating Hypotheses: Estimating Hypotheses Accuracy, Basics of sampling Theory, Comparing Learning Algorithms; Bayesian Learning: Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm.	8
IV	Computational Learning Theory: Sample Complexity for Finite Hypothesis spaces, Sample Complexity for Infinite Hypothesis spaces, The Mistake Bound Model of Learning; INSTANCE-BASED LEARNING – k-Nearest Neighbour Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning.	8
V	Genetic Algorithms: an illustrative example, Hypothesis space search, Genetic Programming, Models of Evolution and Learning; Learning first order rules-sequential covering algorithms-General to specific beam search-FOIL; REINFORCEMENT LEARNING - The Learning Task, Q learning.	8

Text Book:

1. Tom M. Mitchell,―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
2. Ethem Alpaydin,―Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
3. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009.
4. Bishop, C., Pattern Recognition and Machine Learning. Berlin: Springer- Verlag.

	RENEWABLE ENERGY RESOURCES	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	Introduction: Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. Solar Cells: Theory of solar cells. Solar cell materials, solar cell array, solar cell power plant, limitations.	8
II	Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energystorage for solar heating and cooling, limitations.	8
III	Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations. Cells: Principle of working of various types of fuel cells and their working, performance and limitations.	8
IV	Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations. Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. Performance and limitations of energy conversion systems.	8
V	Bio-mass: Availability of bio-mass and its conversion theory. Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations. Wave and Tidal Wave: Principle of working, performance and limitations. Waste Recycling Plants.	8

Text Book:

1. Raja etal, “Introduction to Non-Conventional Energy Resources” Scitech Publications.
2. John Twideu and Tony Weir, “Renewal Energy Resources” BSP Publications, 2006.
3. M.V.R. Koteswara Rao, “Energy Resources: Conventional & Non-Conventional” BSP Publications,2006.
4. D.S. Chauhan,”Non-conventional Energy Resources” New Age International.
5. C.S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.
7. Godfrey Boyle,“ Renewable Energy Power For A Sustainable Future”, Oxford University Press.

	OPERATIONS RESEARCH	3L:0T:0P	3Credits

COURSE OUTCOMES (CO): After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Study the basics of OR and formulate the optimal solution / feasible solution related to various organizations of LPP.
CO2	Study the different method to find the solution of transportation and how to use them in computer application.
CO3	To understand how to assign the task for every person and determine the shortest path/minim cast in network problem.
CO4	Learn the concepts of job sequencing problems like n Jobs and Two machines et, and game theory.
CO5	Develop the concepts to design the CPM and PERT chart and learn the basics of Queuing model.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	2		1	1		1					
CO2		2	1	2		1						
CO3	2	1		2	1		1					
CO4	1	1	2		1		1					
CO5	1		3	1	1	1						

DETAILED SYLLEBUS

Unit	Topics	Lectures
I	Introduction: Definition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study. Linear Programming: Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, sensitivity analysis.	8
II	Transportation Problems: Types of transportation problems, mathematical models, transportation algorithms, Assignment: Allocation and assignment problems and models, processing of job through machines.	8
III	Network Techniques: Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem. Project Management: Phases of project management, guidelines for network	8

	construction, CPM and PERT	
IV	Theory of Games : Rectangular games, Minimax theorem, graphical solution of 2x n or mx2 games, game with mixed strategies, reduction to linear programming model. Quality Systems: Elements of Queuing model, generalized poisson queing model, single server models.	8
V	Inventory Control: Models of inventory, operation of inventory system, quantity discount. Replacement: Replacement models: Equipments that deteriorate with time, equipments that fail with time.	8

Text Book:

1. Wayne L. Winston,"Operations Research" Thomson Learning, 2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education, 2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

OPEN ELECTIVES II LIST 2021-22

	VISION FOR HUMANE SOCIETY	3L:0T:0P	3 Credits

Pre-requisites- for this subject only those faculty will teach these courses who had done the FDP for these courses.

Course Objectives:

1. To help the students to understand the importance and types of relationship with expressions.
2. To develop the competence to think about the conceptual framework of undivided society as well as universal human order.
3. To help the students to develop the exposure for transition from current state to the undivided society and universal human order. Course Methodology:

1. The methodology of this course is exploration and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. It is free from any dogma or set of do's and don'ts related to values.
3. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated and encouraged to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.
4. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous selfevolution.
5. This self-exploration also enables them to critically evaluate their pre- conditionings and present beliefs.

Unit	Topics	Lectures
I	Introduction to the course: Basic aspiration of a Human Being and program for its fulfilment, Need for family and relationship for a Human Being, Human- relationship and role of work in its fulfilment, Comprehensive Human Goal, Need for Undivided Society, Need for Universal Human Order, an appraisal of the Current State, Appraisal of Efforts in this Direction in Human History.	8
II	Understanding Human-Human Relationship & its fulfilment: Recognition of Human-Human Relationship, Recognition of feelings in relationship, Established Values and Expressed Values in Relationship, interrelatedness of feelings and their fulfilment, Expression of feelings, Types of relationship and their purpose, mutual evaluation in relationship, Meaning of justice in relationship, Justice leading to culture, civilization and Human Conduct.	8
III	Justice from family to world family order: Undivided Society as continuity and expanse of Justice in behaviour – family to world family order, continuity of culture and civilization, Universal Order on the basis of Undivided Society, Conceptual Framework for Universal human order, Universal Human Order as continuity and expanse of order in living: from family order to world family order, a conceptual framework for universal human order.	8

IV	Program for Ensuring Undivided Society and Universal Human Order: Education –Sanskar, Health –Sanyam, Production-work, Exchange – storage, Justice-preservation.	8
V	Human Tradition: Scope and Steps of Universal Human Order, Human Tradition (Ex. Family order to world family order), Steps for transition from the current state, Possibilities of participation of students in this direction, Present efforts in this direction, Sum up.	8

Text books:

1. A Foundation Course in Human Values and Profession Ethics (Text Book and Teachers' Manual), R. R. Gaur, R. Asthana, G. P. Bagaria (2010), Excel Books, New Delhi.
2. Avartansheel Arthshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
3. An Appeal by the Dalai Lama to the World: Ethics Are More Important Than Religion, Dalai Lama XIV, 2015.
4. Economy of Permanence – (a quest for social order based on non-violence), J. C. Kumarappa (2010), Sarva-Seva-Sangh-Prakashan, Varansi, India.
1. Energy and Equity, Ivan Illich (1974), The Trinity Press, Worcester & Harper Collins, USA.
2. Human Society, Kingsley Davis, 1949.
3. Hind Swaraj or, Indian home rule Mohandas K. Gandhi, 1909.
4. Integral Humanism, Deendayal Upadhyaya, 1965.
5. Lohiya Ke Vichar, Lok Bharti , Rammanohar Lohiya, 2008.
6. Manav Vyavahar Darshan, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
7. Manaviya Sanvidhan, A. Nagraj, Divya Path Sansthan, Amarkantak, India
8. Samadhanatmak Bhautikvad, A. Nagraj, Divya Path Sansthan, Amarkantak, India
9. Small Is Beautiful: A Study of Economics as if People Mattered, E. F. Schumacher,1973, Blond & Briggs, UK.
10. Slow is Beautiful, Cecile Andrews (http://www.newsociety.com/Books/S/Slow-is- Beautiful)
11. Sociology Themes and Perspectives, Harper Collins; EIGHT edition (2014), Martin Holborn and Peter Langley, 1980.
12. Samagra kranti: Jaya Prakash Narayan's philosophy of social change, Siddharth Publications Renu Sinha, 1996.
13. Science & Humanism – towards a unified worldview, P. L. Dhar & R. R. Gaur (1990), Commonwealth Publishers, New Delhi
14. Vyavaharvadi Samajshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
15. Vyavahatmak Janvad, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
16. The Communist Manifesto, Karl Marx, 1848.
17. Toward a True Kinship of Faiths: How the World's Religions Can Come Together Dalai Lama XIV, 2011

Reference Videos.

1. Kin school (30 minutes) 2.
Technology (Solar City etc.).

	Design Thinking	3L:0T:0P	3Credits

Objective: The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for realtime problems

Unit	Topics	Lectures
I	Introduction to design thinking, traditional problem solving versus design thinking, history of design thinking, wicked problems. Innovation and creativity, the role of innovation and creativity in organizations, creativity in teams and their environments, design mindset. Introduction to elements and principles of design, 13 Musical Notes for Design Mindset, Examples of Great Design, Design Approaches across the world	8
II	Understanding humans as a combination of I (self) and body, basic physical needs up to actualization, prosperity, the gap between desires and actualization. Understanding culture in family society, institution, startup, socialization process. Ethical behavior: effects on self, society, understanding core values and feelings, negative sentiments and how to overcome them, definite human conduct: universal human goal, developing human consciousness in values, policy, and character. Understand stakeholders, techniques to empathize, identify key user problems. Empathy tools- Interviews, empathy maps, emotional mapping, immersion and observations, customer journey maps, and brainstorming, Classifying insights after Observations, Classifying Stakeholders, Do's & Don'ts for Brainstorming, Individual activity- 'Moccasin walk'	8
III	Defining the problem statement, creating personas, Point of View (POV) statements. Research- identifying drivers, information gathering, target groups, samples, and feedbacks. Idea Generation-basic design directions, Themes of Thinking, inspirations and references, brainstorming, inclusion, sketching and presenting ideas, idea evaluation, double diamond approach, analyze – four W's, 5 why's, "How Might We", Defining the problem using Ice-Cream Sticks, Metaphor & Random Association Technique, Mind-Map, ideation activity games - six thinking hats, million-dollar idea, introduction to visual collaboration and brainstorming tools - Mural, JamBoard	8
IV	Fundamental concepts of critical thinking, the difference between critical and ordinary thinking, characteristics of critical thinkers, critical thinking skills- linking ideas, structuring arguments, recognizing incongruences, five pillars of critical thinking, argumentation versus rhetoric, cognitive bias, tribalism, and politics. Case study on applying critical thinking on different scenarios.	8

V	The argument, claim, and statement, identifying premises and conclusion, truth and logic conditions, valid/invalid arguments, strong/weak arguments, deductive argument, argument diagrams, logical reasoning, scientific reasoning, logical fallacies, propositional logic, probability, and judgment, obstacles to critical thinking. Group activity/role plays on evaluating arguments.	8

Text Book:

1. Vijay Kumar, 101 Design Methods: A Structured Approach for Driving Innovation in Your Organization, 2013, John Wiley and Sons Inc, New Jersey
2. BP Banerjee, Foundations of Ethics and Management, 2005, Excel Books
3. Gavin Ambrose and Paul Harris, Basics Design 08: Design Thinking, 2010, AVA Publishing SA
4. Roger L. Martin, Design of Business: Why Design Thinking is the Next Competitive Advantage, 2009, Harvard Business Press, Boston MA

Course Outcome: After successful completion of the course the students will be able to:

1. Develop a strong understanding of the design process and apply it in a variety of business settings
2. Analyze self, culture, teamwork to work in a multidisciplinary environment and exhibit empathetic behavior
3. Formulate specific problem statements of real time issues and generate innovative ideas using design tools
4. Apply critical thinking skills in order to arrive at the root cause from a set of likely causes
5. Demonstrate an enhanced ability to apply design thinking skills for evaluation of claims and arguments.

