w. e. f Academic Year 2018-19

Faculty of Engineering & Technology

Scheme of Instruction and Syllabus

For

B.Tech (AICTE) – I & II Semester

Of

Four Year Degree Course

In

COMPUTER SCIENCE & ENGINEERING

Mahatma Gandhi University

Nalgonda

Telangana State

508 254

SEMESTER – I

S.No	Course Code	Course Title	Scheme of Instructions				Scheme of Examinations		Credits
			L	T	P/D	Contact Hrs/Wk	CIE	SEE	
THEORY									
1.	BSC 101	Engineering Physics	3	1	0	4	30	70	4
2.	BSC 102	Mathematics – I	3	1	0	4	30	70	4
3.	ESC 101	Basic Electrical Engineering	3	1	0	4	30	70	4
4.	ESC 102	Engineering Graphics	1	0	4	5	30	70	3
PRACTICALS									
5.	BSC 101	Engineering Physics Lab	0	0	3	3	25	50	1.5
6.	ESC 101	Basic Electrical Engineering	0	0	2	2	25	50	1
		Total	**10**	**3**	**9**	**22**	**170**	**380**	**17.5**

L : Lectures
T : Tutorials
P : Practicals
CIE : Continuous Internal Evaluation
SEE : Semester End Examination
BSC : Basic Science Course
HS : Humanities and Social Sciences
ESC: Engineering Science Course

Course Code	Course Title						Core/Elective
BSC 101	ENGINEERING PHYSICS						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	1	0	0	30	70	4

Prerequisites:

- Nil

Course objectives:

- The aim of the course to acquire the knowledge on the basic concepts in the wave mechanics, Lasers, Fiber optics, Ultrasonics, Dielectric materials, Superconductivity, Magnetic materials and Electromagnetic theory.
- To understand the properties of Semiconductors. Also get introduction to basics of Thin films and Nanomaterials

Course Outcomes:

- On the completion of course the student will acquire the basic knowledge and understanding on the concepts that are involved in the contents incorporated in the syllabus and students will be able use them in Engineering fields.

UNIT I

Wave mechanics: matter waves-de-Broglie wavelength, properties of wave function, Physical significance-Schrodinger time dependent and time in-dependent wave equation. Particle in a 1-D box.

Electromagnetic theory: Basic laws of electricity and magnetism – Maxwell's equations in integral and differential forms – Conduction and displacement current – Relation between D, E and P – Electromagnetic waves : Equation of plane wave in free space – Poynting theorem.

UNIT II

Fibre Optics : Introduction – Propagation of light through an optical fiber – Acceptance angle – Numerical aperture (NA) – Types of optical fibers and refractive index profiles Fibre drawing process (double crucible method) – Application of optical fibers.

Lasers: Characteristics of lasers – Spontaneous and stimulated emission of radiation – Einstein's coefficients – Population inversion – Ruby laser – Helium – Neon laser – Semiconductor laser- Applications of lasers.

Ultrasonics: Introduction to Ultrasonics waves – Production of ultrasonic waves by Piezoelectric method – Detection of ultrasonic waves: Piezoelectric detector – Properties of Ultrasonics – Wavelength of Ultrasonics by Debye-Sears method – Applications.

UNIT III

Semiconductors : Intrinsic and Extrinsic semiconductors – Concept of a hole – carrier concentration and conductivity in intrinsic semiconductors – Formation of P-N junction diode and its I-V characteristics – Thermistor and its characteristics – Hall effect and its applications.

Dielectric Materials : Dielectrics – Types of polarizations- Electronic, Ionic, Orientational and Space charge polarizations – Expression for Electronic polarizability –Frequency and temperature dependence of dielectric polarizations- Determination of dielectric constant by capacitance Bridge method – Ferro electricity – Barium titanate – Applications of Ferroelectrics.

UNIT IV

Superconductivity: Introduction – Genera properties of super conductors – Meissner effect –Type I and Type II superconductors – BCS theory (Qualitative) – Introduction to High T_c superconductors – Applications of superconductors.

Magnetic Materials: Classification of magnetic materials: dia, para, ferro, antiferro and ferromagnetic materials – Weiss molecular field theory of ferromagnetism – Magnetic domains Hysteresis curve – Soft and hard magnetic materials – Ferrites: Application of ferrites.

UNIT V

Thin Films: Distinction between bulk and thin films **–** Thin film preparation techniques : Thermal evaporation methods, Electron beam evaporation – Construction and working of Solar cell – Applications.

Nanomaterials : Introduction – Properties of materials at reduced size – Surface to volume ratio at nano scale – Classification of nanomaterials – Preparation of nanomaterials : bottom up methods (sol gel and CVD), Top-down methods (ball milling) – Basic ideas of carbon nanotubes – Applications nanomaterials and their health hazards.

Text Books:

1. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning 2012.
2. C. Kittel – Introduction to Solid State Physics, Wiley Eastern Ltd., 5th Edition, 1976.

References:

1. S.L. Gupta and V.Kumar – Solid State Physics, K. Nath & Co., 8th Edition, 1992.
2. A. Goswami – Thin Film Fundamentals, New Age International, 2007.
3. A.K. Bhandhopadhya – Nono Materials, new Age International, 1st Edition, 2007.
4. M.S. Avadhanulu and P.G. Kshirasagar – Engg. Physics, S.Chand & Co., 1st Edition, 1992.
5. C.M. Srivastava and C. Srinivasan – Science of Engg. Materials, New Age International, 2002.

Course Code	Course Title						Core/Elective
BSC 102	MATHEMATICS – I						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	1	0	0	30	70	4

Course objectives:

- To introduce the concepts of sequences, series and their properties
- To Study Fourier Series and its applications.
- To introduce the concepts of functions of several variables and multiple integrals
- To study vector differential and integral calculus

Course Outcomes: After completing this course, the students will able to

- find the nature of sequences and series
- Expand functions as a Fourier Series.
- use the knowledge of multiple integrals in finding the area and volume of any region bounded by given curves
- apply this knowledge to solve the curriculum problems

UNIT I

Sequences and Series: Sequences, Series, General properties of series, Series of positive terms, Comparison tests, tests of Convergence D'Alembert's ratio test, Cauchy's n^{th} root test, Raabe's test, Logarithmic test, Alternating series, Series of positive and negative terms, Absolute convergence and Conditional convergence ; Fourier Series, Half range Sine and Cosine Series, Parseval's theorem.

UNIT II

Calculus of one variable: Rolle's theorem, Lagrange's , Cauchy's mean value theorems (without proof) Taylor's series, Curvature, Radius of curvature, Circle of curvature, Envelope of a family of curves, Evolutes and Involutes, Evaluation of definite and improper integrals, Beta, Gamma and Error functions.

UNIT III

Multivariable Calculus (Differentiation): Functions of two variables, Limits and continuity, Partial derivatives, Total differential and differentiability, Derivatives of composite and implicit functions (Chain rule), Change of

variables, Jacobian , Higher order partial derivatives, Taylor's series of functions of two variables, Maximum and minimum values of functions two variables, Lagrange's method of multipliers.

UNIT IV

Multivariable Calculus (Integration): Double integrals,Change of order of integration, Triple integrals, Change of variables in integrals and applications-areas and volumes.

UNIT V

Vector Calculus: Scalar and vector fields, Gradient of a scalar field, Directional derivative, Divergence and Curl of a vector field, Line, Surface and Volume integrals , Green's theorem in a plane, Gauss's divergence theorem, Stoke's theorem (without proofs) and their verification.

Text Books:

1. R.K.Jain & S.R.K Iyengar, *Advanced Engineering Mathematics*, Narosa Publications, 4th Edition 2014.
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley, 9th Edition, , 2012.

References:

1. B.S.Grewal, *Higher Engineering Mathematics*, Khanna Publications, 43rd Edition, 2014.
2. G.B.Thomas , Maurice Weir and Joel Hass, *Thomas' Calculus* , Peterson, 12th Edition,2010.
3. B.V. Ramana, Higher Engineering Mathematics, 23rd reprint, 2015.
4. N.P.Bali and M. Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2010.
5. H.K. Dass, Er. Rajnish Varma, Higher Engineering Mathematics, Schand Technical Third Edition.

Course Code	Course Title						Core/Elective
ESC 101	BASIC ELECTRICAL ENGINEERING						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	1	0	0	30	70	4

Prerequisites:

- Nil

Course Objectives:

- To understand the basic concepts and the applications of DC and AC circuits.
- To master the basics of 3-phase balanced circuits
- To understand the basics of DC machines and Induction motor.
- To understand the characteristics of series, shunt and compound motors,
- To understand the Stepper motor and Brushless DC motor.

Course Outcomes:

- To understand and analyze basic electric and magnetic circuits
- To study the working principles of electrical machines and power converters.
- To introduce the components of low voltage electrical installations

UNIT I

DC Circuits: Electrical circuit elements (R, L, C), Voltage and current sources, Kirchoff's current and voltage laws, Analysis of simple circuits using with DC excitation, super position, Thevenin's and Norton's theorems, time domian analysis of first order RL and RC circuits.

UNIT II

AC Circuits: Representation of Sinusoidal wave forms, Phasor representation of sinusoidal quantities, Peak and rms values, Active power, Reactive power, apparent power, analysis of single phase AC circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance, 3-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT III

Tranformers: Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency, auto transformer, 3-phase transformer connections.

UNIT IV

Electrical machines:

Generation of rotating magnetic field, Construction and working of 3-phase induction motors, significance of torque slip characteristics, loss components and efficiency, Methods of starting and Speed control of induction motors, single phase induction motor.

Construction, working, torque speed characteristic and speed control of separately excited DC motor.

Construction and working of synchronous generators

UNIT V

Electrical installations: Components of LT switch gear: Switch fuse unit (SFU), MCB, ELCB, MCCB, types of wires and cables, earthing. Types of batteries, important characteristics for batteries, elementary calculations for energy consumption, power factor improvement and battery bachup.

Text Books:

1. V.K.Mehta, *Principles of Electrical Engineering*, S.Chand & Co.,1995
2. Kothari and Nagrath, *Basic Electrical Engineering*, Tata McGraw Hill, 2nd Edition, 2006.