	Soil and Water Conservation Engineering	3L:0T:0P	3Credits

Unit	Topics	Lectures
I	Definition and scope of soil conservation, cause of soil erosion, Mechanism of erosion, universal soil loss equation, soil erosion due to wind and its control, vegetation management, i.e., strip cropping, stubble mulching and other practices.	8
II	Types of soil erosion due to water- sheet erosion, rill erosion, gully erosion, sediment transport in channels, sediment deposition in reservoirs. Methods of soil erosion control: bounding and terracing on agriculture land for gully control, bench terraces, vegetated water ways, chute spillways, drop inlet spillways, check dams, river training works.	8
III	Biological methods of soil erosion control, grass land management, forest management. Soil quality management, drainage works, reclamation of salt affected soils. Water conservation: water harvesting, rainfall- run off relation, water storage in ponds, lakes, reservoirs and aquifers, groundwater recharge through wells, check dams and storage works.	8
IV	Water losses: filtration, seepage and evaporation losses, pollution/ contamination of water quality due to agricultural practices i.e., fertilizers and pesticides, self purification of surface water, sources of agricultural water pollution, pollutant dispersion in ground water.	8
V	Need of planned utilization of water resources, economics of water resources utilization. Flood plain zones management, modifying the flood, reducing susceptibility to damage, reducing the impact of flooding.	8

Suggested reading:

1. Alam Singh – Modern Geotechnical Engineering
2. K. R. Arora – Soil Mechanics and foundation Engineering.
3. N. C. Brady – Principles of Soil Sciences
4. B. C. Punmia – Soil Mechanics and Foundation Engineering

KOE079	Introduction to Women's and Gender Studies	3L:0T:0P	3Credits

Unit	Topics	Lectures
I	Women and Society: Understanding Sex- Gender, Gender shaping Institutions, Theories of Gender construction Understanding Sexism and Androcentrism, Understanding Patriarchy and Theories of Patriarchy, Private and Public dichotomy, Sexual Division of Work, Patriarchy practices in different institutions and Text Books.	8
II	Feminist Theory: Rise of Feminism, Introduction to various stands of Feminism- Liberal Feminism, Radical Feminism, Marxist Feminism, Socialist Feminism, Cultural Feminism, Eco-Feminism, Post Colonial Feminism, Post Modern Feminism. Waves of Feminism.	8
III	Women's Movement: The socio-economic conditions of women during the age of Industrial revolution the Call for Women's Rights 1848, Women's rights movement 1848-1920,Historical Developments of Social Reform Movements in India , Women's groups and organizations, Women's Movement Movements for Uniform Civil code and ShahBano case, Dalit women and the question of double marginality.	8
IV	Gender Roles and Psychology of Sex: Difference Conceptualization of gender roles and gender role attitudes, Gender: Aggression, Achievement, Communication, Friendship and Romantic, Relationships Sex Differences in Mental Health Trauma relating to Rape , Taboo , Childhood Sexual Abuse , Domestic Violence , Sexual Harassment at Work Place, Educational Institutions, Eve Teasing etc.	8
V	Gender and Representation: Gender and Mass Media- Print Media, Gender and Mass Media-Electronic Media, Gender and Films, Advertisements, Mega Serials, Stereotyping and breaking the norms of women's roles Women's Representation in Literary Texts.	8

Suggested reading:

1.Basab iChakrabarti, Women's Studies: Various Aspects. UrbiPrakashani2014
2.Arvind Narrain. Queer: Despised Sexuality Law and Social Change. Book for Change. 2005
3.Chandra Talpade Mohanty, Feminism without Borders: Decolonizing Theory, Practicing Solidarity. Duke University Press.
4.Flavia Agnes. Law and Gender Inequality: The Politics of Women's Rights in India. Oxford University Press, 2001
5.Sonia Bathla, Women, Democracy and the Media: Cultural and Political Representations in the Indian Press, Sage, New Delhi, 1998.

Note:

1. The Student shall choose an open Elective from the list in such a manner that he/she has not studied the same course in any form during the degree programme.
2. * It is mandatory that for these subjects (KOE069, KOE076, KOE087,KOE097 & KOE098) only Trained Faculty (who had done the FDP for these courses) will teach the courses.

B.Tech. VII Semester (2021-22)

HUMANITIES, SCOCIAL SCIENCE AND MANAGEMENT COURSE

(HSMC COURSE) HSMC1/HSMC2

	RURAL DEVELOPMENT: ADMINISTRATION AND PLANNING
	PROJECT MANAGEMENT & ENTREPRENEURSHIP

OPEN ELECTIVE-II

	FILTER DESIGN
	BIOECONOMICS
	MACHINE LEARNING
	RENEWABLE ENERGY RESOURCES
	OPERATIONS RESEARCH
	VISION FOR HUMANE SOCIETY
	DESIGN THINKING
	SOIL AND WATER CONSERVATION ENGINEERING
	INTRODUCTION TO WOMEN'S AND GENDER STUDIES

	RURAL DEVELOPMENT: ADMINISTRATION AND PLANNING	3L:0T:0P	3 Credits

COURSE OUTCOME: After completion of the course student will be able to:

1. Students can understand the definitions, concepts and components of Rural Development 2. Students will know the importance, structure, significance, resources of Indian rural economy.
3. Students will have a clear idea about the area development programmes and its impact.

4. Students will be able to acquire knowledge about rural entrepreneurship.
5. Students will be able to understand about the using of different methods for human resource planning

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Unit	Topics	Lectures
I	Rural Planning & Development: Concepts of Rural Development, Basic elements of rural Development, and Importance of Rural Development for creation of Sustainable Livelihoods, An overview of Policies and Programmes for Rural Development- Programmes in the agricultural sector, Programmes in the Social Security, Programmes in area of Social Sector.	8
II	Rural Development Programmes: Sriniketan experiment, Gurgaon experiment, marthandam experiment, Baroda experiment, Firkha development scheme, Etawa pilot project, Nilokheri experiment,approaches to rural community development: Tagore, Gandhi etc	8
III	Panchayati Raj & Rural Administration: Administrative Structure: bureaucracy, structure of administration; Panchayati Raj Institutions Emergence and Growth of Panchayati Raj Institutions in India; People and Panchayati Raj; Financial Organizations in Panchayati Raj Institutions, Structure of rural finance, Government & Non-Government Organizations / Community Based Organizations, Concept of Self help group.	8
IV	Human Resource Development in Rural Sector: Need for Human Resource Development, Elements of Human Resource Development in Rural Sector Dimensions of HRD for rural development-Health, Education, Energy, Skill Development, Training, Nutritional Status access to basic amenities - Population composition.	8
V	Rural Industrialization and Entrepreneurship: Concept of R Industrialization, Gandhian approach to Rural Industrialization, Appropriate Technology for Rural Industries, Entrepreneurship and Rural IndustrializationProblems and diagnosis of Rural Entrepreneurship in India, with special reference to Women Entrepreneurship; Development of Small Entrepreneurs in India, need for and scope of entrepreneurship in Rural area.	8

Text Book:

1. Corporate Social Responsibility: An Ethical Approach - Mark S. Schwartz
2. Katar Singh: Rural Development in India – Theory History and Policy
3. TodaroM.P. Economic Development in III World war
4. Arora R.C – Integrated Rural Development in India
5. Dhandekar V.M and Rath N poverty in India
6. A.N.Agarwal and KundanaLal: Rural Economy of India
7. B.K.Prasad: Rural Development-Sarup& Son's Publications.

	PROJECT MANAGEMENT & ENTREPRENEURSHIP	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	Entrepreneurship: Entrepreneurship: need, scope , Entrepreneurial competencies & traits, Factors affecting entrepreneurial development, Entrepreneurial motivation (Mc Clellend's Achievement motivation theory), conceptual model of entrepreneurship , entrepreneur vs. intrapreneur; Classification of entrepreneurs; Entrepreneurial Development Programmes	8
II	Entrepreneurial Idea and Innovation: Introduction to Innovation, Entrepreneurial Idea Generation and Identifying Business Opportunities, Management skills for Entrepreneurs and managing for Value Creation, Creating and Sustaining Enterprising Model & Organizational Effectiveness	8
III	Project Management: Project management: meaning, scope & importance, role of project manager; project life-cycle Project appraisal: Preparation of a real time project feasibility report containing Technical appraisal,; Environmental appraisal, Market appraisal (including market survey for forecasting future demand and sales) and Managerial appraisal.	8
IV	Project Financing: Project cost estimation & working capital requirements, sources of funds, capital budgeting, Risk & uncertainty in project evaluation , preparation of projected financial statements viz. Projected balance sheet, projected income statement, projected funds & cash flow statements, Preparation of detailed project report, Project finance.	8
V	Social Entrepreneurship: Social Sector Perspectives and Social Entrepreneurship, Social Entrepreneurship Opportunities and Successful Models, Social Innovations and Sustainability, Marketing Management for Social Ventures, Risk Management in Social Enterprises, Legal Framework for Social Ventures.	8

Text Book:

1. Innovation and Entrepreneurship by Drucker, P.F.; Harper and Row
2. Business, Entrepreneurship and Management: Rao, V.S.P.;Vikas
3. Entrepreneurship: Roy Rajeev; OUP.
4. Text Book of Project Management: Gopalkrishnan, P. and Ramamoorthy, V.E.; McMillan

5. Project Management for Engineering, Business and Technology: Nicholas, J.M., and Steyn, H.; PHI
6. Project Management: The Managerial Process: Gray, C.F., Larson, E.W. and Desai, G.V.; MGH

	FILTER DESIGN	3L:0T:0P	3 Credits

COURSE OBJECTIVE: Students undergoing this course are expected to:

1. Understand about the characteristics of different filters.
2. Understand the concept of Approximation Theory.
3. Learn about the switched capacitor filter.

COURSE OUTCOME: After completion of the course student will be able to:

CO1	Choose an appropriate transform for the given signal.
CO2	Choose appropriate decimation and interpolation factors for high performance filters.
CO3	Model and design an AR system.
CO4	Implement filter algorithms on a given DSP processor platform.

Unit	Topics	Lectures
I	Introduction: Fundamentals, Types of filters and descriptive terminology, why we use Analog Filters, Circuit elements and scaling, Circuit simulation and modelling. Operational amplifiers: Op-amp models, Op-amp slew rate, Operational amplifiers with resistive feedback: Noninverting and Inverting, Analysing Op-amp circuits, Block diagrams and feedback, The Voltage follower, Addition and subtraction, Application of Op-amp resistor circuits.	8

II	First order filter: Bilinear transfer functions and frequency response – Bilinear transfer function and its parts, realization of passive elements, Bode plots, Active realization, The effect of A(s), cascade design.	8
III	Second order low pass and band pass filters: Design parameters, Second order circuit, frequency response of low pass and band pass circuits, Integrators and others biquads.	8
IV	Second order filters with arbitrary transmission zeros: By using summing, By voltage feed forward, cascade design revisited. Low pass filters with maximally flat magnitude: the ideal low pass filter, Butterworth response, Butterworth pole locations, low pass filter specifications, arbitrary transmission zeros.	8
V	Low pass filter with equal ripple (Chebyshev) magnitude response: The chebyshev polynomial ,The chebyshev magnitude response, Location of chebyshev poles, Comparison of maximally flat & equal–ripple responses, Chebyshev filter design Inverse chebyshev and cauer filters: Inverse chebyshev response, From specifications to pole and zero locations, Cauer magnitude response, Chebyshev rational functions, Cauer filter design.	8

Text Book:

1. Rolf. Schaumann, Haiqiao Xiao, Mac. E. Van Valkenburg, “Analog Filter Design”, 2ndIndian Edition, Oxford University Press.

Reference Books:

1. J. Michael Jacob, “Applications and Design with Analog Integrated Circuits”, Second edition, Pearson.
2. T. Deliyannis, Yichuang Sun, J.K. Fidler, “Continuous-Time Active Filter Design”,CRC Press.

HSMC & OPEN ELECTIVES II LIST 2021-22

	BIOECONOMICS	3L:0T:0P	3 Credits

OBJECTIVE:

This course is designed with an objective to provide an understanding of the basic knowledge of bioecomics to students so that they can explore entrepreneurship opportunities in the bio based industry. This course also serve interdisciplinary innovation in terms of sustainable bioeconomy

COURSE OUTCOME: After completion of the course student will be able to:

1. Students will be able to understand basic concept of Bioeconomics, challenges, opportunities& regulations
2. Students will be able to understand development and innovation in terms of bioeconomy towards sustainable development
3. Students will be able to understand Inter- and transdisciplinarity in bioeconomy &research approaches
4. Students will be able to explain biobased resources ,value chain, innovative use of biomass and biological knowledge to provide food, feed, industrial products

Unit	Topics	Lectures
I	Introduction: Fundamentals, Types of filters and descriptive terminology, why we use Analog Filters, Circuit elements and scaling, Circuit simulation and modelling. Operational amplifiers: Op-amp models, Op-amp slew rate, Operational amplifiers with resistive feedback: Noninverting and Inverting, Analysing Op-amp circuits, Block diagrams and feedback, The Voltage follower, Addition and subtraction, Application of Op-amp resistor circuits.	8
II	Economic Growth, Development, and Innovation in terms of bioeconomy, Environmental Economics and the Role of Government , Modelling and Tools Supporting the Transition to a Bioeconomy Economy in sustainable elopment.	8
III	Inter- and transdisciplinarity in Bioeconomy &research approaches, primary production, processing of biobased resources,Markets, Sustainability Management and Entrepreneurshi in biobased products.	8

IV	Biobased Resources and Value Chains, Processing of Biobased Resources, Markets, Sustainability Management and Entrepreneurship opportunity in biobased product. Food Security and Healthy Nutrition in the Context of the Bioeconomy, Use of Biomass for the Production of Fuel and Chemicals, The importance of Biotechnology for the Bioeconomy.	8
V	sustainable and innovative use of biomass and biological knowledge to provide food, feed, industrial products, bioenergy and ecological services, importance of bioeconomyrelated concepts in public, scientific, and political discourse, Dynamic Management of Fossil Fuel, Biofuel.	8

Text Book:

1. Principles of Bioeconomics by I. Sundar, Vedams eBooks (P) Ltd New Delhi, India
2. Bioeconomy:Shaping the Transition to a Sustainable, Biobased Economy by Iris Lewandowski, Springer.
3. Sociobiology and Bioeconomics by Koslowski, Peter
4. Modeling, Dynamics, Optimization and Bioeconomics I, by Pinto, Alberto Adrego, Zilberman,
David, Springer.

	MACHINE LEARNING	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	INTRODUCTION – Well defined learning problems, Designing a Learning System, Issues in Machine Learning; THE CONCEPT LEARNING TASK - General-to-specific ordering of hypotheses, Find-S, List then eliminate algorithm, Candidate elimination algorithm, Inductive bias.	8
II	DECISION TREE LEARNING - Decision tree learning algorithmInductive bias- Issues in Decision tree learning; ARTIFICIAL NEURAL NETWORKS – Perceptrons, Gradient descent and the Delta rule, Adaline, Multilayer networks, Derivation of backpropagation rule Backpropagation AlgorithmConvergence, Generalization.	8
III	Evaluating Hypotheses: Estimating Hypotheses Accuracy, Basics of sampling Theory, Comparing Learning Algorithms; Bayesian Learning: Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm.	8
IV	Computational Learning Theory: Sample Complexity for Finite Hypothesis spaces, Sample Complexity for Infinite Hypothesis spaces, The Mistake Bound Model of Learning; INSTANCE-BASED LEARNING – k-Nearest Neighbour Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning.	8
V	Genetic Algorithms: an illustrative example, Hypothesis space search, Genetic Programming, Models of Evolution and Learning; Learning first order rules-sequential covering algorithms-General to specific beam search-FOIL; REINFORCEMENT LEARNING - The Learning Task, Q learning.	8

Text Book:

1. Tom M. Mitchell,―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
2. Ethem Alpaydin,―Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
3. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009.
4. Bishop, C., Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.

HSMC & OPEN ELECTIVES II LIST 2021-22

	RENEWABLE ENERGY RESOURCES	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	Introduction: Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. Solar Cells: Theory of solar cells. Solar cell materials, solar cell array, solar cell power plant, limitations.	8
II	Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energystorage for solar heating and cooling, limitations.	8
III	Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations. Cells: Principle of working of various types of fuel cells and their working, performance and limitations.	8
IV	Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations. Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. Performance and limitations of energy conversion systems.	8
V	Bio-mass: Availability of bio-mass and its conversion theory. Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations. Wave and Tidal Wave: Principle of working, performance and limitations. Waste Recycling Plants.	8

Text Book:

1. Raja etal, “Introduction to Non-Conventional Energy Resources” Scitech Publications.
2. John Twideu and Tony Weir, “Renewal Energy Resources” BSP Publications, 2006.
3. M.V.R. Koteswara Rao, “Energy Resources: Conventional & Non-Conventional” BSP Publications,2006.
4. D.S. Chauhan,”Non-conventional Energy Resources” New Age International.
5. C.S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.
7. Godfrey Boyle,“ Renewable Energy Power For A Sustainable Future”, Oxford
   University Press.

HSMC & OPEN ELECTIVES II LIST 2021-22

	OPERATIONS RESEARCH	3L:0T:0P	3Credits

Unit	Topics	Lectures
I	Introduction: Definition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study. Linear Programming: Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, sensitivity analysis.	8
II	Transportation Problems: Types of transportation problems, mathematical models, transportation algorithms, Assignment: Allocation and assignment problems and models, processing of job through machines.	8
III	Network Techniques: Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem. Project Management: Phases of project management, guidelines for network construction, CPM and PERT	8
IV	Theory of Games : Rectangular games, Minimax theorem, graphical solution of 2x n or mx2 games, game with mixed strategies, reduction to linear programming model. Quality Systems: Elements of Queuing model, generalized poisson queing model, single server models.	8
V	Inventory Control: Models of inventory, operation of inventory system, quantity discount. Replacement: Replacement models: Equipments that deteriorate with time, equipments that fail with time.	8

Text Book:

1. Wayne L. Winston,"Operations Research" Thomson Learning, 2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education, 2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

HSMC & OPEN ELECTIVES II LIST 2021-22

	VISION FOR HUMANE SOCIETY	3L:0T:0P	3 Credits

Pre-requisites- for this subject only those faculty will teach these courses who had done the FDP for these courses.

Course Objectives:

1. To help the students to understand the importance and types of relationship with expressions.
2. To develop the competence to think about the conceptual framework of undivided society as well as universal human order.
3. To help the students to develop the exposure for transition from current state to the undivided society and universal human order. Course Methodology:

1. The methodology of this course is exploration and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. It is free from any dogma or set of do's and don'ts related to values.
3. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated and encouraged to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.
4. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous selfevolution.
5. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

Unit	Topics	Lectures
I	Introduction to the course: Basic aspiration of a Human Being and program for its fulfilment, Need for family and relationship for a Human Being, Human- relationship and role of work in its fulfilment, Comprehensive Human Goal, Need for Undivided Society, Need for Universal Human Order, an appraisal of the Current State, Appraisal of Efforts in this Direction in Human History.	8
II	Understanding Human-Human Relationship & its fulfilment: Recognition of Human-Human Relationship, Recognition of feelings in relationship, Established Values and Expressed Values in Relationship, interrelatedness of feelings and their fulfilment, Expression of feelings, Types of relationship and their purpose, mutual evaluation in relationship, Meaning of justice in relationship, Justice leading to culture, civilization and Human Conduct.	8

III	Justice from family to world family order: Undivided Society as continuity and expanse of Justice in behaviour – family to world family order, continuity of culture and civilization, Universal Order on the basis of Undivided Society, Conceptual Framework for Universal human order, Universal Human Order as continuity and expanse of order in living: from family order to world family order, a conceptual framework for universal human order.	8
IV	Program for Ensuring Undivided Society and Universal Human Order: Education – Sanskar, Health –Sanyam, Production-work, Exchange – storage, Justice-preservation.	8
V	Human Tradition: Scope and Steps of Universal Human Order, Human Tradition (Ex. Family order to world family order), Steps for transition from the current state, Possibilities of participation of students in this direction, Present efforts in this direction, Sum up.	8

Text books:

1. A Foundation Course in Human Values and Profession Ethics (Text Book and Teachers' Manual), R. R. Gaur, R. Asthana, G. P. Bagaria (2010), Excel Books, New Delhi.
2. Avartansheel Arthshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
3. An Appeal by the Dalai Lama to the World: Ethics Are More Important Than Religion, Dalai Lama XIV, 2015.
4. Economy of Permanence – (a quest for social order based on non-violence), J. C. Kumarappa (2010), Sarva-Seva-Sangh-Prakashan, Varansi, India.
1. Energy and Equity, Ivan Illich (1974), The Trinity Press, Worcester & Harper Collins, USA.
2. Human Society, Kingsley Davis, 1949.
3. Hind Swaraj or, Indian home rule Mohandas K. Gandhi, 1909.
4. Integral Humanism, Deendayal Upadhyaya, 1965.
5. Lohiya Ke Vichar, Lok Bharti , Rammanohar Lohiya, 2008.
6. Manav Vyavahar Darshan, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
7. Manaviya Sanvidhan, A. Nagraj, Divya Path Sansthan, Amarkantak, India
8. Samadhanatmak Bhautikvad, A. Nagraj, Divya Path Sansthan, Amarkantak, India
9. Small Is Beautiful: A Study of Economics as if People Mattered, E. F. Schumacher,1973, Blond & Briggs, UK.
10. Slow is Beautiful, Cecile Andrews (http://www.newsociety.com/Books/S/Slow-is-Beautiful)
11. Sociology Themes and Perspectives, Harper Collins; EIGHT edition (2014), Martin Holborn and Peter Langley, 1980.
12. Samagra kranti: Jaya Prakash Narayan's philosophy of social change, Siddharth Publications Renu Sinha, 1996.
13. Science & Humanism – towards a unified worldview, P. L. Dhar & R. R. Gaur (1990), Commonwealth Publishers, New Delhi

14. Vyavaharvadi Samajshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
15. Vyavahatmak Janvad, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
16. The Communist Manifesto, Karl Marx, 1848.
17. Toward a True Kinship of Faiths: How the World's Religions Can Come Together Dalai Lama XIV, 2011

Reference Videos.

1. Kin school (30 minutes) 2. Technology (Solar City etc.).
3. Natural Farming.
4. Economics of Happiness (1h 8m).

	DESIGN THINKING	3L:0T:0P	3Credits

Course Objective: The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for realtime problems

Course Outcome: After successful completion of the course the students will be able to:

1. Develop a strong understanding of the design process and apply it in a variety of business settings
2. Analyze self, culture, teamwork to work in a multidisciplinary environment and exhibit empathetic behavior
3. Formulate specific problem statements of real time issues and generate innovative ideas using design tools
4. Apply critical thinking skills in order to arrive at the root cause from a set of likely causes
5. Demonstrate an enhanced ability to apply design thinking skills for evaluation of claims and arguments.