References:

1. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
2. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
3. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
4. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

Course Code	Course Title						Core/Elective
ESC 102	ENGINEERING GRAPHICS						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	1	0	0	4	30	70	3

Course Objective:

- To prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- To prepare you to communicate effectively
- To prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice

Course Outcome: The student will learn

- Introduction to engineering design and its place in society
- Exposure to the visual aspects of engineering design
- Exposure to engineering graphics standards
- Exposure to computer-aided geometric design
- Exposure to creating working drawings
- Exposure to engineering communication

UNIT I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only), Cycloid, Epicycloid, Hypocycloid and Involute, Scales – Plain, Diagonal.

UNIT II

Orthographic Projections: Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes, Projections of planes inclined Planes - Auxiliary Planes;

UNIT III

Projections of Regular Solids: Inclined to both the Planes- Auxiliary Views, Draw simple annotation, dimensioning and scale.

Sections and Sectional Views of Right Angular Solids: Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone;

UNIT IV

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, Conventions.

UNIT V

Overview of Computer Graphics with CAD (For Internal Evaluation Weightage only):

Computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (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].

Suggested Text/ Reference 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, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
   CAD Software Theory and User Manuals.
5. Computer Aided Engineering Drawing – K Balaveera Reddy- CBS Publishers.

Course Code	Course Title						Core/Elective
BSC 101	ENGINEERING PHYSICS LAB						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	3	25	50	1.5

List of Experiments:

1. To calculate the Numerical aperture (NA) acceptance angle of a given optical fibre.
2. Determination of wavelength of LASER using diffraction grating.
3. Determination of Velocity of ultrasonic waves in a liquid by Debye-Sears method.
4. To draw the I-V characteristics of P-N Junction diode and to evaluate the value of potential barrier of the diode.
5. Determination of carrier concentration, Mobility and Hall Coefficient of Ge Crystal using Hall Effect Experiment.
6. To draw the curve between the magnetizing field and the intensity of magnetization of the specimen (soft iron rod) and to find out i) Coercivity ii) Retentivity and iii) Hysteresis loss.
7. To draw the I-V Characteristics of a solar cell and to calculate the i) Fill factor ii) Efficiency and iii) Series resistance.
8. To find the values of Electrical conductivity and energy gap of Ge Crystal by Four probe method.
9. To determine the Dielectric Constant and Phase transition temperature of Lead Zirocnium Titanate (PZT).
10. To determine the constants of A, B and a using Thermistor characteristics.

Course Code	Course Title						Core/Elective
ESC 101	BASIC ELECTRICAL ENGINEERING LAB						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	2	25	50	1

Course Objective:

- To acquaint with practical electric AC &DC circuits implementation

Course Outcomes: On successful completion of the course, the student will acquire the ability to:

- Awareness about various electric safety rules to be followed while working with electrical equipment's.
- Explore themselves in designing basic electric circuits
- Identify requirements for electric machines for domestic and industrial purpose

List of Experiments:

1. Verification of Kirchhoff's Laws.
2. Verification of Thevinin's & Norton's Theorems.
3. Study of Three-phase Balanced Circuits.
4. Measurement of Power by Two-Wattmeter Method.
5. Study of Single-Phase RLC Series Circuits.
6. Magnetization Curve of a Separately Excited DC Generator.
7. Load Characteristics of Shunt Generator.
8. Performance Characteristics of shunt Motor.
9. Speed Control of DC Shunt Motor.
10. O.C and S.C Test on Single-Phase Transformer.
11. Load Test on Single-Phase Transformer.
12. Load Test on Three-Phase Induction Motor.

Note: At least ten experiments should be conducted in the Semester

SEMESTER – II

S.No	Course Code	Course Title	Scheme of Instructions				Scheme of Examinations		Credits
			L	T	P/D	Contact Hrs/Wk	CIE	SEE	
THEORY									
1.	BSC 202	Engineering Chemistry	3	1	0	4	30	70	4
2.	BSC 201	Mathematics –II	3	1	0	4	30	70	4
3.	ESC 201	Programming for Problem Solving	3	0	0	3	30	70	3
4.	HSMC 201	English	2	0	0	2	30	70	2
PRACTICALS									
5.	BSC 101	Engineering Chemistry Lab	0	0	3	3	25	50	1.5
6.	ESC 201	Programming for Problem Solving Lab	0	0	4	4	25	50	2
7.	ESC 202	Workshop Practice	0	0	6	6	25	50	3
8.	HSMC 201	English Lab	0	0	2	2	25	50	1
		Total	**11**	**2**	**15**	**28**	**220**	**480**	**20.5**

L: Lectures

T: Tutorials

P: Practicals

CIE: Continuous Internal Evaluation

SEE: Semester End Examination

BSC: Basic Science Course

HS: Humanities and Social Sciences

ESC: Engineering Science Course

Course Code	Course Title						Core/Elective
BSC 202	ENGINEERING CHEMISTRY						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	1	0	0	30	70	4

UNIT I

Periodic properties, Atomic & Molecular Structure and Spectroscopy:

Variation of s, p, d and f orbital, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electro negativity, oxidation states, coordination numbers and geometries.

Molecular Orbital Theory, Linear Combination of Atomic Orbital, Molecular Orbital energy level diagrams of diatomic molecules- O_2, N_2 and NO. Crystal Field Theory salient features, Crystal field splitting of d-orbital of transition metal complexes in Octahedral, Tetrahedral and Square planar geometries.

Principles of Spectroscopy, selection rules of Vibrational, Rotational & Electronic spectroscopy and their applications. Selection rules (Derivation not required)

UNIT II

Thermodynamics and electrochemistry:

Thermodynamics: Thermodynamics first law and its limits, Thermodynamic second law. Thermodynamic functions: Enthalpy, Entropy, Free energy and their significance. Entropy and Free energy change for isothermal process. Variation of free energy change with temperature and pressure.

Electrochemistry: Electrochemical cells- Electrolytic and Galvanic cells-notation, cell reaction and cell potentials. Types of electrodes-Calomel, Quinhydrone and Glass electrodes. Determination of P^H of a solution by using Quinhydrone electrode. Principles and applications of Conductometric and Potentiometric titrations. Nernst equation and its derivation. Application of Nernst equation to electrode potential and emf of cells. Numericals.

UNIT III

Water chemistry and corrosion:

Water chemistry: Hardness of water-Types and units of hardness, estimation of temporary and permanent hardness of water by EDTA method. Alkalinity of water and its determination. Water softening by Ion-exchange and Reverse Osmosis methods. Boiler troubles-scales and sludges formation-causes, effects and prevention. Specifications of potable water. Water treatment for drinking purpose-coagulation, sedimentation, filtration, sterilization by Chlorination and Ozanization.

Corrosion-causes and its effects. Types of corrosion-Dry or Chemical corrosion and Wet or Electrochemical corrosion and their mechanism. Electrochemical corrosion and its types. Factors influencing rate of corrosion.

Corrosion control methods: Cathodic protection methods- Sacrificial anodic and Impressed current cathodic protection method. Surface coating methods: Hot dipping-Galvanizing and Tinning. Electroplating.

UNIT-IV

Energy Sources and Nanomaterials:

Batteries: Primary batteries-Zn carbon battery. Secondary batteries-Pb- Acid battery and Ni-Cd battery. Lithium-ion batteries- advantages and applications.

Fuel cells: Concept of fuel cells and their advantages. Construction and working of H_2-O_2 and Methanol-Oxygen fuel cells.

Solar cells: Concept of solar energy conversion, photovoltaic cells.

Nanomaterials: Introduction. Properties of nanomaterials. Synthesis of nanomaterials-Top down, Bottom up approach and Sol-gel method. Applications of nanomaterials-Electronic, Telecommunications and medicine.

UNIT-V

Engineering materials:

Polymers: Introduction. Classification of polymers: Plastics, Fibers and Elastomers.

Preparation, properties and engineering applications of the following polymers:

Plastics: PVC and Bakelite

Fibres: Nylon 6:6, and Dacron.

Elastomers: Buna-S and Butyl Rubber.

Conducting polymers: Introduction. Mechanism of conduction in polymers. Intrinsic conducting polymers: Poly-acetylene and poly-aniline. Aplications of conducting polymers.

Liquid Crystals: Introduction. Classification of liquid crystals. Thermotropic, Lyotropic liquid crystals. Chemical constitution and liquid crystalline behavior. Molecular ordering in liquid crystals. Nematic, Smectic and Cholestric liquid crystals and their applications.

Text Book:

1. Jain & Jain, Engineering chemistry, Dhanpat Rai publishing Co.,16th Edition.

References:

1. B.L.Tembe,Kamaluddin and M.S.Krishnan, Engineering Chemistry(NPTELWeb-book)
2. Prashanth Rath, Engineering Chemistry, Cengage Learning.
3. M.J.Sienko and R.A.Plane, Chemistry: Principles and Applications, MGH Publishers.
4. B.H.Mahan, University Chemistry, Pearson Publishing Co., 4th Edition.
5. C.N. Banwell, Fundamentals of Molecular Spectroscopy, TMH

Course Code	Course Title						Core/Elective
BSC 201	MATHEMATICS – II						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	1	0	0	30	70	4

Course objectives:

- To study matrix algebra and its use in solving system of linear equations and in solving eigen value problems
- To provide an overview of ordinary differential equations
- To study special functions like Legendre and Bessel functions
- To introduce the concept of functions of complex variable and their properties

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

- solve system of linear equations and eigen value problems
- solve certain first order and higher order differential equations
- determine the analyticity of complex functions and expand functions as Taylor and Laurent series
- evaluate complex and real integrals using residue theorem

UNIT I

Matrices: Elementary row and column operations, Rank of a matrix, Echelon form, System of linear equations, Linearly dependence and independence of vectors, Linear transformation,Orthogonal transformation,Eigenvalues, Eigenvectors, Properties of eigenvalues , Cayley-Hamilton theorem, Quadratic forms, Diagonalization of Matrices, Reduction of quadratic form to canonical form by orthogonal transformation , Nature of quadratic forms.

UNIT II

First Order Ordinary Differential Equations: Exact first order differential equations , Integrating factors, Linear first order equations , Bernoulli's , Riccati's and Clairaut's differential equations, Orthogonal trajectories of a given family of curves.

UNIT III

Differential Equations of Higher Orders: Linear independence and dependence, Solutions of second and higher order linear homogeneous equations with constants coefficients, Method of reduction of order for the linear homogeneous second order differential equations with variable coefficients , Solutions of non-homogeneous linear differential equations, Method of variation of parameters, solution of Euler-Cauchy equation, Simultaneous linear differential equations, Power Series solution, Legendre Polynomial of first kind, Bessel's function of first kind and their properties.