Unit	Topics	Lectures
I	Introduction to design thinking, traditional problem solving versus design thinking, history of design thinking, wicked problems. Innovation and creativity, the role of innovation and creativity in organizations, creativity in teams and their environments, design mindset. Introduction to elements and principles of design, 13 Musical Notes for Design Mindset, Examples of Great Design, Design Approaches across the world	8
II	Understanding humans as a combination of I (self) and body, basic physical needs up to actualization, prosperity, the gap between desires and actualization. Understanding culture in family society, institution, startup, socialization process. Ethical behavior: effects on self, society, understanding core values and feelings, negative sentiments and how to overcome them, definite human conduct: universal human goal, developing human consciousness in values, policy, and character. Understand stakeholders, techniques to empathize, identify key user problems. Empathy tools- Interviews, empathy maps, emotional mapping, immersion and observations, customer journey maps, and brainstorming, Classifying insights after Observations, Classifying Stakeholders, Do's & Don'ts for Brainstorming, Individual activity- 'Moccasin walk'	8

III	Defining the problem statement, creating personas, Point of View (POV) statements. Research- identifying drivers, information gathering, target groups, samples, and feedbacks. Idea Generation-basic design directions, Themes of Thinking, inspirations and references, brainstorming, inclusion, sketching and presenting ideas, idea evaluation, double diamond approach, analyze – four W's, 5 why's, "How Might We", Defining the problem using Ice-Cream Sticks, Metaphor & Random Association Technique, Mind-Map, ideation activity games - six thinking hats, million-dollar idea, introduction to visual collaboration and brainstorming tools - Mural, JamBoard	8
IV	Fundamental concepts of critical thinking, the difference between critical and ordinary thinking, characteristics of critical thinkers, critical thinking skills- linking ideas, structuring arguments, recognizing incongruences, five pillars of critical thinking, argumentation versus rhetoric, cognitive bias, tribalism, and politics. Case study on applying critical thinking on different scenarios.	8
V	The argument, claim, and statement, identifying premises and conclusion, truth and logic conditions, valid/invalid arguments, strong/weak arguments, deductive argument, argument diagrams, logical reasoning, scientific reasoning, logical fallacies, propositional logic, probability, and judgment, obstacles to critical thinking. Group activity/role plays on evaluating arguments.	8

Text Book:

1. Vijay Kumar, 101 Design Methods: A Structured Approach for Driving Innovation in Your Organization, 2013, John Wiley and Sons Inc, New Jersey
2. BP Banerjee, Foundations of Ethics and Management, 2005, Excel Books
3. Gavin Ambrose and Paul Harris, Basics Design 08: Design Thinking, 2010, AVA Publishing SA
4. Roger L. Martin, Design of Business: Why Design Thinking is the Next Competitive Advantage, 2009, Harvard Business Press, Boston MA

	SOIL AND WATER CONSERVATION ENGINEERING	3L:0T:0P	3Credits

Unit	Topics	Lectures
I	Definition and scope of soil conservation, cause of soil erosion, Mechanism of erosion, universal soil loss equation, soil erosion due to wind and its control, vegetation management, i.e., strip cropping, stubble mulching and other practices.	8
II	Types of soil erosion due to water- sheet erosion, rill erosion, gully erosion, sediment transport in channels, sediment deposition in reservoirs. Methods of soil erosion control: bounding and terracing on agriculture land for gully control, bench terraces, vegetated water ways, chute spillways, drop inlet spillways, check dams, river training works.	8
III	Biological methods of soil erosion control, grass land management, forest management. Soil quality management, drainage works, reclamation of salt affected soils. Water conservation: water harvesting, rainfall- run off relation, water storage in ponds, lakes, reservoirs and aquifers, groundwater recharge through wells, check dams and storage works.	8
IV	Water losses: filtration, seepage and evaporation losses, pollution/ contamination of water quality due to agricultural practices i.e., fertilizers and pesticides, self purification of surface water, sources of agricultural water pollution, pollutant dispersion in ground water.	8
V	Need of planned utilization of water resources, economics of water resources utilization. Flood plain zones management, modifying the flood, reducing susceptibility to damage, reducing the impact of flooding.	8

Suggested reading:

1. Alam Singh – Modern Geotechnical Engineering
2. K. R. Arora – Soil Mechanics and foundation Engineering.
3. N. C. Brady – Principles of Soil Sciences
4. B. C. Punmia – Soil Mechanics and Foundation Engineering

	INTRODUCTION TO WOMEN'S AND GENDER STUDIES	3L:0T:0P	3Credits

Unit	Topics	Lectures
I	Women and Society: Understanding Sex- Gender, Gender shaping Institutions, Theories of Gender construction Understanding Sexism and Androcentrism, Understanding Patriarchy and Theories of Patriarchy, Private and Public dichotomy, Sexual Division of Work, Patriarchy practices in different institutions and Text Books.	8
II	Feminist Theory: Rise of Feminism, Introduction to various stands of Feminism- Liberal Feminism, Radical Feminism, Marxist Feminism, Socialist Feminism, Cultural Feminism, Eco-Feminism, Post Colonial Feminism, Post Modern Feminism. Waves of Feminism.	8
III	Women's Movement: The socio-economic conditions of women during the age of Industrial revolution the Call for Women's Rights 1848, Women's rights movement 1848-1920,Historical Developments of Social Reform Movements in India , Women's groups and organizations, Women's Movement Movements for Uniform Civil code and ShahBano case, Dalit women and the question of double marginality.	8
IV	Gender Roles and Psychology of Sex: Difference Conceptualization of gender roles and gender role attitudes, Gender: Aggression, Achievement, Communication, Friendship and Romantic, Relationships Sex Differences in Mental Health Trauma relating to Rape , Taboo , Childhood Sexual Abuse , Domestic Violence , Sexual Harassment at Work Place, Educational Institutions, Eve Teasing etc.	8
V	Gender and Representation: Gender and Mass Media- Print Media, Gender and Mass Media-Electronic Media, Gender and Films, Advertisements, Mega Serials, Stereotyping and breaking the norms of women's roles Women's Representation in Literary Texts.	8

Suggested reading:

5. Basab iChakrabarti, Women's Studies: Various Aspects. UrbiPrakashani2014
6. Arvind Narrain. Queer: Despised Sexuality Law and Social Change. Book for Change. 2005
7. Chandra Talpade Mohanty, Feminism without Borders: Decolonizing Theory, Practicing Solidarity. Duke University Press.
8. Flavia Agnes. Law and Gender Inequality: The Politics of Women's Rights in India. Oxford University Press, 2001
9. Sonia Bathla, Women, Democracy and the Media: Cultural and Political Representations in the Indian Press, Sage, New Delhi, 1998.

III & IV
OPEN ELECTIVES LIST

AS PER

AICTE MODEL CURRICULUM

[Effective from the Session: 2021-22]

Note:

1. The Student shall choose an open Elective from the list in such a manner that he/she has not studied the same course in any form during the degree programme.
2. ** It is mandatory that for these subjects** only Trained Faculty (who had done the FDP for these courses) will teach the courses.

B. TECH.

VIII Semester (2021-22)

OPEN ELECTIVE –III

	FUNDAMENTALS OF DRONE TECHNOLOGY
	CLOUD COMPUTING
	BIO MEDICAL SIGNAL PROCESSING
	ENTREPRENEURSHIP DEVELOPMENT
	INTRODUCTION TO SMART GRID
	QUALITY MANAGEMENT
	INDUSTRIAL OPTIMIZATION TECHNIQUES
	VIROLOGY
	NATURAL LANGUAGE PROCESSING
	**HUMAN VALUES IN MADHYASTH DARSHAN

OPEN ELECTIVE –IV

	ELECTRIC VEHICLES
	AUTOMATION AND ROBOTICS
	COMPUTERIZED PROCESS CONTROL
	DATA WAREHOUSING & DATA MINING
	DIGITAL AND SOCIAL MEDIA MARKETING
	MODELING OF FIELD-EFFECT NANO DEVICES
	MODELLING AND SIMULATION OF DYNAMIC SYSTEMS
	BIG DATA
	**HUMAN VALUES IN BUDDHA AND JAIN DARSHAN
	**HUMAN VALUES IN VEDIC DARSANA

OPEN ELECTIVE –III

	FUNDAMENTALS OF DRONE TECHNOLOGY
	CLOUD COMPUTING
	BIO MEDICAL SIGNAL PROCESSING
	ENTREPRENEURSHIP DEVELOPMENT
	INTRODUCTION TO SMART GRID
	QUALITY MANAGEMENT
	INDUSTRIAL OPTIMIZATION TECHNIQUES

	VIROLOGY
	NATURAL LANGUAGE PROCESSING
	**HUMAN VALUES IN MADHYASTH DARSHAN

** It is mandatory that for these subjects (**) only Trained Faculty (who had done the FDP for these courses) will teach the courses.

FUNDAMENTALS OF DRONE TECHNOLOGY (UNMANNED AERIAL VEHICLES)

The course is an introduction to flight dynamics and control of aerial vehicles such as drones, UAVs and other such aircrafts, and the current development in the field. It is suitable for graduate and post graduate level with the following course objectives and outcomes.

Eligible Branch: Electronics & Communication, Instrumentation, Aeronautical, Electrical Engineering & Allied Branch, Mechanical, Computer Science & other allied relevant branches.

COURSE OBJECTIVES: The course should enable the students to:

1. To make the students to understand the basic concepts of UAV drone systems.
2. To introduce the stability and control of an aircraft

COURSE OUTCOMES: The student should able to:

1. Ability to design UAV drone system
2. To understand working of different types of engines and its area of applications.
3. To understand static and dynamic stability dynamic instability and control concepts
4. To know the loads taken by aircraft and type of construction and also construction materials in them.

FUNDAMENTALS OF DRONE TECHNOLOGY		
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction to Drones: Introduction to Unmanned Aircraft Systems, History of UAV drones, classification of drones, System Composition, applications.	08

II	Design of UAV Drone Systems: Introduction to Design and Selection of the System, Aerodynamics and Airframe Configurations, Characteristics of Aircraft Types, Design Standards and Regulatory Aspects-India Specific, Design for Stealth.	08
III	Avionics Hardware of Drones: Autopilot, AGL-pressure sensorsservos-accelerometer –gyros-actuators- power supply-processor, integration, installation, configuration.	08
IV	Communication, Payloads and Controls: Payloads, Telemetry, Tracking, controls-PID feedback, radio control frequency range, modems, memory system, simulation, ground test-analysis-trouble shooting.	08
V	Navigation and Testing: Waypoints navigation, ground control software, System Ground Testing, System In-flight Testing, Future Prospects and Challenges	08

Text Books:

1. Reg Austin "Unmanned Aircraft Systems UAV design, development and deployment", Wiley, 2010.
2. Robert C. Nelson, Flight Stability and Automatic Control, McGraw-Hill, Inc, 1998.
3. Kimon P. Valavanis, "Advances in Unmanned Aerial Vehicles: State of the Art and the Road to Autonomy", Springer, 2007
4. Paul G Fahlstrom, Thomas J Gleason, "Introduction to UAV Systems", UAV Systems, Inc, 1998
5. Dr. Armand J. Chaput, "Design of Unmanned Air Vehicle Systems", Lockheed Martin Aeronautics.