UNIT IV

Functions of a Complex Variable: Limits and continuity of a function, differentiability and analyticity, Elementary Analytic functions, Necessary and Sufficient conditions for a function to be analytic,Cauchy- Riemann equations in polar form, harmonic functions, complex integration, Cauchy's integral theorem, extension of Cauchy's integral theorem for multiply connected regions, Cauchy's integral formula,Cauchy's inequality, Cauchy's formula for derivatives, Liouville's theorem, Maximum Modulus principle (without proof)and its applications

UNIT V

Residue Calculus: Power series, Taylor's series, Laurent's series, zeros and singularities, residues, residue theorem, evaluation of real integrals using residue theorem, Argument principle, Rouche's Theorem and their applications, conformal mapping Bilinear transformations. (**All Theorems without Proof)**

Text Books:

1. R.K. Jain & S.R.K. lyengar, *Advanced Engineering Mathematics*, Narosa Publications, 4th Edition,2014.
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley , 9th Edition, , 2012.

References:

1. Dr.B.S.Grewal, *Higher Engineering Mathematics*, Khanna Publications, 43rd Edition, 2014.
2. Dr.M.D.Raisinghania, *Ordinary and Partial differential equations*, S.CHAND, 17th Edition 2014.
3. James Brown, R.V Churchill, Complex Variables and applications, Mc GrawHill 9th Edition 2013.
4. B.V. Ramana, Higher Engineering Mathematics, 23rd reprint, 2015.
5. S.L Ross, Differential Equations 3rd Edition, Wiley India.
6. G.F. Simmons and S.G. Krantz, Differential Equations, Tata Mc Graw Hill, 2007.
7. N. Bali, M.Goyal, A text book of Engineering Mathematics,Laxmi publications,2010
8. H.K. Dass, Er. Rajnish Varma, Higher Engineering Mathematics, Schand Technical

Third Edition.

Course Code	Course Title						Core/Elective
ESC 201	PROGRAMMING FOR PROBLEM SOLVING						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- To acquire problem solving skills
- To be able to develop flowcharts
- To understand structured programming concepts
- To be able to write programs in C Language
- To understand different type of data representations (Arrays, Structures and Files).
- To understand different types of sorting and searching techniques.

Course Outcome:

- Able to design algorithms for different problems
- Able to write program for various problems.
- Able to write program for matrix representation.
- Able to perform file handling operations.

UNIT I

Introduction to Programming: Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)**.**

Introduction to Algorithm: steps to solve logical and numerical problems. Representation of Algorithm**:** Flowchart/Pseudocode with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

UNIT II

Arithmetic expressions and precedence, Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching, Iteration and loops

Introduction to Arrays: Arrays, Representation of Arrays (1-D, 2-D), Character arrays and Strings

UNIT III

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Introduction to Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

UNIT IV

Introduction to Function: Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference

Introduction to Recursion: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc.

UNIT V

Introduction to Structure: Structures, Defining structures, Array of Structures and Union

Introduction to File: File handling (only if time is available, otherwise should be done as part of the lab)

Text Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

References:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Course Code	Course Title						Core/Elective
HSMC 201	ENGLISH						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	2	0	0	0	30	70	2

Course Objectives:

- Communicate clearly, accurately and appropriately
- Know and use verbal and non-verbal communication appropriately
- Infer information from texts
- Learn basic grammar of the English language
- Use appropriate idiomatic expressions, one word substitutes etc.

UNIT I

Vocabulary Building:

1.1. Word Formation

1.2. Synonyms, Antonyms, Abbreviations and Acronyms

1.3. One word Substitutes

1.4. Words and their categorizations

1.5. Foreign words and Silent letters

UNIT II

Remedial English and Common Errors:

2.1. Tense and Aspects

2.2. Conjuncts and Connectives

2.3. Voice

2.4. Concord

2.5. Degrees of comparison and Question Tags

UNIT III

Writing Practices:

3.1. Sentence Structure

3.2. Use of phrase and clauses in sentence

3.3. Coherence

3.4. Writing sample sentence

3.5. Paragraph-précis and expansion

Textbook:

1. E. Suresh Kumar, Engineering English, Orient Blackswan, 2014.

References:

1. E. Suresh Kumar et al., Communication Skills and Soft Skills,Pearson, 2011.
1. Sanjay Kumar and Pushp Lata, Communication Skills, OUP, 2011.
2. Kavita Tyagi and Padma Misra, Professional Communication, PHI, 2011.
3. Meenakshi aman and Sangeeta Sharma, Technical Communication: Principles and Practice, OUP, 2011.

Course Code	Course Title						Core/Elective
BSC 101	ENGINEERING CHEMISTRY LAB						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	3	25	50	1.5

Course Objective:

- The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering.

Course Outcome: The students will learn to

- Estimate rate constants of reactions from concentration of reactants/products as a function of time
- Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
- Synthesize a small drug molecule and analyse a salt sample

List of Experiments:

I. VOLUMETRIC ANALYSIS

1. Estimation of Hardness of sample water by EDTA method
2. Estimation of alkalinity of sample water

II. INSTRUMENTAL ANALYSIS CONDUCTOMETRY

1. Conductometric and acid-base strong acid vs strong base titration.
2. Conductometric weak acid vs strong base titration.
3. Conductometric mixture of acids vs strong base titration.
4. Conductometric precipitation titration-barium chloride against sodium sulphate

III. POTENTIOMETRY

1. Potentiometric acid-base titration –strong acid vs strong base, using Quinhydrone electrode.
2. Potentiometric redox titration-$KMnO_4$vs Fe^{+2}

IV. pH METRY

1. pH Metry strong acid vs strong base titration.
2. pH Metry weak acid vs strong base titration

V. COLORIMETRY

1. Verification of Beer's Law –using Potassium permanganate.
2. Estimation of $KMnO_4$(Mn) in the given solution
3. Estimation of iron in cement

VI. KINETICS

1. First order reaction-hydrolysis of methyl acetate
2. Second order reaction-potassium iodide and persulphate

Text Books:

1. Senior practical Physical Chemistry, BD Khosla, A.Ghulati, VC.Garg., R.Chand and Co., New Delhi 10th ed. 2001.
2. Practical Physical Chemistry, B.Vishwanathan, P.S Raghavan, Viva Books Private Limited.

Course Code	Course Title						Core/Elective
ESC 201	PROGRAMMING FOR PROBLEM SOLVING LAB						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	4	25	50	2

Course Outcome: The student will be able

- To formulate the algorithms for simple problems
- To translate given algorithms to a working and correct program
- To correct syntax errors as reported by the compilers
- To identify and correct logical errors encountered at run time
- To write iterative as well as recursive programs
- To represent data in arrays, strings and structures and manipulate them through a program
- To declare pointers of different types and use them in defining self-referential structures.
- To create, read and write to and from simple text files

List of Programs:

1. **Tutorial 1:** Problem solving using computers:
   Lab1: Familiarization with programming environment
2. **Tutorial 2:** Variable types and type conversions:
   Lab 2: Simple computational problems using arithmetic expressions
3. **Tutorial 3:** Branching and logical expressions:
   Lab 3: Problems involving if-then-else structures
4. **Tutorial 4:** Loops, while and for loops:
   Lab 4: Iterative problems e.g., sum of series
5. **Tutorial 5:** 1D Arrays: searching, sorting:

Lab 5: 1D Array manipulation

6. **Tutorial 6:** 2D arrays and Strings

   Lab 6: Matrix problems, String operations

7. **Tutorial 7:** Functions, call by value:

   Lab 7: Simple functions

8. **Tutorial 8 &9:** Numerical methods (Root finding, numerical differentiation, numerical integration):

   Lab 8 and 9: Programming for solving Numerical methods problems

9. **Tutorial 10:** Recursion, structure of recursive calls

   Lab 10: Recursive functions

10. **Tutorial 11:** Pointers, structures and dynamic memory allocation

    Lab 11: Pointers and structures

11. **Tutorial 12:** File handling:

    Lab 12: File operations

Note: The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.

Course Code	Course Title						Core/Elective
ESC 202	WORKSHOP PRACTICE						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	6	25	50	3

Course Objectives:

- To study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working precision and safety at work place.
- Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

Course Outcomes: The student will able to

- Fabricate components with their own hands.
- Get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
- Assembling different components, they will be able to produce small devices of their interest.
- Apply basic electrical engineering knowledge for house wiring practice.

I . Lectures & videos:

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods.
2. CNC machining, Additive manufacturing

3. Fitting operations & power tools
4. Electrical &Electronic
5. Carpentry
6. Plastic moulding, glass cutting
7. Metal casting
8. Welding (arc welding & gas welding), brazing

II. Workshop Practice (Two from each trade):

1. Machine shop
2. Fitting shop
3. Carpentry
4. Electrical house wiring
5. Welding
6. Black Smithy
7. Tin Smithy
8. Glass Cutting (Demo)

Note:- Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Text Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Workshop manual / K.Venugopal /Anuradha

References:

1. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.
2. Workshop manual – P. Kannaiah / K.L. Narayana / Scitech
3. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

Course Code	Course Title						Core/Elective
HSMC 201	English Lab						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	2	25	50	1

Course Objectives:

- To enable the students to
- learn the sound systems of English
- learn the word stress in English
- learn the rhythm and intonation of English
- improve their articulation skills and participation skills

Note: While teaching the following items, emphasis may be laid on intensive practice in the language lab. Lecturing may be avoided as far as possible.

1. **Pronunciation:** Introduction to Phonetics (speech sounds), Vowels sounds, Consonant Sounds, Consonant clusters etc.
2. **Stress:** Primary stress, Secondary stress, functional stress, rules of word stress
3. **Intonation:** Introduction of Intonation, Major patterns of intonation in English with their semantic implications.
4. **Introduction to Rhythm:** Definition and types of Rhythm. Repetition, Alternation, Gradation.
   A. **Regular Rhythm**
   B. **Flowing Rhythm**
   C. **Progress Rhythm**
5. **Listening Comprehension:** Listening for specific details, Listening Comprehension Tests.
6. **Descriptions, Narrations, Giving Directions**
7. **Group Discussions, Interview Skills, Mock Interviews.**

Lab Manual Recommended:

- E. Suresh Kumar. A Handbook for English Language Laboratories (with CD). Revised edition, Cambridge University Press India Pvt. Ltd. 2014

Text Books:

1. T. Balasubramanian. A Text book of English Phonetics for Indian Students. Macmillan, 2008.
2. Edgar Thorpe. Winning at Interviews. Pearson Education, 2006.
3. J. Sethi et al., A Practical Course in English Pronunciation (with CD). Prentice Hall of India, 2005.
4. Hari Mohan Prasad. How to Prepare for Group Discussions and Interviews. Tata McGraw Hill, 2006.

Faculty of Engineering & Technology

Scheme of Instruction and Syllabus

For

B.TECH (CBCS) – III & IV SEMESTER

Of

Four Year Degree Course

In

COMPUTER SCIENCE & ENGINEERING

Mahatma Gandhi University

Nalgonda

Telangana State

508 254

UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY

B.TECH (CBCS) 4 YEAR (8 SEMESTER) REGULAR PROGRAMME

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

(Applicable from the batch admitted from the Academic Year 2018-19 and onwards)

SEMESTER – III

Sl No	Course Code	Course Title	Scheme of Instructions				Scheme of Examinations		Credits
			L	T	P/Dg	Contact Hrs/Wk	CIE	SEE	
THEORY									
	BSC 301 MT	Mathematics –III (Probability and Statistics)	3	1	0	4	30	70	4
	ESC 302 CS	Digital Logic Design	3	0	0	3	30	70	3
	ESC 303 EC	Basic Electronics	3	0	0	3	30	70	3
	PCC 304 CS	Data Structures Using C++	3	1	0	4	30	70	4
	PCC 305 CS	Computer Organization & Architecture	3	0	0	3	30	70	3
PRACTICALS									
	PCC 311 CS	Data Structures using C++ Lab	0	0	2*2	4	25	50	2
	PCC 312 CS	Computer Organization & Architecture Lab	0	0	2*2	4	25	50	2
	PCC 313 CS	IT Workshop (Python & MAT Lab)	0	0	2*2	4	25	50	2
		Total	**15**	**2**	**12**	**29**	**225**	**500**	**23**

Course Code	Course Title						Core/Elective
BSC 301 MT	MATHEMATICS – III (Probability & Statistics)						Core
	Contact Hours per Week				CIE	SIE	Credits
	L	T	D	P			
	3	1	0	0	30	70	4

Course Objective:

- To provide the knowledge of probability distributions, tests of significance, correlation and regression.

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

- Apply various probability distributions to solve practical problems, to estimate unknown parameters of populations and apply the tests of hypotheses
- Perform a regression analysis and to compute and interpret the coefficient of correlation

UNIT-I : Measures of Central tendency, Moments, skewness and Kurtosis, Discrete random variables, Independent random variables, The multinomial distribution, Poisson approximation to the binomial distribution, Infinite sequences of Bernoulli trials, Sums of independent random variables, Expectation of Discrete Random Variables, Variance of a sum.

UNIT-II: Continuous random variables and their properties, Distribution functions and densities, Normal, Exponential and gamma densities.

UNIT-III: Probability distributions, Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions.

UNIT-IV: Curve fitting by the method of least squares, fitting of straight lines, Second degree parabolas and more general curves, Correlation, Regression and Rank correlation.

UNIT-V: Test of significance, Large sample test for single proportion, Difference of proportions, Single mean, difference of means, and difference of standard deviations. Small Sample test for single mean, Difference of means and correlation coefficients, Test for ratio of variances, Chi-square test for goodness of fit and independence of attributes.

Suggested Readings:

1. R.K.Jain & S.R.K Iyengar, Advanced Engineering Mathematics, Narosa Publications, 4th Edition 2014.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publications, 43rd Edition.
3. S. Ross, "A First Course in Probability", Pearson Education India, 2002.
4. N.P. Bali and M. Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 2010.
5. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2006.
6. S.C Gupta & Kapoor: Fundamentals of Mathematical statistics, Sultan chand & sons, New Delhi.

Course Code	Course Title						Core/Elective
ESC 302 CS	Digital Logic Design						Core
	Contact Hours per Week				CIE	SIE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- To introduce concepts of Boolean logic, Postulates and Boolean Theorems.
- To understand the use of logic minimization methods and to solve the Boolean logic expressions
- To understand how to design the combinational and sequential circuits.
- To introduce and realize the adder circuits
- To understand the state reduction methods for sequential circuits.

Course Outcomes: Students will be

- Able to apply the concepts of Boolean logic, Postulates and Boolean Theorems to solve the Boolean expressions.
- Able to solve the Complex Boolean logic expressions using Minimization methods.
- Able to design the combinational, sequential circuits and various adder circuits.
- Able to apply state reduction methods to solve sequential circuits.

UNIT-I: Boolean Algebra: Axiomatic definition of Boolean Algebra Operators, Postulates and Theorems, Boolean Functions, Canonical Forms and Standard Forms, Simplification of Boolean Functions Using Theorems and Karnaugh Map Method.

UNIT-II: Minimization of Switching Functions: Quine-McCluskey Tabular Method, Determination of Prime Implicants and Essential Prime Implicants.

Combinational Logic Design: Single-Output and Multiple-Output Combinational Circuit Design, AND-OR, OR-AND and NAND/NOR Realizations, Exclusive-OR and Equivalence functions.

UNIT–III: Design of Combinational Logic Circuits: Gate Level design of Small Scale Integration (SSI) circuits, Modular Combinational Logic Elements- Decoders, Encoders, Priority encoders, Multiplexers and De-multiplexers.

Design of Integer Arithmetic Circuits using Combinational Logic: Integer Adders – Binary Adders, Subtractors, Ripple Carry Adder and Carry Look Ahead Adder, and Carry Save Adders.

UNIT-IV: Design of Combinational Circuits using Programmable Logic Devices (PLDs): Programmable Read Only Memories (PROMs), Programmable Logic Arrays (PLAs), Programmable Array Logic (PAL) devices.

Introduction to Sequential Circuit Elements: Latch, Various types of Flip-Flops and their Excitation Tables.

UNIT –V: Models of Sequential Circuits: Moore Machine and Mealy Machine, Analysis of Sequential Circuits-State Table and State Transition Diagrams. Design of Sequential Circuits-Counters. Moore and Mealy State Graphs for Sequence Detection, Methods for Reduction of State Tables and State Assignments.

Suggested Readings:

1. M Morris Mano and Michael D Ciletti, *Digital Design*, Prentice Hall of India, Fourth Edition, 2008.
2. Zvi Kohavi, *Switching and Finite Automata Theory*, Tata McGraw Hill, 2nd Edition, 1979.

Course Code	Course Title						Core/Elective
PCC 305 CS	COMPUTER ORGANIZATION & ARCHITECTURE						Core
	Contact Hours per Week				CIE	SIE	Credits
	L	T	D	P			
	3	0	0	0	25	50	3

Course Objectives:

- The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.
- It begins with basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
- Topics include computer arithmetic, instruction set design, micro-programmed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors

Course Outcomes:

- Understand the basics of instructions sets and their impact on processor design.
- Demonstrate an understanding of the design of the functional units of a digital computer system.
- Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
- Design a pipeline for consistent execution of instructions with minimum hazards.
- Recognize and manipulate representations of numbers stored in digital computers

UNIT-I

Basic Computer Organization: Functions of CPU, I/O Units, Memory: Instruction: Instruction Formats-One address, two addresses, zero addresses and three addresses and comparison; addressing modes with numeric examples: Program Control- Status bit conditions, conditional branch instructions, Program Interrupts: Types of Interrupts.

UNIT-II

Input-Output Organizations: I/O Interface, I/O Bus and Interface modules: I/O Vs Memory Bus, Isolated Vs Memory-Mapped I/O, Asynchronous data Transfer- Strobe Control, Hand Shaking: Asynchronous Serial transfer- Asynchronous Communication interface, Modes of transfer Programmed I/O, Interrupt Initiated I/O,DMA; DMA Controller, DMA Transfer, IOP-CPU-IOP Communication, Intel 8089 IOP.

UNIT-III

Memory Organizations: Memory hierarchy, Main Memory, RAM, ROM Chips, Memory Address Map, Memory Connection to CPU, associate memory, Cache Memory, Data Cache, Instruction cache, Miss and Hit ratio, Access time, associative, set associative, mapping, waiting into cache, Introduction to virtual memory.

UNIT-IV

8086 CPU Pin Diagram: Special functions of general purpose registers, Segment register,concept of pipelining, 8086 Flag register, Addressing modes of 8086.

UNIT-V

8086-Instruction formats: assembly Language Programs involving branch & Call instructions sorting, evaluation of arithmetic expressions.

Suggested Readings:

1. Computer System Architecture, M. Morris Mano, 3rd Edition, Pearson/PHI.
2. Advanced Micro Processor and Peripherals- Hall/ A K Ray
3. Computer Organization and Architecture, William Stallings 6th Edition, Pearson/PHI.
4. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson.
5. Fundamentals or Computer Organization and Design, - Sivaraama Dandamudi Springer Int. Edition.
6. Computer Architecture a quantitative approach, John L. Hennessy and David A. Patterson, Fourth Edition Elsevier.
7. Computer Architecture: Fundamentals and principles of Computer Design, Joseph D. Dumas II, BS Publication.

Course Code	Course Title						Core/Elective
ESC 303 EC	BASIC ELECTRONIC ENGINEERING						Core
	Contact Hours per Week				CIE	SIE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- To analyze the behavior of semiconductor diodes in Forward and Reverse bias.
- To design of Half wave and Full wave rectifiers with L,C, LC & CLC Filters.
- To explore V-I characteristics of Bipolar Junction Transistor in CB, CE & CC configurations.
- To explain feedback concept and different oscillators.
- To analyze Digital logic basics and Photo Electric devices.

Course Outcomes: Students will be

- Able to learn about forward biased and reversed biased circuits.
- Able to plot the V-I Characteristics of diode and transmission.
- Able to design combinational logic circuits and PLDs.

UNIT-I: Semi-Conductor Theory: Energy Levels, Intrinsic and Extrinsic Semiconductors, Mobility, Diffusion and Drift current. Hall Effect, Characteristics of P-N Junction diode, Parameters and Applications.

Rectifiers: Half wave and Full wave Rectifiers (Bridge, center tapped) with and without filters, ripple regulation and efficiency. Zener diode regulator.

UNIT-II: Bipolar Junction Transistor: BJT, Current components, CE, CB, CC configurations, characteristics, Transistor as amplifier. Analysis of CE, CB, CC Amplifiers (qualitative treatment only) .