CLOUD COMPUTING		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
	At the end of course , the student will be able to understand	
CO1	Understand basic concept and evolution of Cloud Computing.	K1,K2
CO2	Understand the importance of different Cloud enabling technologies and apply their application in real world.	K2,K3
CO3	Understand and analyze multi layered cloud architecture design along with their applications and challenges.	K2,K4
CO4	Understand and Apply Resource management and analyze security systems in cloud	K3,K4
CO5	Analyze and Evaluate the components of open stack, Google Cloud platform, Hadoop, Virtual Box and Amazon web	K4,K5

CO \ PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	2	2	2	1	2	2	3	3	3	3
CO2	3	3	3	2	2	2	2	1	2	2	3	3	3	3
CO3	3	3	2	2	2	2	2	1	2	2	3	3	3	3
CO4	3	3	2	2	3	3	2	1	2	2	3	3	3	3
CO5	3	3	3	3	3	2	2	1	2	2	3	3	3	3

DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction: Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed, History of Cloud Computing - Cloud Architecture - Types of Clouds - Business models around Clouds – Major Players in Cloud Computing- issues in Clouds - Eucalyptus - Nimbus - Open Nebula, CloudSim.	08
II	Cloud Services: Types of Cloud services: Software as a ServicePlatform as a Service –Infrastructure as a Service - Database as a Service - Monitoring as a Service –Communication as services. Service providers- Google, Amazon, Microsoft Azure, IBM, Sales force.	08

III	Collaborating Using Cloud Services: Email Communication over the Cloud - CRM Management – Project Management-Event Management - Task Management – Calendar - Schedules - Word Processing – Presentation – Spreadsheet - Databases – Desktop - Social Networks and Groupware.	08
IV	Virtualization for Cloud: Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization –System VM, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - supervisors – Xen, KVM, VMware, Virtual Box, Hyper-V.	08
V	Security, Standards and Applications: Security in Clouds: Cloud security challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium – The Distributed management Task Force – Standards for application Developers – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud. Hadoop – MapReduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine	08

Text Books:

1. David E.Y. Sarna, "Implementing and Developing Cloud Application", CRC press 2011.
2. Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud computing synopsis and recommendation, May 2011.
3. Anthony T Velte, Toby J Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", McGrawHill 2010.
4. Haley Beard, "Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs", Emereo Pty Limited, July 2008.

BIOMEDICAL SIGNAL PROCESSING		
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction to Bio-Medical Signals: Classification, Acquisition and Difficulties during Acquisition. Basics of Electrocardiography, Electroencephalography, Electromyography & electro-retinography Role of Computers in the Analysis, Processing, Monitoring & Control and image reconstruction in bio-medical field.	08
II	ECG: Measurement of Amplitude and Time Intervals, QRS Detection (Different Methods), ST Segment Analysis, Removal of Baseline Wander and Power line Interferences, Arrhythmia Analysis, Portable Arrhythmia Monitors.	08
III	Data Reduction: Turning Point algorithm, AZTEC Algorithm, Fan Algorithm, Huffman and Modified Huffman Coding, Run Length. Coding.	08
IV	EEG: Neurological Signal Processing, EEG characteristic, linear prediction theory, Sleep EEG, Dynamics of Sleep/Wake transition. Study of pattern of brain waves, Epilepsy-Transition, detection and Estimation. EEG Analysis By Spectral Estimation: The Bt Method, Periodogram, Maximum Entropy Method & AR Method, Moving Average Method. The ARMA Methods, Maximum Likelihood Method.	08
V	EP Estimation: by Signal Averaging, Adaptive Filtering:- General Structures of Adaptive filters, LMS Adaptive Filter, Adaptive Noise Cancelling, Wavelet Detection:- Introduction, Detection By Structural features, Matched Filtering, Adaptive Wavelet Detection, Detection of Overlapping Wavelets.	08

Text Books:

1. Willis J. Tomkin, “Biomedical Digital Signal Processing”, PHI.
2. D. C. Reddy, “Biomedical Signal Processing”, McGraw Hill
3. Crommwell Weibel and Pfeifer, “Biomedical Instrumentation and Measurement”, PHI

Reference Books:

1. Arnon Cohen, “Biomedical Signal Processing (volume-I)”, Licrc Press\
2. Rangaraj M. Rangayyan, “Biomedical Signal Analysis A Case Study Approach”, John Wiley and Sons Inc.
3. John G. Webster, “Medical instrumentation Application and Design”, John Wiley & Sons Inc

ENTREPRENEURSHIP DEVELOPMENT		
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.	08
II	Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.	08
III	Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.	08
IV	Project Planning and control: The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.	08
V	Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.	08

Text Books:

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India

INTRODUCTION TO SMART GRID		
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction: Introduction to Smart Grid: Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid, Concept of Resilient & Self Healing Grid, Present development & International policies in Smart Grid. Case study of Smart Grid. CDM opportunities in Smart Grid.	08
II	Smart Grid Technologies: Introduction to Smart Meters, Real Time Prizing, Smart Appliances, Automatic Meter Reading (AMR), Outage Management System (OMS), Plug in Hybrid Electric Vehicles (PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation.	08
III	Smart Grid Technologies: Smart Substations, Substation Automation, Feeder Automation, Geographic Information System (GIS), Intelligent Electronic Devices (IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System (WAMS), Phase Measurement Unit (PMU), PMUs application to monitoring & control of power system.	08
IV	Microgrids and Distributed Energy Resources: Concept of microgrid, need & application of microgrid, formation of microgrid, Issues of interconnection, protection & control of microgrid, Plastic & Organic solar cells, thin flim solar cells, Variable speed wind generators, fuel cells, microturbines, Captive power plants, Integration of renewable energy sources.	08
V	Power Quality Management in Smart Grid: Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring	08

Text Books:

1. Ali Keyhani, Mohammad N. Marwali, Min Dai, “Integration of Green and Renewable Energy in Electric Power Systems”, Wiley.
2. Clark W. Gellings, “The Smart Grid: Enabling Energy Efficiency and Demand Response”, CRC Press.
3. Janaka Ekanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, “Smart Grid:
4. Technology and Applications”, Wiley.
5. Jean Claude Sabonnadiere, NouredineHadjsaid, “Smart Grids”, Wiley Blackwell 19.
6. Stuart Borlase, “Smart Grids (Power Engineering)”, CRC Press.

Reference Books:

1. Andres Carvallo, John Cooper, “The Advanced Smart Grid: Edge Power Driving Sustainability”,Artech House Publishers July 2011.

2. James Northcote, Green, Robert G. Wilson "Control and Automation of Electric Power Distribution Systems (Power Engineering)", CRC Press.
3. MladenKezunovic, Mark G. Adamiak, Alexander P. Apostolov, Jeffrey George Gilbert "SubstationAutomation (Power Electronice and Power Systems)", Springer
4. R.C. Dugan, Mark F. McGranghan, Surya Santoso, H. Wayne Beaty, "Electrical Power System Quality", 2nd Edition, McGraw Hill Publication.

QUALITY MANAGEMENT		
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Quality Concepts: Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type. Control on Purchased Product: Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. Manufacturing Quality: Methods and techniques for manufacture, inspection and control of product, quality in sales and services, guarantee, analysis of claims.	08
II	Quality Management: Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program. Human Factor in quality Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods.	08
III	Control Charts, Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. Attributes of Control Chart, Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts	08
IV	Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.	08
V	ISO-9000 and its concept of Quality Management, ISO 9000 series, Taguchi method, JIT in some details.	08

Text Books:

1. Lt. Gen. H. Lal, “Total Quality Management”, Eastern Limited, .
2. Greg Bounds, “Beyond Total Quality Management”,McGraw Hill
3. Menon, H.G, “TQM in New Product manufacturing”,McGraw Hill

INDUSTRIAL OPTIMIZATION TECHNIQUES		
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	I Linear Programming: Historical development of optimization, engineering application of optimization, formulation of design problems as a mathematical programing problem. Graphical method of solution, Simplex method, Dual Simplex method and its application in engineering. Transportation and Assignment: Introduction, Mathematical formulations, optimal solution of transportation model. Assignment problems: mathematical formulation, solution of Assignment models (Hungarian method), variation of the Assignment problem, the travelling sales man problem and their application in Engineering.	08
II	Sequencing and Network Analysis: Introduction of sequencing, General assumptions, n Jobs through 2 machines, n jobs through 3 machines, n jobs through m machines, 2 jobs through m machines and their applications in Engineering. Network Analysis: Introduction, Network logic (Network or arrow diagram), Rules for drawing network diagrams, time analysis, forward and backward computation CPM and PERT, and their applications in Engineering.	08
III	Theory of Games and Queueing Models: Introduction, 2 person zero sum games, Maximin and minimax principle, game with saddle point and without saddle point, Principle of dominance, Rectangular games, graphical solution of 2xn or mx2 games. Queuing model: Introduction, Application of Queuing model, generalized Poisson queuing model, single server models and multiple channel Queuing modeland their applications in Engineering.	08
IV	Dynamic Programming and Simulation: Introduction Formulation of Dynamic Programming Problem, Dynamic Programming Algorithm, Forward recursions, Capital Budgeting Problem, Cargo-loading Problem. Solution of LPP by DPP Simulation: Introduction, definition and types of simulation, need for Simulation advantage and disadvantage, application of simulation, simulation procedure, Monte Carlo simulation and their applications in Engineering.	08
V	Inventory Control and Replacement Models: Introduction, types of inventories, Inventory cost, Deterministic and probabilistic (nondeterministic) inventory models and their application in engineering. Replacement models: Introduction, definition, Replacement of items that deteriorate, Replacement of items that fail suddenly, Equipment Renewal Problem, Individual and Group Replacement policies & their applications in Engineering	08

Text Books:

1. Singiresu S. Rao. “Engineering Optimization” Theory and Practice”. New Age International, New Delhi.
2. R. Panneerselvam. “Operations Research “. Prentice- Hall of India, New Delhi
3. Eliezer Naddor. “Inventory Systems”. John Wiley & Sons, Inc. New York

Reference Books:

1. H.A. Taha: Operations Research – An Introduction, Macmillan Publishing Company, Inc., New York.
2. K. Swarup, P.K. Gupta, M. Mohan: “Operations Research”, Sultan Chand and Sons, New Delhi.
3. P.K. Gupta, D.S. Hira: “Operations Research” – An Introduction, S. Chand & Company Limited, New Delhi.
4. S.S. Rao: “Optimization Theory and Applications”, Wiley Eastern Ltd., New

VIROLOGY

OBJECTIVE:

The objective of this course is to help the student learn molecular virology by general principles as opposed to describing each virus family. The rules for viral replication that all viruses follow are illustrated and discussed: while pointing out to the specific features of each virus, the course aims to reveal unity in the virus world rather than diversity. Host-pathogen interactions and examples of viral diseases will be discussed, with particular emphasis on the main principles of vaccine and antiviral drug development

DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	General Concepts: Virus history, Diversity, shapes, sizes and components of genomes. Isolation and purification of viruses and components.	08
II	Consequences of virus infection to animals and human. Viral infection: affect on host macromolecules. Viral infection: establishment of the antiviral state. Viruses counter attack mechanisms. Viral diagnostic techniques: Rapid Antigen testing, RTPCR.	08
III	Classification of viruses and nomenclatures. +strand RNA viruses- Picorna viruses. Flavi viruses- West Nile virus and Dengue virus. Corona viruses- SARS pathogens. Small DNA viruses: parvo- and polyoma viruses. Large DNA viruses: Herpes-adeno-, and poxviruses. Miscellaneous viruses.	08
IV	–ve strand RNA viruses Paramyxo viruses. Orthomyxo viruses: Influenza pathogenesis and Bird flu. Rhabdo viruses: Rabies pathogenesis.. dsRNA viruses- Reo viruses. Retroviruses: structure, classification, life cycle; reverse transcription. Retroviruses: HIV, viral pathogenesis and AIDS.	08
V	Antivirals and viral vaccines Viral Vaccines Conventional vaccines- killed and attenuated, modern vaccinesrecombinant proteins, subunits, DNA vaccines, peptides, immunemodulators (cytokines), vaccine delivery and adjuvants, large scale manufacturing- QA/QC issues. Antivirals Interferons, designing and screening of antivirals, mechanism of action, antiviral libraries, antiretrovirals- mechanism of action and drug resistance. Modern approaches of virus control Anti-sense RNA, siRNA, ribozymes.	08

Reference Books:

1. Antiviral Agents, Vaccines and immunotherapies. Stephen K. Tyring. ISBN 9780367393748 CRC
2. Basic Virology – Edward K Wanger. Blackwell Publication
3. Fundamentals of molecular virology – Acheson and Nicholas H,2011 4. Principles of Virology 2nd edition by S.J.Flint, L.W.Enquist, R.M.Krug,V.R. Racaniello, and A.M.Skalka ASM Press
5. Medical Virology 4th edition by David O.White and Frank J. Fenner. Academic Press.