JFET: Construction and working, parameters, CS, CG, CD Characteristics, CS amplifier.

UNIT-III: Feedback Concepts – Properties of Negative Feedback Amplifiers, Classification, Parameters. Oscillators – Barkhausen Criterion, LC Type and RC Type Oscillators and Crystal Oscillators. (Qualitative treatment only).

UNIT-IV: Operational Amplifiers – Introduction to OP Amp, characteristics and applications – Inverting and Non-inverting Amplifiers, Summer, Integrator, Differentiator, Instrumentation Amplifier.

Digital Systems: Basic Logic Gates, half, Full Adder and Subtractors.

UNIT-V: Data Acquisition Systems: Study of transducer (LVDT, Strain gauge, Temperature, and Force). Photo Electric Devices and Industrial Devices: Photo diode, Photo Transistor, LED, LCD, SCR, UJT Construction and Characteristics only.

Display Systems: Constructional details of C.R.O and Applications.

Suggested Readings:

1. Jocob Millman, Christos C. Halkias and Satyabrata Jit,Electronics Devices and Circuits,3rd Edition, McGraw Hill Education (India) Private Limited, 2010.
2. Rama Kanth A. Gaykward,Op-AMPS and Linear Integrated Circuit, 4thEdition PrenticeHall of India, 2000.
3. M. Morris Mano,Digital Design, 3rdEdition, Prentice Hall of India, 2002.
4. William D Cooper, and A.D. Helfrick,Electronic Measurements and InstrumentationsTechniques, 2ndEdition, Prentice Hall of India, 2008.
5. S. Shalivahan, N. Suresh Kumar, A. Vallava Raj,Electronic Devices and Circuits, 2ndEdition., McGraw Hill Education (India) Private Limited, 2007

Course Code	Course Title						Core/Elective
PCC 304 CS	DATA STRUCTURES USING C++						Core
	Contact Hours per Week				CIE	SIE	Credits
	L	T	D	P			
	3	1	0	0	30	70	4

Course Objectives:

- To introduce the time and space complexities of algorithms.
- To discuss the linear and non-linear data structures and their applications.
- To introduce the creation, insertion and deletion operations on binary search trees and balanced binary search trees.
- To introduce various internal sorting techniques and their time complexities

Course Outcomes: Students will be

- Able to analyze the time and space complexities of algorithms.
- Able to implement linear, non-linear data structures and balanced binary trees
- Able to analyze and implement various kinds of searching and sorting techniques.
- Able to find a suitable data structure and algorithm to solve a real world problem.

UNIT–I: Performance and Complexity Analysis: Space Complexity, Time Complexity, Asymptotic Notation (Big-Oh), Complexity Analysis Examples.

Linear List-Array Representation: Vector Representation, Multiple Lists Single Array. **Linear List-Linked Representation:** Singly Linked Lists, Circular Lists, Doubly Linked Lists, Applications (Polynomial Arithmetic).

Arrays and Matrices: Row and Column Major Representations, Sparse Matrices.

UNIT –II: Stacks: Array Representation, Linked Representation, Applications (Recursive Calls, Infix to Postfix, Postfix Evaluation).

Queues: Array Representation, Linked Representation. **Skip Lists and Hashing:** Skip Lists Representation, Hash Table Representation, Application- Text Compression.

UNIT- III: Trees: Definitions and Properties, Representation of Binary Trees, Operations, and Binary Tree Traversal. **Binary Search Trees:** Definitions, Operations on Binary Search Trees. **Balanced Search Trees:** AVL Trees, and B-Trees.

UNIT –IV: Graphs: Definitions and Properties, Representation, Graph Search Methods (Depth First Search and Breadth First Search) **Application of Graphs:** Shortest Path Algorithm (Dijkstra), Minimum Spanning Tree (Prim's and Kruskal's Algorithms).

UNIT –V: Searching: Linear Search and Binary Search Techniques and their complexity analysis. **Sorting and Complexity Analysis:** Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, and Heap Sort.

Suggested Readings:

1. Sartaj Sahni, *Data Structures--Algorithms and Applications in C++*, 2nd Edition, Universities Press (India) Pvt. Ltd., 2005.
2. Mark Allen Weiss, *Data Structures and Problem Solving using C++*, Pearson Education International, 2003.
3. Michael T. Goodrich, Roberto Tamassia, David M. Mount, *Data Structures and Algorithms in C++*, John Wiley & Sons, 2010.

ourse Code	Course Title						Core/Elective
	DATA STRUCTURES Using C++ LAB						Core
CC 311 CS	Contact Hours per Week				CIE	SIE	Credits
	L	T	D	P			
	0	0	0	4	25	50	2

Course Objectives:

- Design and construct simple programs by using the concepts of structures as abstract data type.
- To have a broad idea about how to use pointers in the implement of data structures.
- To enhance programming skills while improving their practical knowledge in data structures.
- To strengthen the practical ability to apply suitable data structure for real time applications.

Course Outcomes:

After completing this course, the student will able to:

- Implement the abstract data type and reusability of a practical data structures.
- Implement linear data structures such as Stacks, Queues using array and linked list.
- Understand and implements non linear data structures such as Trees, Graphs.
- Implement various kinds of searching, sorting and traversal techniques and know when to choose which technique.
- Understanding and implementing hash techniques.
- Decide a suitable data structure and algorithm to solve real world problem.

List of Programs:

1. Implement the following operations on singly linked list:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
2. Implement the following operations on doubly linked list:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
3. Implement the following operations on circular linked list:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
4. Implementation of Stacks, Queues (using both arrays and linked lists).
5. Implementation of circular queue using arrays.
6. Implementation of double ended queue (de queue) using arrays.
7. Implement a program to evaluate a given postfix expression using stacks.
8. Implement a program to convert a given infix expression to postfix form using stacks.

9. Implementation of Polynomial arithmetic using linked list.
10. Implementation of recursive and non recursive functions to perform the following searching operations for a key value in a given list of integers:
    i) Linear search ii) Binary search
11. Implementation of hashing with (a) Separate Chaining and (b) Open addressing methods.
12. Implementation of recursive and iterative traversals on binary tree.
13. Implementation of operations on binary tree (delete entire tree, copy entire tree, mirror image, level order, search for a node etc.)
14. Implementation of the following operations on binary search tree (BST):
    (a) Minimum key (b) Maximum key (c) Search for a given key (d) Delete a node with given key

Course Code	Course Title						Core/Elective
PCC 312 CS	COMPUTER ORGANIZATION & ARCHITECTURE LAB						Core
	Contact Hours per Week				CIE	SIE	Credits
	L	T	D	P			
	0	0	0	4	25	50	2

Course Objectives:

The objectives of the course are to impart knowledge of the:

- To become familiar with the architecture and Instruction set of Intel 8086 microprocessor.
- To provide practical hands on experience with Assembly Language Programming.
- To familiarize the students with interfacing of various peripheral devices with 8085 microprocessors.

Course Outcomes:

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

1. Interpret the principles of Assembly Language Programming, instruction set in developing microprocessor based applications.
2. Develop Applications such as: 8-bit Addition, Multiplication, Division, array operations, swapping, negative and positive numbers.
3. Analyse the interfaces like serial ports, digital-to-analog Converters and analog-to-digital converters etc.
4. Build interfaces of Input-output and other units like stepper motor with 8086.
5. Analyse the function of traffic light controller.

List of Programs:

1. Tutorials with 8086 kit / MASM software tool.
2. Fixed-point multiplication and division.
3. Floating-point multiplication and division.
4. Sorting hexadecimal array.
5. Code conversion from hexadecimal to decimal.
6. Sum of set of BCD numbers.

7. Searching.

8. Display a string of characters using 8279.

9. Interfacing traffic light controller using 8255.

10. Interfacing seven-segment LED using 8255.

11. Interfacing stepper motor using 8255.

12. Interfacing 8253 counter.

13. D/A conversion using 8255.

14. A/D conversion using 8255.

Course Code	Course Title						Core/Elective
PCC 313 CS	IT WORKSHOP (Python & MAT Lab)						Core
	Contact Hours per Week				CIE	SIE	Credits
	L	T	D	P			
	0	0	0	4	25	50	2

Course Objectives :

- Introducing a new object oriented programming
- Preparing students to cope up with new Market tendencies
- To learn programs in MATLAB environment
- To handle Functions, Polynomials by using MATLABcommands
- Ability to solve any Mathematical functions
- To learn Mathematical Modelling in a new approach
- To plot Graphics (2-D) easily and effectively

Course Outcomes :

After completing this course, the student will be able to:

1. Implement basic syntax in python.
2. Analyse and implement different kinds of OOP concept in real world problems.
3. Implement MATLAB operations and graphic functions.

List of Programs:

SECTION 1: MAT LAB / SCILAB PROGRAMS

1. Introduction to MATLAB/ SCI Lab Environment
2. Study of basic matrix operations
3. To solve linear equation
4. Solution of Linear equations for Underdetermined and Over determined cases.
5. Determination of Eigen values and Eigen vectors of a Square matrix.
6. Solution of Difference Equations.
7. Solution of Difference Equations using Euler Method.
8. Solution of differential equation using 4th order Runge- Kutta method.
9. Determination of roots of a polynomial.
10. Determination of polynomial using method of Least Square Curve Fitting.
11. Determination of polynomial fit, analyzing residuals, exponential fit and error bounds from the given data.

12. Determination of time response of an R-L-C circuit

SECTION 2 : Python Programs

1. Introduction to Python Programming:
    a. Running instructions in Interactive interpreter and a Python Script.
    b. Write a program to purposefully raise Indentation Error and Correct it
    c. Write a program to compute distance between two points taking input from the user
    d. Write a program add.py that takes 2 numbers as command line arguments and prints its sum.
    e. Program to display the following information: Your name, Full Address, Mobile Number, College Name, Course Subjects
    f. Write a Program for checking whether the given number is a even number or not.
2. Control Structures, Lists
    a. Program to find the largest three integers using if-else
    b. Program that receives a series of positive numbers and display the numbers in order and their sum
    c. Program to find the product of two matrices $[A]_{mxp}$ and $[B]_{pxr}$
    d. Program to display two random numbers that are to be added, the program should allow the student to enter the answer.
    e. If the answer is correct, a message of congratulations should be displayed.
    f. If the answer is incorrect, the correct answer should be displayed.
    g. Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . 1/10.
    h. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
3. Functions and Recursion
    a. Write recursive and non-recursive functions for the following
    b. To find GCD of two integers
    c. To find the factorial of positive integer
    d. To print Fibonacci Sequence up to given number n
    e. To display prime number from 2 to n.
    f. Function that accepts two arguments: a list and a number n. It displays all of the numbers in the list that are greater than n

g. Functions that accept a string as an argument and return the number of vowels and consonants that the string contains

4. Files, Exceptions, Lists, Sets, Random Numbers
   a. Program to write a series of random numbers in a file from 1 to n and display.
   b. Program to write the content in a file and display it with a line number followed by a colon
   c. Program to display a list of all unique words in a text file
   d. Program to analyses the two text files using set operations
   e. Write a program to print each line of a file in reverse order.
   f. Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?
   g. Write a program combine lists that combines these lists into a dictionary.
5. Object Oriented Programming
   a. Program to implement the inheritance
   b. Program to implement the polymorphism
6. GUI Programming
   a. Program that converts temperature from Celsius to Fahrenheit
   b. Program that displays your details when a button is clicked.
   c. Write a GUI for an Expression Calculator using tk

ourse Code	Course Title						Core/Elective
C 411 CS	JAVA LAB						Core
	Contact Hours per Week				CIE	SIE	Credits
	L	T	D	P			
	0	0	0	4	0	50	2

Course Objectives:

- It covers various concepts of java programming language
- It introduces Multithreading and synchronization
- It introduces various classes and interfaces in Collection framework
- It introduces AWT Classes
- It introduces the feasible and optimal solutions by using the different design methods

Course Outcome:

- Able to use classes and interfaces efficiently for implementation of various applications.
- Able to implement Event handling mechanisms using java programs.

List of Programs:

1. A program to illustrate the concept of class with constructors, methods and overloading.
2. A program to illustrate the concept of inheritance and dynamic polymorphism.
3. A program to illustrate the usage of abstract class.
4. A program to illustrate multithreading.
5. A program to illustrate thread synchronization.
6. A program using StringTokenizer.
7. A program using Linked list class.
8. A program using TreeSet class.
9. A program using HashSet and Iterator classes.
10. A program using map classes.
11. A program using Enumeration and Comparator interfaces.
12. A program to illustrate the usage of filter and Buffered I/O streams.
13. A program to illustrate the usage of Serialization.
14. An application involving GUI with different controls, menus and event handling.
15. A program to implement AWT/Swing.

AICTE

Faculty of Engineering & Technology

Scheme of Instruction and Syllabus

For

B.TECH (CBCS) – III & IV SEMESTER

Of

Four Year Degree Course

In

COMPUTER SCIENCE & ENGINEERING

Mahatma Gandhi University

Nalgonda

Telangana State

508 254

With effect from the ACADEMIC YEAR 2019-20

UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY

B.TECH (CBCS) 4 YEAR (8 SEMESTER) REGULAR PROGRAMME

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

(Applicable from the batch admitted from the Academic Year 2018-19 and onwards)

SEMESTER – IV

Course Code	Course Title	Scheme of Instructions				Scheme of Examinations		Credits
		L	T	P/Dg	Contact Hrs/Wk	CIE	SEE	
THEORY								
BSC 401 MT	Operations Research	3	0	0	3	30	70	3
HSMC 402	Business Economics & Financial Analysis	3	0	0	3	30	70	3
PCC 403 CS	Object Oriented Programming through Java	3	1	0	4	30	70	4
PCC 404 CS	Design & Analysis of Algorithms	3	0	0	3	30	70	3
PCC 406 CS	Operating System	3	0	0	3	30	70	3
MC 407 CE	Environmental Sciences	3	0	0	3	30	70	-
PRACTICALS								
PCC 411 CS	Java Lab	0	0	2*2	4	25	50	2
PCC 412 CS	Operating Systems Lab	0	0	2*2	4	25	50	2
PCC 413 CS	Design & Analysis of Algorithms Lab	0	0	2*2	4	25	50	2
	Total	**18**	**1**	**12**	**31**	**255**	**570**	**22**

w. e. f Academic Year 2019-20

Course Code	Course Title				CIE	SIE	Core/Elective
HS 401 MT	OPERATIONS RESEARCH						Core
	Contact Hours per Week						Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objective:

- The objective of the course is to give an overview of different Optimization Techniques useful for problem solving and decision making.

Course Outcomes : Students can able to

- Model Physical Problems in Engineering and Management in Mathematical Form.
- Solve decision making situation problem using the concept of linear programming techniques.
- Solve transport related problems of Industry.
- Solve the problems related to assignment of jobs or projects to the employees in IT and Management related, which minimizes the total assignment cost.

UNIT – I: Introduction: i. Introduction to OR- Origin, Nature, definitions, Managerial applications and limitations of OR. **ii. Linear Programming:** Mathematical model, Formulation of LPP, assumptions underlying LPP, Solution by the Graph, Exceptional cases.

UNIT – II: Allocation Model - I: i. LPP - Simplex Method- Solution to LPP problems Maximization and Minimization cases Optimality conditions. Degeneracy. ii. Dual - Formulation, Relationship between Primal - Dual, Solution of dual, Economic interpretation of dual.

UNIT – III: Allocation Model – II: Transportation Problem (TP) - Mathematical model, IBFS using northwest corner rule, Row and Column Minimum methods, Matrix minimum method(LCM) and Vogel's approximation method, Unbalanced TP, Degeneracy, Optimality Test and Managerial applications.

UNIT – IV: Allocation Model – III : i. Assignment Problem (AP): Mathematical model, Unbalanced AP, Restricted AP, method of obtaining solution- Hungarian method. ii. Travelling salesman problem

UNIT – V: Competitive Strategy Models: Game Theory- concepts, saddle point, Dominance, Zero-sum game, two, three and more Persons games, analytical method of solving two person zero sum games, graphical solutions for (m x 2) and (2 x n) games

Suggested Readings:

1. J.K. Sharma, "Operations Research Theory and Applications 2009, 4th Ed. Macmillan.
2. S.D.Sharma, "Operations Research" , Publishing 2017, Latest Edition, Kedar Nath Ram Nath.
3. N.D. Vohra, "Quantitative Techniques in Management", 2010, 4th Ed.TMH.
4. Kasana, HS & Kumar, KD, "Introductory Operations Research theory and applications", 2008, Springer.
5. Chakravarty, P, "Quantitative Methods for Management and Economics", 2009, 1st Ed. HPH.
6. Barry Render, Ralph M. Stair, Jr. and Michael E. Hanna, "Quantitative analysis for Management", 2007, 9th Ed. Pearson.
7. Pannerselvam, R, "Operations Research", 2006, 3rd Ed. PHI.
8. Selvaraj, R, "Management Science Decision Modeling Approach", 2010, 1st Ed. Excel.
9. Ravindren, A, Don T. Phillips and James J. Solberg, 2000, "Operations Research Principles and Practice", 2nd Ed. John Wiley and Sons.
10. Hillier, Frederick S. & Lieberman, "Introduction to Operations Research Concepts and Cases", 2010, 8th Ed. TMH.
11. Prem Kumar Gupta & others, "Operations Research", 2010, S. Chand.

Course Code	Course Title						Core/Elective
HSMC 402	BUSINESS ECONOMICS & FINANCIAL ANALYSIS						Core
	Contact Hours per Week				CIE	SIE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objective:

- To prepare engineering students to analyze cost/ revenue/ financial data and to make economic and financial analysis in decision making process and to examine the performance of companies engaged in engineering.

Course Outcome:

- To perform and evaluate present and future worth of the alternate projects and to appraise projects by using traditional and DCF Methods. To carry out cost benefit analysis of projects and to calculate BEP of different alternative projects.

UNIT – I: Introduction to Engineering Economics, Basic Principles and Methodology of Engineering Economics, Fundamental Concepts, Demand, Demand Determinants, Law of Demand, Demand Forecasting and Methods , Elasticity of Demand, Theory of Firm, Supply, Elasticity of Supply.

UNIT – II: Macro Economic Concepts: National Income Accounting, Methods of Estimation, Various Concepts of National Income, Inflation, Definition, Causes of Inflation and Measures to Control Inflation New Economic Policy 1991 (Industrial policy, Trade policy, and Fiscal policy) Impact on Industry.

UNIT – III: Production, Cost, Market Structures & Pricing: Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions. **Cost analysis:** Types of Costs, Short run and Long run Cost Functions. Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition. **Pricing:** Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT – IV: Capital Budgeting Techniques: Significance of Capital Budgeting, cash flows, Time Value of Money Choosing between alternative investment proposals, Methods of Appraisal Techniques, Pay Back Period, Average Rate of Return, Net Present Value, Internal Rate of Return, Profitability Index.

UNIT – V: **Introduction to Accounting:** Accounting Principles (GAPP), concepts, convention, Double entry system of Book keeping, Accounting rules, Journal ledger, Trial balance, Trading and Profit and Loss account, Balance Sheet (Simple Problems)

Suggested Reading:

1. Engineering Economics, Principles, Henry Malcom Steinar, McGraw Hill Pub.
2. Business Economics - Theory and Applications, D.D.Chaturvedi, S.L.Gupta, International Book HousePvt. Ltd. 2013.
3. Accounting, Jain and Narang, Kalyani Publishers.
4. Cost Accounting, Arora, M.N, Vikas Publication.
5. Financial Management, S.N.Maheshwari, Vikas Publishing House.

w. e. f Academic Year 2019-20

Course Code	Course Title						Core/Elective
PCC 403 CS	OBJECT ORIENTED PROGRAMMING Through JAVA						Core
	Contact Hours per Week				CIE	SIE	Credits
	L	T	D	P			
	3	1	0	0	30	70	4

Course Objective:

- To understand object oriented programming concepts, and apply them in solving problems.
- To introduce the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes.
- To introduce the implementation of packages and interfaces.
- To introduce the concepts of exception handling and multithreading.
- To introduce the design of Graphical User Interface using applets and swing controls.

Course Outcome:

UNIT – I: Object Oriented System Development: Understanding Object Oriented Development, Understanding Object Concepts, Benefits of Object Oriented Development. **Java Programming Fundamentals:** Introduction. Overview of Java, Data Type, Variables and Arrays, Operators, Control statements, Classes, Methods , Inheritance, Packages and Interfaces.

UNIT – II: Exceptions Handling, Multithreaded Programming, I/O basics, Reading Console input and output, Reading and Writing Files, Print Writer Class, String Handling.