NATURAL LANGUAGE PROCESSING

COURSE OBJECTIVES:

- To introduce the fundamental concept and techniques of Natural Language Processing
- To be able to map the appropriate techniques with the problem and solve real world problems.

COURSE OUTCOME(CO):

After completion of the course, a student will be able to

COURSEOUTCOME (CO)	DESCRIPTION
CO1	Basics of text components and text processing.
CO2	To differentiate among different techniques while considering different plus andminus of each technique.
CO3	To classify text, reduce Dimensionality, use different Topic ModellingApproaches and Algorithms.
CO4	Ability to understand the advanced processor architecture and concept ofRTOS.
CO5	Analyze text data from different real-world situations.

CO-PO MAPPING:

PO	PO											
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	2		1		1	1			1		
CO2	1	3		2		1			1			
CO3	1	2		1		1	1					
CO4	3		1	1			1					
CO5		3	1		2	1						

DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax.	08
II	Introduction to semantics and knowledge representation, some applications like machine translation, database interface.	08
III	Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top- Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.	08
IV	Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.	08
V	Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.	08

Text Books:

1. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, "NLP: A Paninian Perspective", Prentice Hall, New Delhi.
2. James Allen, "Natural Language Understanding", Pearson Education.
3. D. Jurafsky, J. H. Martin, "Speech and Language Processing", Pearson Education.
4. L. M. Ivansca, S. C. Shapiro, "Natural Language Processing and Language Representation", AAAI Press, 2000.
5. T. Winograd, Language as a Cognitive Process, Addison-Wesley.

HUMAN VALUES IN MADHYASTH DARSHAN		
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
	Catalogue Description: Madhyasth Darshan is a new emerging philosophy that describes the existential realities along with its implication in behaviour and work at the level of individual as well as society. This philosophy has been propounded by Shri A. Nagraj in seventies. It is to be kept in mind that Darshan means realisation which calls for developing the capacity to see the reality in oneself directly. So, any study of Darshan shall help develop this capacity in the students through proper steps of practices and shall not just provide the information.	08
I	Module I: Introduction to Madhyasth Darshan and its Basics Need to study Madhyasth Darshan; introduction, basic formulations of the darshan; the complete expanse of study and the natural outcome of living according to the darshan.	08
II	Module II: Submergence of Nature in Space The ever-present existence in the form of nature submerged in space; nature classified into two categories – material and consciousness, and four orders; the form, property, natural characteristic and selforganization of the four orders, General direction and process of evolution in the nature/ existence.	08
III	Module III: Human Being as an indivisible part of Nature Human being as an indivisible part of nature; various types (five classes) of human beings; human being in the combination of self and body; purpose of self as realization, prosperity for the body; need of behavior and work for attaining the goals of realization and prosperity	08
IV	Module IV: Fulfillment of human goal of realization and prosperity Following natural, social and psychological principles for actualizing the human goal; form of conducive society and order for such practices, study process- achieving realization through self-study and practice while living in such a society (social order).	08
V	Module V: Human Conduct based on Madhyasth Darshan Description of such a realized self, continuity of happiness, peace, satisfaction and bliss through realization, conduct of a realized human being. Possibility of finding solutions to present day problems (such as inequality of rich and poor, man and woman etc.) in the light of it.	

Text Books:

1. Nagraj, A., "Manav Vyavahar Darshan", Jeevan Vidya Prakashan, 3rd edition, 2003

References:

1. Nagraj, A., "Vyavaharvadi Samajshastra", Jeevan Vidya Prakashan, 2nd edition, 2009.
2. Nagraj, A., "Avartanasheel Arthashastra", Jeevan Vidya Prakashan, 1st edition, 1998.
3. Class notes on "Human Values in Madhyasth Darshan" available on www.uhv.org.in
4. PPTs for "Human Values in Madhyasth Darshan" available on www.uhv.org.in
5. Video lectures on "Human Values in Madhyasth Darshan" on AKTU Digital Education

OPEN ELECTIVE –IV

	ELECTRIC VEHICLES
	AUTOMATION AND ROBOTICS
	COMPUTERIZED PROCESS CONTROL
	DATA WAREHOUSING & DATA MINING
	DIGITAL AND SOCIAL MEDIA MARKETING
	MODELING OF FIELD-EFFECT NANO DEVICES
	MODELLING AND SIMULATION OF DYNAMIC SYSTEMS
	BIG DATA
	**HUMAN VALUES IN BUDDHA AND JAIN DARSHAN
	**HUMAN VALUES IN VEDIC DARSANA

** It is mandatory that for these subjects (**) only Trained Faculty (who had done the FDP for these courses) will teach the courses.

ELECTRIC VEHICLES		
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction of Electric Vehicles: Concept of Electrified transportation, Past, present status of electric vehicles, Recent developments and trends in electric vehicles, Comparison of EVs and IC Engine vehicles, Understanding electric vehicle components, Basic EV components and architecture, Autonomy and vehicle computing needs.	08
II	Electric Motor Drives for EV applications: Concept of EV motors, Classification of EV motors, Comparison of Electric motors for EV applications, Recent EV motors, BLDC and SRM, axial flux motor. Introduction to power electronics converters, DC-DC converter, speed control of dc motor, BLDC motor driving schemes.	08
III	EV Batteries and Battery Management System: EV batteries, Lead Acid batteries – Basics, Characteristics, Lithium batteries- Basics, Characteristics, Selection of battery for EVs, Smart battery pack design, Mechanical and reliability aspects of Li Ion packs, UN38 regulation familiarity, Cell balancing in Li Ion, Battery second life and usage in BESS (energy storage systems). BMS - Global price trends, volumetric and gravimetric efficiency trends	08
IV	Charging system design technology for EV applications: Charging system design considerations, AC & DC Charging, Charging methods, On-board/Off-board chargers,Vehicle to charger communication system, OCPP familiarity cloud and device side, metrology, billing and authentication types, understand the computing needs in a charging system, Understand internal major block diagrams and subsystems of low and high power chargers. IEC61850 and 61851 familiarities, IEC61000, 60950/51, IEC62196 key highlights.	08
V	EV Charging Facility Planning: Identification of EV demand, Impact of EV charging on power grid, Energy generation scheduling, different power sources, centralized charging schemes, Energy storage integration into micro-grid, Overview and applicability of AI for the EV ecosystem, design of V2G aggregator, case studies.	08

Reference:

1. C.C.Chan, K.T.Chau. Modern Electric Vehicle Technology, Oxford University Press, NY 2001
2. M.Ehsani, Y.Gao, S.E.Gay, A.Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles – Fundamentals, Theory and Design, CRC Press, 2004
3. James Larminie, John Lowry. Electric Vehicle Technology Explained. Wiley 2012
4. NPTEL Course on Electric Vehicles – Part 1 by Dr. Amit Jain, IIT Delhi
5. Tests on Lithium-ion batteries. Available at: https://www.lithium-batterie-service.de/en/un-38.3-testseries
6. Handbook on Battery Energy Storage Systems- ADB, 2018 Addition Practical Hand (Lab works):
    a. BLDC motor control experiment
    b. E-rickshaw commercial BLDC and driver based live demo
    c. Charge discharge characteristics of Li-Ion batteries and cells
    d. BMS function SoC, SoH and cell balancing dem

AUTOMATION AND ROBOTICS		
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Automation: Definition, Advantages, goals, types, need, laws and principles of Automation. Elements of Automation. Fluid power and its elements, application of fluid power, Pneumatics vs. Hydraulics, benefit and limitations of pneumatics and hydraulics systems, Role of Robotics in Industrial Automation.	08
II	Manufacturing Automation: Classification and type of automatic transfer machines; Automation in part handling and feeding, Analysis of automated flow lines, design of single model, multimode and mixed model production lines. Programmable Manufacturing Automation CNC machine tools, Machining centers, Programmable robots, Robot time estimation in manufacturing operations.	08
III	Robotics: Definition, Classification of Robots - Geometric classification and Control classification, Laws of Robotics, Robot Components, Coordinate Systems, Power Source. Robot anatomy, configuration of robots, joint notation schemes, work volume, manipulator kinematics, position representation, forward and reverse transformations, homogeneous transformations in robot kinematics, D-H notations, kinematics equations, introduction to robot arm dynamics.	08
IV	Robot Drives and Power Transmission Systems: Robot drive mechanisms: Hydraulic/Electric/Pneumatics, servo & stepper motor drives, Mechanical transmission method: Gear transmission, Belt drives, Rollers, chains, Links, Linear to Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearings. Robot end Effectors: Classification of End effectors – active and passive grippers, Tools as end effectors, Drive system for rippers. Mechanical, vacuum and magnetic grippers. Gripper force analysis and gripper design.	08
V	Robot Simulation: Methods of robot programming, Simulation concept, Off-line programming, advantages of offline programming. Robot Applications: Robot applications in manufacturing-Material transfer and machine loading/unloading, Processing operations like Welding & painting, Assembly operations, Inspection automation, Limitation of usage of robots in processing operation. Robot cell design and control, Robot cell layouts-Multiple robots & Machine interference.	08

Text Books:

1 An Introduction to Robot Technology, by Coifet Chirroza, Kogan Page.
2 Robotics for Engineers, by Y. Koren, McGraw Hill.
3 Robotic: Control, Sensing, Vision and Intelligence, by Fu, McGraw Hill.
4 Introduction to Industrial Robotics, by Nagrajan, Pearson India.
5 Robotics, by J.J. Craig, Addison-Wesley.
6 Industrial Robots, by Groover, McGraw Hill.

Robotic Engineering - An Integrated Approach : Richard D. Klafter Thomas A.