UNIT – III: Exploring Java Language, Collections Overview, Collections Interfaces, Collections Classes, Iterators, Random Access Interface, Maps, Comparators, Arrays, Legacy classes and interfaces, Sting tokenizer, BitSet, Date, Calendar, Timer.

UNIT – IV: Introducing AWT working With Graphics: AWT Classes, Working with Graphics. **Event Handling:** Two Event Handling Mechanisms, The Delegation Event Model, Event Classes, Source of Events, Event Listener Interfaces. **AWT Controls:** Control Fundamentals, Labels, Using Buttons, Applying Check Boxes, CheckboxGroup, Choice Controls, Using Lists, Managing Scroll Bars, Using TextField, Using TextArea, Understanding Layout Managers, Menu bars and Menus, Dialog Boxes,

FileDialog, Handling events by Extending AWT Components, Exploring the controls, Menus and Layout Managers.

UNIT –V: Java I/O classes and interfaces, Files, Stream and Byte classes, Character Streams, Serialization.

Suggested Reading:

1. Herbert Schildt, The Complete Reference Java, 7th Edition, Tata McGraw Hill, 2005.
2. James M Slack, Programming and Problem solving with JAVA, Thomson Learning, 2002
3. C Thomas Wu, An Introduction to Object Oriented programming with Java, Tata McGraw Hill, 2005.

Course Code	Course Title						Core/Elective
PCC 405 CS	OPERATING SYSTEMS						Core
	Contact Hours per Week				CIE	SIE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- Provide an introduction to operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection)
- Introduce the issues to be considered in the design and development of operating system
- Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

Course Outcomes:

- Will be able to control access to a computer and the files that may be shared
- Demonstrate the knowledge of the components of computer and their respective roles in computing.
- Ability to recognize and resolve user problems with standard operating environments.
- Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.

UNIT – I: Operating System Introduction: Structures, Simple Batch, Multiprogrammed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls.

UNIT – II: Process and CPU Scheduling: Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads, and Interposes Communication, Scheduling Criteria, Scheduling Algorithms, Multiple Processor Scheduling. System call interface for process management-fork, exit, wait, waitpid, exec

UNIT – III: Deadlocks: System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock. **Process Management and Synchronization:** The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors. **Interprocess**

UNIT – IV: Greedy method: General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT – V: Branch and Bound: General method, applications - Travelling sales person problem, 0/1 knapsac problem - LC Branch and Bound solution, FIFO Branch and Bound solution. **NP-Hard and NP-Complete problems:** Basic concepts, non deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

Suggested Reading:

1. Fundamentals of Computer Algorithms, Ellis Horowitz,Satraj Sahni and Rajasekharan,University Press.
2. Design and Analysis of algorithms, Aho, Ullman and Hopcroft,Pearson education.
3. Introduction to Algorithms, second edition,T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, PHI Pvt. Ltd./ Pearson Education.
4. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and sons.

Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT – IV: Memory Management and Virtual Memory: Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

UNIT – V: File System Interface and Operations: Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, lseek, stat, ioctl, system calls.

Suggested Reading:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. Advanced programming in the Unix environment, W.R.Stevens, Pearson education.
3. Operating Systems – Internals and Design Principles, Stallings, 5th Edition, Pearson Education/PHI, 2005.
4. Operating System A Design Approach-Crowley,TMH.
5. Modern Operating Systems, Andrew S Tanenbaum 2nd edition, Pearson/PHI
6. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
7. Unix Internals The New Frontiers, U.Vahalia, Pearson Education.

w. e. f Academic Year 2019-20

Course Code	Course Title						Core/Elective
PCC 404 CS	DESIGN & ANALYSIS OF ALGORITHMS						Core
	Contact Hours per Week				CIE	SIE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- Introduces the notations for analysis of the performance of algorithms.
- Introduces the data structure disjoint sets.
- Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate;
- Describes how to evaluate and compare different algorithms using worst-, average-, and best-case analysis.
- Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

Course Outcomes:

- Ability to analyze the performance of algorithms
- Ability to choose appropriate data structures and algorithm design methods for a specified application
- Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs

UNIT – I: Introduction: Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations, Big oh notation, Omega notation, Theta notation and Little oh notation. **Divide and conquer:** General method, applications-Binary search, Quick sort, Merge sort, Strassen's Matrix multiplication.

UNIT – II: Disjoint Sets: Disjoint set operations, union and find algorithms **Backtracking:** General method, applications, n-queen's problem, sum of subsets problem, graph coloring

UNIT – III: Dynamic Programming: General method, applications- Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.

Course Code	Course Title						Core/Elective
C 405 CE	ENVIRONMENTAL SCIENCES						Core
	Contact Hours per Week				CIE	SIE	Credits
	L	T	D	P			
	3	0	0	0	0	50	3

Course Objective:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures

UNIT-I: Environmental studies: Definition, scope and importance, need for public awareness. Natural resources: Water resources; use and over utilization of surface and ground water, floods, drought, conflicts over water, dams' benefits and problems. Effects of modern agriculture, fertilizer-pesticide problems, water logging salinity. Energy resources, growing energy needs renewable and non-renewable energy sources. Land Resources, land as a resource, land degradation, soil erosion and desertification.

UNIT-II: Ecosystems: Concepts of an ecosystem, structure and functions of an ecosystem, producers, consumers and decomposers, energy flow in ecosystem, food chains, ecological pyramids, aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT-III: Biodiversity: Genetic species and ecosystem diversity, bio-geographical classification of India. Value of biodiversity, threats to biodiversity, endangered and endemic species of India, conservation of biodiversity.

UNIT-IV: Environmental Pollution: Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution and solid waste management.

Environment Protection Act: Air, water, forest and wild life acts, issues involved in enforcement of environmental legislation.

UNIT-V: Social Aspects and the Environment: Water conservation, watershed management, and environmental ethics. Climate change, global warming, acid rain, ozone layer depletion. Environmental protection act, population explosion. **Disaster Management:** Types of disasters, impact of disasters on environment, infrastructure and development. Basic principles of disaster mitigation, disaster management, and methodology, disaster management cycle, and disaster management in India.

w. e. f Academic Year 2019-20

Course Code	Course Title						Core/Elective
PCC 412 CS	OPERATING SYSTEMS LAB						Core
	Contact Hours per Week				CIE	SIE	Credits
	L	T	D	P			
	0	0	0	4	0	50	2

Course Objectives:

- To provide an understanding of the design aspects of operating system concepts through simulation
- Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

Course Outcomes:

- Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.
- Able to implement C programs using Unix system calls

List of Experiments

1. Write C programs to simulate the following CPU Scheduling algorithms
   a) FCFS b) SJF c) Round Robin d) priority
2. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close, fcntl, seek, stat, opendir, readdir)
3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.
4. Write a C program to implement the Producer – Consumer problem using semaphores using UNIX/LINUX system calls.
5. Write C programs to illustrate the following IPC mechanisms
   a) Pipes b) FIFOs c) Message Queues d) Shared Memory
6. Write C programs to simulate the following memory management techniques
   a) Paging b) Segmentation

Suggested Reading :

1. A. K. De, *Environmental Chemistry*, New Age Publications, 2002.
2. E. P. Odum, *Fundamentals of Ecology*, W.B. Sunders Co., USA.
3. GL. Karia and R.A. Christian, *Waste Water Treatment, Concepts and Design Approach*, Prentice Hall of India, 2005.
4. Benny Joseph, *Environmental Studies*,TataMcGraw-Hill, 2005
5. V. K. Sharma, *Disaster Management*, National Centre for Disaster Management, IIPE, Delhi,

w. e. f Academic Year 2019-20

Course Code	Course Title						Core/Elective
PCC 413 CS	DESIGN & ANALYSIS OF ALGORITHMS LAB						Core
	Contact Hours per Week				CIE	SIE	Credits
	L	T	D	P			
	0	0	0	4	0	50	2

Course Objectives:

- It covers various concepts of java programming language
- It introduces searching and sorting algorithms
- It introduces the feasible and optimal solutions by using the different design methods

Course Outcomes:

- Develop the feasible and optimal solutions by using Greedy and dynamic programming.
- Able to design the searching algorithms

List of Programs:

1. Write a program to implement n-Queen's problem
2. Write a program to implement Optimal Binary Search Tree
3. Write a program to implement 0/1 Knapsack problem by using Dynamic Programming
4. Write a program to implement Greedy Knapsack problem
5. Write a program to implement Prim's minimum cost spanning tree by using Greedy Method
6. Write a program to implement Kruskal's minimum cost spanning tree by using Greedy Method
7. Write a program to implement Job sequencing with deadlines by using Greedy Method
8. Write a program to implement Single source shortest path problem by using Greedy Method

Dept. Copy

AICTE

UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY

B.TECH (CBCS) 4 YEAR (8 SEMESTER) REGULAR PROGRAMME

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

(Applicable from the batch admitted from the Academic Year 2018-19 and onwards)

Faculty of Engineering & Technology

Scheme of Instruction and Syllabus

For

B.TECH (CBCS) –V SEMESTER

Of

Four Year Degree Course

In

COMPUTER SCIENCE & ENGINEERING

Mahatma Gandhi University

Nalgonda

Telangana State

508 254

With effect from the ACADEMIC YEAR 2020-21

UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY

B.TECH (CBCS) 4 YEAR (8 SEMESTER) REGULAR PROGRAMME

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

(Applicable from the batch admitted from the Academic Year 2018-19 and onwards)

SEMESTER – V

S.No	Course Code	Course Title	Scheme of Instructions				Scheme of Examinations		Credits
			L	T	P/Dg	Contact Hrs/Wk	CIE	SEE	
THEORY									
1.	HSMC 501	Principles Of Management	3	0	0	3	30	70	3
2.	ESC 502 CS	Fundamentals of Data Science	3	0	0	3	30	70	3
3.	PCC 503 CS	Database Management Systems	3	0	0	3	30	70	3
4.	PCC 504 CS	Software Engineering	3	0	0	3	30	70	3
5.	PCC 505 CS	Automata Languages & Computation	3	0	0	3	30	70	3
6.	#PE -I	Professional Elective-I	3	0	0	3	30	70	3
PRACTICALS									
7.	PCC 511 CS	Database Management Systems Lab	0	0	2*2	4	25	50	2
8	PCC 512 CS	Software Engineering Lab	0	0	2*2	4	25	50	2
9.	ESC 513CS	Data Science Lab	0	0	2	2	25	50	1
		Total	**18**	**0**	**10**	**28**	**255**	**570**	**23**

#PE-I	Professional Elective –I
PE 513 CS	Principles Of Programming Languages
PE 514 CS	Advanced Operating Systems
PE 515 CS	Graph Theory

Course Code	Course Title						Core/Elective
HSMC 501	PRINCIPLES OF MANAGEMENT						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- Managers manage business organizations in the dynamic global environment
- Organizations develop and maintain competitive advantage
- Business decisions are made using various tools and techniques to remain competitive
- Managers use problem-solving strategies and critical thinking skills in reallife situations
- Different areas of the business (i.e., Manufacturing/Service, Marketing, Finance and Human Resource Management) support the vision and mission.
- Managers implement successful planning

Course Outcomes:

- Towards the end of the course it is expected that the student would be matured enough to apply the industrial management concepts and techniques in real life situations.