COMPUTERIZED PROCESS CONTROL		
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Basics of Computer-Aided Process Control: Role of computers in process control, Elements of a computer aided Process control System, Classification of a Computer–Aided Process Control System Computer Aided Process–control Architecture: Centralized Control Systems, Distributed control Systems, Hierarchical Computer control Systems. Economics of Computer-Aided Process control. Benefits of using Computers in a Process control. Process related Interfaces: Analog Interfaces, Digital Interfaces, Pulse Interfaces, Standard Interfaces.	08
II	Industrial communication System: Communication Networking, Industrial communication Systems, Data Transfer Techniques, Computer Aided Process control software, Types of Computer control Process Software, Real Time Operating System.	08
III	Process Modelling for computerized Process control: Process model, Physical model, Control Model, Process modelling. Modelling Procedure: Goals Definition, Information Preparation, Model Formulation, Solution Finding, Results Analysis, Model Validation.	08
IV	Advanced Strategies For Computerised Process control: Cascade Control, Predictive control, Adaptive Control, Inferential control, Intelligent Control, Statistical control.	08
V	Examples of Computerized Process Control: Electric Oven Temperature Control, Reheat Furnace Temperature control, Thickness and Flatness control System for metal Rolling, Computer-Aided control of Electric Power Generation Plant.	08

Text Books:

1. S. K. Singh, “Computer Aided Process control”, PHI.

Reference Books:

1. C. L. Smith, “Digital computer Process Control”, Ident Educational Publishers.
2. C. D. Johnson, “Process Control Instrumentation Technology”, PHI.
3. Krishan Kant, “Computer Based Industrial Control”
4. Pradeep B. Deshpande & Raymond H. Ash, “Element of Computer Process Control with Advance Control Applications”, Instrument Society of America, 1981.
5. C. M. Houpis & G. B. Lamond, “Digital Control System Theory”,McGraw Hill.

DATA WAREHOUSING & DATA MINING		
	DETAILED SYLLABUS	3-1-0

Unit	Topic	Proposed Lecture
I	Data Warehousing: Overview, Definition, Data Warehousing Components, Building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept.	08
II	Data Warehouse Process and Technology: Warehousing Strategy, Warehouse /management and Support Processes, Warehouse Planning and Implementation, Hardware and Operating Systems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design	08
III	Data Mining: Overview, Motivation, Definition & Functionalities, Data Processing, Form of Data Pre-processing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Discretization and Concept hierarchy generation, Decision Tree	08
IV	Classification: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms. Clustering: Introduction, Similarity and Distance Measures, Hierarchical and Partitional Algorithms. Hierarchical Clustering- CURE and Chameleon. Density Based Methods DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method – Statistical Approach, Association rules: Introduction, Large Item sets, Basic Algorithms, Parallel and Distributed Algorithms, Neural Network approach.	08
V	Data Visualization and Overall Perspective: Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse. Warehousing applications and Recent Trends: Types of Warehousing Applications, Web Mining, Spatial Mining and Temporal Mining.	08

Suggested Readings:

1. Alex Berson, Stephen J. Smith “Data Warehousing, Data-Mining & OLAP”, McGrawHil.
2. Mark Humphries, Michael W. Hawkins, Michelle C. Dy, “Data Warehousing: Architecture and Implementation”, Pearson Education..
3. I. Singh, “Data Mining and Warehousing”, Khanna Publishing House.
4. Margaret H. Dunham, S. Sridhar,”Data Mining:Introductory and Advanced Topics” Pearson Education.

DIGITAL AND SOCIAL MEDIA MARKETING		
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction to Digital Marketing: The new digital world - trends that are driving shifts from traditional marketing practices to digital marketing practices, the modern digital consumer and new consumer's digital journey. Marketing strategies for the digital world-latest practices.	08
II	Social Media Marketing -Introduction to Blogging, Create a blog post for your project. Include headline, imagery, links and post, Content Planning and writing. Introduction to Face book, Twitter, Google +, LinkedIn, YouTube, Instagram and Pinterest; their channel advertising and campaigns.	08
III	Acquiring & Engaging Users through Digital Channels: Understanding the relationship between content and branding and its impact on sales, search engine marketing, mobile marketing, video marketing, and social-media marketing. Marketing gamification, Online campaign management; using marketing analytic tools to segment, target and position; overview of search engine optimization (SEO).	08
IV	Designing Organization for Digital Success: Digital transformation, digital leadership principles, online P.R. and reputation management. ROI of digital strategies, how digital marketing is adding value to business, and evaluating cost effectiveness of digital strategies.	08
V	Digital Innovation and Trends: The contemporary digital revolution, digital transformation framework; security and privatization issues with digital marketing Understanding trends in digital marketing – Indian and global context, online communities and co-creation.	08

Text Books:

1. Moutsy Maiti: Internet Mareting, Oxford University Press India
2. Vandana, Ahuja; Digital Marketing, Oxford University Press India (November, 2015).
3. Eric Greenberg, and Kates, Alexander; Strategic Digital Marketing: Top Digital Experts
4. Share the Formula for Tangible Returns on Your Marketing Investment; McGraw-Hill Professional.
5. Ryan, Damian; Understanding Digital Marketing: marketing strategies for engaging the digital generation; Kogan Page.
6. Tracy L. Tuten & Michael R. Solomon: Social Media Marketing (Sage Publication)

MODELING OF FIELD-EFFECT NANO DEVICES		
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	MOSFET scaling, short channel effects - channel engineering - source/drain engineering - high k dielectric - copper interconnects - strain engineering, SOI MOSFET, multigate transistors – single gate – double gate – triple gate – surround gate, quantum effects – volume inversion – mobility – threshold voltage – inter subband scattering, multigate technology – mobility – gate stack.	08
II	MOS Electrostatics – 1D – 2D MOS Electrostatics, MOSFET CurrentVoltage Characteristics – CMOS Technology – Ultimate limits, double gate MOS system – gate voltage effect - semiconductor thickness effect – asymmetry effect – oxide thickness effect – electron tunnel current – two dimensional confinement, scattering – mobility.	08
III	Silicon nanowire MOSFETs – Evaluvation of I-V characteristics – The I-V characteristics for nondegenerate carrier statistics – The I-V characteristics for degenerate carrier statistics – Carbon nanotube – Band structure of carbon nanotube – Band structure of graphene – Physical structure of nanotube – Band structure of nanotube – Carbon nanotube FETs – Carbon nanotube MOSFETs – Schottky barrier carbon nanotube FETs – Electronic conduction in molecules – General model for ballistic nano transistors – MOSFETs with 0D, 1D, and 2D channels – Molecular transistors – Single electron charging – Single electron transistors.	08
IV	Radiation effects in SOI MOSFETs, total ionizing dose effects – single-gate SOI – multi-gate devices, single event effect, scaling effects.	08
V	Digital circuits – impact of device performance on digital circuits – leakage performance trade off – multi VT devices and circuits – SRAM design, analog circuit design – transconductance - intrinsic gain – flicker noise – self heating –band gap voltage reference – operational amplifier – comparator designs, mixed signal – successive approximation DAC, RF circuits.	08

Text Books:

1. J P Colinge, "FINFETs and other multi-gate transistors", Springer – Series on integrated circuits and systems, 2008
2. Mark Lundstrom, Jing Guo, "Nanoscale Transistors: Device Physics, Modeling and Simulation", Springer, 2006
3. M S Lundstorm, "Fundamentals of Carrier Transport", 2nd Ed., Cambridge University Press, Cambridge UK, 2000.

MODELLING AND SIMULATION OF DYNAMIC SYSTEMS		
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction to modeling and simulation: Introduction to modeling, Examples of models, modeling of dynamic system, Introduction to simulation, MATLAB as a simulation tool, Bond graph modeling, causality, generation of system equations.	08
II	Bond graph modeling of dynamic system: Methods of drawing bond graph model- Mechanical systems & Electrical systems, some basic system models- Mechanical systems, Thermal systems, hydraulic systems, pneumatic systems and electrical systems.	08
III	System models of combined systems: Linearity and non linearity in systems combined rotary and translatory system, electro mechanical system, hydro-mechanical system.	08
IV	Dynamic Response and System Transfer Function: Dynamic response of 1^{st} order system and 2^{nd} order system, performance measures for 2^{nd} order system, system transfer function, transfer function of 1^{st} and 2^{nd} order system Block diagram algebra, signal flow diagram, state variable formulation, frequency response and bode plots.	08
V	Simulation and simulation applications: Simulation using SIMULINK, examples of simulation problems- simple and the compound pendulum, planner mechanisms, validation and verification of the simulation model, parameter estimation methods, system identifications, introduction to optimization.	08

BIG DATA		
	DETAILED SYLLABUS	3-1-0
Unit	Topic	Proposed Lecture
I	Introduction to Big Data: Types of digital data, history of Big Data innovation, introduction to Big Data platform, drivers for Big Data, Big Data architecture and characteristics, 5 Vs of Big Data, Big Data technology components, Big Data importance and applications, Big Data features – security, compliance, auditing and protection, Big Data privacy and ethics, Big Data Analytics, Challenges of conventional systems, intelligent data analysis, nature of data, analytic processes and tools, analysis vs reporting, modern data analytic tools.	08
II	Hadoop: History of Hadoop, Apache Hadoop, the Hadoop Distributed File System, components of Hadoop, data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, Hadoop Echo System. Map-Reduce: Map-Reduce framework and basics, how Map Reduce works, developing a Map Reduce application, unit tests with MR unit, test data and local tests, anatomy of a Map Reduce job run, failures, job scheduling, shuffle and sort, task execution, Map Reduce types, input formats, output formats, Map Reduce features, Real-world Map Reduce	08
III	HDFS (Hadoop Distributed File System): Design of HDFS, HDFS concepts, benefits and challenges, file sizes, block sizes and block abstraction in HDFS, data replication, how does HDFS store, read, and write files, Java interfaces to HDFS, command line interface, Hadoop file system interfaces, data flow, data ingest with Flume and Scoop, Hadoop archives, Hadoop I/O: Compression, serialization, Avro and file-based data structures. Hadoop Environment: Setting up a Hadoop cluster, cluster specification, cluster setup and installation, Hadoop configuration, security in Hadoop, administering Hadoop, HDFS monitoring & maintenance, Hadoop benchmarks, Hadoop in the cloud	08
IV	Hadoop Eco System and YARN: Hadoop ecosystem components, schedulers, fair and capacity, Hadoop 2.0 New Features – Name Node high availability, HDFS federation, MRv2, YARN, Running MRv1 in YARN. NoSQL Databases: Introduction to NoSQL MongoDB: Introduction, data types, creating, updating and deleing documents, querying, introduction to indexing, capped collections Spark: Installing spark, spark applications, jobs, stages and tasks, Resilient Distributed Databases, anatomy of a Spark job run, Spark on YARN SCALA: Introduction, classes and objects, basic types and operators, built-in control structures, functions and closures, inheritance.	08
V	Hadoop Eco System Frameworks: Applications on Big Data using Pig, Hive and HBase Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators, Hive - Apache Hive architecture and installation, Hive shell, Hive services, Hive metastore, comparison with traditional databases, HiveQL, tables, querying data and user defined functions, sorting and aggregating, Map Reduce scripts, joins & subqueries. HBase – Hbase concepts, clients, example, Hbase vs RDBMS, advanced usage, schema design, advance indexing, Zookeeper – how it helps in monitoring a cluster, how to build applications with Zookeeper. IBM Big Data strategy, introduction to Infosphere, BigInsights and Big Sheets, introduction to Big SQL.	08

Suggested Readings:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley.
2. Big-Data Black Book, DT Editorial Services, Wiley.
3. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch, “Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill.
4. Thomas Erl, Wajid Khattak, Paul Buhler, “Big Data Fundamentals: Concepts, Drivers and Techniques”, Prentice Hall.

Text Books:

1. Zeigler B.P. Praehofer. H. and Kim I.G. "Theory of modeling and simulation", 2nd Edition. Academic press 2000.
2. Robert L. Woods, Kent L. Lawrence, “Modeling and simulation of dynamic systems”, Person, 1997.
3. Brown, Forbes T. “Engineering System Dynamics”, New York, NY: CRC, 2001. ISBN: 9780824706166.
4. Pratab.R " Getting started with MATLAB" Oxford university Press 2009.

HUMAN VALUES IN BAUDDHA AND JAIN DARSHAN

Catalogue Description: Bauddha and Jain Darshan form a part of the philosophy of Indian tradition. This course outlines the basic concepts and principles of these two philosophies and provides scope for further reading of the philosophies, so as to gain clarity about the human being, the existence and human participation i.e. human values expressing itself in human conduct.
It is to be kept in mind that Darshan means realization which calls for developing the capacity to see the reality in oneself directly. So, any study of Darshan shall help develop this capacity in the students through proper steps of practices and shall not just provide the information.

DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction to Bauddha and Jain Darshan and their Basics Need to study Bauddha and Jain Darshan; the origin of the these philosophies, their basic principles and scope for further reading.	08
II	Basic Principles of Bauddha Darshan law of impermanence (changability); four noble truths; eightfold path; law of cause- action (pratitya-samutpaad) Definition of some salient words of Buddha Darshan – nirvana, dhamma, tri-ratna(Buddha, Dharma and Sangh), pragya, karma, parmi, ashta-kalap, trishna, shad-ayatan, samvedana, vipassana, anitya, maitri, brham-vihaar, tathagata, arahant..	08
III	Purpose and Program for a Human Being based on Bauddha Darshan The purpose and program of a human being living on the basis of it, clarity and practice of human values and human conduct, the natural outcome of such a program on society, nature and tradition. Purpose-freedom from suffering, nirvana; root of suffering- vikaar – raga, dvesha and moha, Progam – various steps of meditation for attaining knowledge; shamath and vipassana; sheel- samadhi-pragya; practice of equanimity (samatva), eightfold path(Ashtang Marg); combination of understanding and practice..	08
IV	Basic Principles of Jain Darshan Basic realities – description of nine elements in existence (jeev, ajeev, bandh, punya, paap, aashrav, samvar, nirjara, moksha), 6 dravya of lok – dharma, adhrma, akash, kaal, pudgal, jeev; tri-lakshan, various types of pragya, various stages of realisation; samyak-gyan, samyak- darshan, samyak-charitra, syadvaad, anekantavaad, naya- nishchaya and vyavahar, karma- phal siddhanta Definition of some salient words of Jain Darshan –arhant, jin, tirthankara, panch- parameshthi, atma, pramaan, kaal, pudgal, paramanu, kashay, leshya..	08
V	Purpose and Program for a Human Being based on Jain Darshan The purpose and program of a human being living on the basis of it, clarity and practice of human values and human conduct, the natural outcome of such a program on society, nature and tradition, possibility of finding solutions to present day problems in the light of it. Purpose (goal) - moksha, Program- following mahavrat, anuvrat, 10 lakshan dharma; samyak darshan-gyan-charitra. Commonality with Bauddha Darshan	08

Text Books:

1. Chattejee, S.G. and Datta, D.M., "An Introduction to Indian Philosophy", University of Calcutta Press, 1960..

Reference Books:

1. "Dhammapad", Vipassana Research Institute, 2001.
2. Drukpa, G., "Musings from the Heart", Drukpa Publications Private Ltd, 2018.
3. Jyot, "Ek cheez milegi Wonderful", A Film Directed by Jyot Foundation, 2013.
4. Goenka, S.N., "The Discourse Summaries", Vipassana Research Institute, 1987.
5. Madhavacharya, "Sarva-darshan Samgraha", Chaukhambha Vidya Bhavan, Varanasi, 1984.
6. Varni, J., "Samansuttam", Sarva Seva Sangh Prakashan, Varanasi, 7th Edition, 2010.
7. https://www.youtube.com/watch?v=cz7QHNvNFfA&list=PLPJVlVRVmhc4Z01fD57jbzycm9I6W054x (English)
6. https://www.youtube.com/watch?v=r5bud1ybBDc&list=PLY9hraHvoLQLCkl7Z2DWKMgRAWU77bKFy (Hindi).

HUMAN VALUES IN VEDIC DARŚANA		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
	At the end of course , the student will be able to understand	
CO1	Students should have knowledge of Vedic Darśana literature and Nyaya Darśana.	
CO2	Students should have knowledge of Vaisheshik Darśana (Philosophy of Matter)	
CO3	Students should have introductory knowledge of Sankhya and Yoga Darśana (Philosophy of Spirituality)	
CO4	Students should have introductory knowledge of Upaniṣad and Vedanta Darśana (Philosophy of God)	
CO5	Students should know the Purpose for a Human Being based on the Vedic Darśana	

CO/PO MAPPING:

CO \ PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						1	2	3	1			1		
CO2						1	2	3	1			1		
CO3						1	2	3	1			1		
CO4						1	2	3	1			1		
CO5						1	2	3	1			1		
Target level						1	2	3	1					

DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture

I	Introduction to Vedic Darśana and Nyāya Darśana (Philosophy of Indian Logic and Reasoning) Introduction to Vedic literature, need to study Vedic Darśana; its origin and subject matter. Introduction to Nyāya Darśana, 16 padārthas (pramāṇa, prameya, saṃśaya, prayojana, dṛṣṭānta, siddhānta, avayava, tarka, nirṇaya, vāda, jalpa, vitaṇḍā, hetuābhāsa, chala, jāti, nigrahasthāna) paṃcāvayava prakriyā (pratijñā, hetu, udāharaṇa, upanaya, nigamana).	09
II	Vaiśeṣika Darśana (Philosophy of Matter) Introduction to Vaiśeṣika Darśana, definition of Dharma, abhyudaya, niḥśreyasa; 6 padārthas (dravya, guṇa, karma, sāmānya, viśeśa, samavāya) – their definition, characteristics and relationship; nitya-anitya; cause-effect relationships; dṛṣṭa-adṛṣṭa karma phala; mindful dāna; śucitā-aśucitā; reasons of rāga-dveśa, avidyā, sukha-duḥkha, etc. and how to get rid of them.	07
III	Sāṃkhya-Yoga Darśana (Philosophy of Spirituality) Sāṃkhya Darśana- Puruṣārtha, the nature of Puruṣa and Prakṛti, 24 elements of Prakṛti, bondage and salvation (liberation), the principle of satkāryavāda, triguṇātmaka prakṛti.Yoga Darśana- the steps of Aṣṭāṃga yoga (yama, niyama, āsana, prāṇāyāma, pratyāhāra, dhāraṇā, dhyāna and samādhi) and the challenges in following them, afflictions (kleṣa)- avidyā, asmitā, rāga, dveṣa, abhiniveśa, different types of vṛttis (pramāṇa, viparyaya, vikalpa, nidrā, smṛti), the process of nirodha of vṛttis; maitri, karuṇā, muditā, upekṣā; description of yama, niyama, āsana and praṇayāma; kriyāyoga– tapa, svādhyāya and īśvara-praṇidhāna; different steps of samādhi, different types of saṃyama, vivekakhyāti, prajñā. Vedanta Darshan Vedanta Darshan- Nature of Brahma and Prakriti, Methods of Upasana; adhyasaand sanskar; nature of Atma, description of existence, principle of karma-phala, description o pancha kosha, different nature of paramatma/brahma, Ishwar, Four qualifications (Sadhan chatushtay).	12
IV	Upaniṣad and Vedanta Darśana (Philosophy of God) Introduction to Upaniṣads and Vedanta Darśana; Īśopaniṣad – Idea of renouncement, Karma Yoga, balance of Vidyā-Avidyā and Prakṛti-Vikṛti; Tattirīyopaniṣad – Different names of the God and their meaning, parting message of Guru to the graduating student (Śikṣāvallī), Nature of Brahma and Prakṛti, Methods of Upāsanā; Nature of Ātmā, Description of existence, principle of karma-phala, description of paṃca kośa, nature of mukti , process and way to achieve it, antaḥkaraṇa-śuddhi, different characteristics of paramātmā/brahma, Īśvara, Four qualifications (Sādhana-catuṣṭaya)	08
V	Purpose and Program for a Human Being based on the Vedic Darśana The purpose and program of a human being living on the basis of the Vedic Darśana, clarity and practice of human values and human conduct, the natural outcome of such a program on society, nature and tradition. Vedic system of living in a society – the idea of vratas and varaṇa (freedom of choice with commitment), Varṇa System, Āśrama System, Paṃca Mahāyajña, 16 Saṃskāras, etc.	06

Refertence Books:

1. Acharya Udayveer Shastri, Sankhya Darshanam (vidyodayaBhashyam), Govindram Hasanand.
2. Acharya Rajveer Shastri, Patanjal Yog Darśana Bhashyam, Arsha Sahitya Prachar Trust.
3. Acharya Udayveer Shastri, Brahma Sutra (Vedanta Darshanam), Govindram Hasanand.
4. Krishna, I. (2010) The SāṃkhyaKarika, BharatiyaVidyaPrakashan, 4th edition 5. Madhavacharya, Sarva-DarshanaSamgrah ChaukhambhaVidyabhavan,Varanasi.
6. Muller, F.M. (1928) The Six Systems of Indian Philosophy, London: Longmans Green and Co. Publication.
7. Maharaj O. () PatanjalYogpradeep, Geeta press Gorakhpur
8. Vachaspati M. Sankhyatatvakaumudi, Motilal Banarasi Das Publication.
9. Shreemad Bhagwat geeta
10. Shankaracharya, VivekChoodamani
11. Rajyoga, Swami Shivananda
12. The Nyāya Sutras of Gotama, Sinha, N. (Ed.). Motilal Banarsidass Publ. (1990).
13. Pandit Madanmohan Vidyasagar. Sanskar Samuchaya, Vijaykumar Govindram Hasanand. 1998
14. Vedic Vision: Ancient Insights Into Modern Life, Satyavrata Siddhantalankar, Vijay Krishn Lakhanpal, 1999
15. Sanskar Chandrika (Hindi), Dayananda Saraswati, and Satyavrata Siddhantalankar. Vijay Krishn Lakhanpal, (1990).
16. THE TAITTIRIYA Upanishad, Achari, Sri Rama Ramanuja. (2013).
17. Vedic religion: The Taittiriya-Upanishad with the commentaries of Sankaracharya Suresvaracharya and Sayana (Vidyarana). Sastri, A. Mahadeva.(2016).
18. Taittiriyopanishad Sankara Bhashya With Hindi Translation Gita Press 1936.
19. Gautama's Nyāyasūtras: With Vātsyāyana-Bhāṣya. Jha, Ganganatha, ed. Oriental Book Agency, 1939.
20. NyayaDarshnam, Acharya Udayveer Shastri, Vijaykumar Govindram Hasanand (2018)
21. VaisheeshikaDarshanam, Acharya Udayveer Shastri, Vijaykumar Govindram Hasanand (2017)
22. Chattejee, S.G. and Datta, D.M. (1960) An Introduction to Indian Philosophy,Calcutta: University of Calcutta Press.
23. A Foundation Course in Human Values and Profession Ethics (Text Book and Teachers' Manual), R. R. Gaur, R. Asthana, G. P. Bagaria (2019 Second Revised Edition), Excel Books, New Delhi [ISBN 978-93-87034-47-1].
24. Class notes on "Human Values in Vedic Darśana" available on www.uhv.org.in
25. PPTs for "Human Values in Vedic Darśana" available on www.uhv.org.in