UNIT - I

Introduction to Management: Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management- Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT – II

Planning and Decision Making: General Framework for Planning - Planning Process, Types of Plans, Management by Objectives; Development of Business Strategy. Decision making and Problem Solving - Programmed and Non Programmed Decisions, Steps in Problem Solving and Decision Making; Bounded Rationality and Influences on Decision Making; Group Problem Solving and Decision Making, Creativity and Innovation in Managerial Work.

UNIT – III

Organization and HRM: Principles of Organization: Organizational Design & Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization; Organizational Culture; Organizational Climate and Organizational Change.

UNIT – IV

Leading and Motivation: Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills, Leader as Mentor and Coach, Leadership during adversity and Crisis; Handling Employee and Customer Complaints, Team Motivation - Types of Motivation; Relationship between Motivation, Performance and Engagement, Content Motivational Theories - Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y.

UNIT – V

Controlling: Control, Types and Strategies for Control, Steps in Control Process, Budgetary and Non-Budgetary Controls. Characteristics of Effective Controls, Establishing control systems, Control frequency, and Methods

Suggested Readings:

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.
3. Essentials of Management, Koontz Kleihrich, Tata McGraw Hill.
4. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012

Course Code	Course Title						Core/Elective
ESC 502 CS	FUNDAMENTALS OF DATA SCIENCES						Core
	Contact Hours per Week				CIE	SIE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- Familiarize the student about the concepts of data visualization and formal inference procedures.
- Enable the student to interpret wider range of visual and numerical data
- Train the student on basic machine learning algorithms
- Demonstrate the Applications of Data Science, Technologies for visualization Handling of variables using Python

Course Outcomes: The student should be able to

- Identify the types of data.
- Understand about how to collect the data, manage the data.
- Classify the data using svm and navie bayesian
- Apply coding techniques to data for securing the data

UNIT -I

Introduction to core concepts and technologies: Introduction, Terminology, data science Process, data science toolkit, Types of data, Example applications

UNIT -II

Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, using multiple data sources

UNIT -III

Data analysis: Introduction, Terminology and concepts. Introduction to statistics. Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.

UNIT -IV

Data visualization: Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, mapping variables to encodings, Visual encodings.

UNIT V

Applications of Data Science, Technologies for visualisation, Bokeh (Python)

Suggested Readings:

1. Cathy O'Neil, Rachel Schutt, Doing Data Science, Straight Talk from the Frontline. O'Reilly, 2013.
2. Jure Leskovek, Anand Rajaraman, Jeffrey Ullman, Mining of Massive Datasets. v 2.1, Cambridge University Press, 2014.

Course Code	Course Title						Core/Elective
PCC 503 CS	DATABASE MANAGEMENT SYSTEMS						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- To introduce three schema architecture and DBMS functional components
- To learn formal and commercial query languages of RDBMS
- To understand the principles of ER modeling and theory of normalization
- To study different file organization and indexing techniques
- To familiarize theory of serializablity and implementation of concurrency control and recovery

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

- Understand the mathematical foundations on which RDBMS are built
- Model a set of requirements using the Extended Entity Relationship Model (EER) , transform an EER model into a relational model ,and refine the relational model using theory of Normalization
- Develop Database application using SQL and Embedded SQL
- Use the knowledge of file organization and indexing to improve database application performance
- Understand the working of concurrency control and recovery mechanisms in RDBMS

UNIT-I :

Introduction: Database System Applications, Purpose of Database Systems, View of Values, Nested Sub-queries, Complex Queries, Views, Modification of the Database, Joined Relations Data, Database Languages, Relational Databases, Database Design, Object–based and Semi-structured Databases, Data Storage and Querying, Transaction Management, Data Mining and Analysis, Database Architecture, Database Users and Administrators.

Database Design and the E-R Model: Overview of the Design Process, The Entity- Relationship Model, Constraints, Entity-Relationship Diagrams, Entity – Relationship Design Issues, Weak Entity Sets, Extended E-R Features, Database Design for Banking Enterprise, Reduction to Relational Schemas, Other Aspects of Database Design.

UNIT-II:

Relational Model: Structure of Relational Databases, Fundamental Relational-Algebra Operations, Additional Relational – Algebra Operations, Extended Relational - Algebra Operations, Null Values, Modification of the Databases.Structured Query Language: Data Definition, Basic Structure of SQL Queries, Set Operations, Aggregate Functions, Null

UNIT-III:

Advanced SQL: SQL Data Types and Schemas, Integrity Constraints, Authorization, Embedded SQL, Dynamic SQL, Functions and Procedural Constructs, Recursive Queries, Advanced SQL Features. Relational Database Design: Features of Good Relational Design, Atomic Domains and First Normal Form, Functional-Dependency Theory, Decomposition using Functional Dependencies.

UNIT – IV

Indexing and Hashing: Basic Concepts, Ordered Indices, B^+-tree Index Files, B-tree Index Files, Multiple-Key Access, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices.

Index Definition in SQL Transactions: Transaction Concepts, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability.

UNIT – V

Concurrency Control: Lock-based Protocols, Timestamp-based Protocols, Validation-based Protocols, Multiple Granularity, Multi-version Schemes, Deadlock Handling, Insert and Delete Operations, Weak Levels of Consistency, Concurrency of Index Structures.

Recovery System: Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions, Buffer Management, Failure with Loss of Nonvolatile Storage, Advanced Recovery Techniques, Remote Backup Systems.

Suggested Readings:

1. Abraham Silberschatz, Henry F Korth, S Sudarshan, Database System Concepts, McGraw-Hill International Edition, 6th Edition, 2010

2. Ramakrishnan, Gehrke, Database Management Systems, McGraw-Hill International Edition, 3rd Edition, 2003
3. Elmasri, Navathe, Somayajulu, Fundamentals of Database Systems, Pearson Education, 4th Edition, 2004

Course Code	Course Title						Core/Elective
PCC 504 CS	SOFTWARE ENGINEERING						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- To introduce the basic concepts of software development- processes from defining a product to shipping and maintaining that product
- To impart knowledge on various phases , methodologies and practices of software development
- To understand the importance of testing in software development and study various testing strategies and software quality metrics

Course Outcomes: Student will be able to

- Acquire working knowledge of alternative approaches and techniques for each phase of software development
- Acquire skills necessary for independently developing a complete software project
- Understand the practical challenges associated with the development of a significant software system

UNIT-I

Introduction to Software Engineering:

A generic view of Process: Software Engineering, Process Framework, CMM Process Patterns, Process Assessment.

Process Models: Prescriptive Models, Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, The Unified Models, Personal and Team Process Models, Process Technology, Product and Process.

An Agile view of Process: Introduction to Agility and Agile Process, Agile Process Models.

UNIT-II

Software Engineering Principles: SE Principles, Communication Principles, Planning Principles, Modeling Principles, Construction Principles, Deployment.

System Engineering: Computer-based Systems, The System Engineering Hierarchy, Business Process Engineering, Product Engineering, System Modeling.

Requirements Engineering: A Bridge to Design and Construction, Requirements Engineering Tasks, Initiating Requirements Engineering Process, Eliciting Requirements, Developing Use-Cases, Building the Analysis Model, Negotiating Requirements, Validating Requirements.

UNIT-III

Building the Analysis Model: Requirements Analysis Modeling Approaches, Data Modeling Concepts, Object-Oriented Analysis, Scenario-based Modeling, Flow-oriented Modeling, Class-based Modeling, Creating a Behavioral Model.

Design Engineering: Design within the context of SE, Design Process and Design Quality, Design Concepts, The Design Model, Pattern-based Software Design.

UNIT-IV

Creating an Architectural Design: Software Architecture, Data Design, Architectural Styles and Patterns, Architectural Design, Assessing Alternative Architectural Designs, Mapping Data Flow into a Software Architecture.

Modeling Component-Level Design: Definition of Component, Designing Class-based Components, Conducting Component-level Design, Object Constraint Language, Designing Conventional Components.

Performing User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation.

UNIT-V

Software Quality Assurance: Basic Elements, Tasks, Goals and Metrics, Formal Approaches, Statistical Software Quality Assurance, Software Reliability, ISO 9000 Quality Standards, SQA Plan.

Testing Strategies: A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for O-O Software, Validation Testing, System Testing, The Art of Debugging.

Testing Tactics: Software Testing Fundamentals, Black-box and White-box Testing, Basis Path Testing, Control Structure Testing, O-O Testing Methods, Testing Methods applicable on the Class Level, Inter Class Test Case Design, Testing for Specialized Environments, Architectures and Applications, Testing Patterns.

Product Metrics: Software Quality, A Framework for Product Metrics, Metrics for the Analysis Model, Metrics for the Design Model, Metrics for Source Code, Metrics for Testing, Metrics for Maintenance.

Suggested Readings:

1. Roger S.Pressman, Software Enigneering: A Practitioner's Approach, 7th Edition, McGraw Hill, 2009
2. Ali Behforooz and Frederick J.Hudson, Software Engineering Fundamentals, Oxford University Press, 1996
3. Pankaj Jalote , An Integrated Approach to Software Engineering, 3rd Edition, Narosa Publishing House, 2008

Course Code	Course Title						Core/Elective
PCC 505 CS	AUTOMATA LANGUAGES & COMPUTATION						Core
	Contact Hours per Week				CIE	SIE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- Introduce the concept of formal specification of languages and different classes of formal languages
- Discuss automata models corresponding to different levels of Chomsky hierarchy
- Understand the concept of computability and decidability

Course Outcomes : Student will be able to

- Design Finite State Machine, Pushdown Automata, and Turing Machine
- Determine a language's place in the Chomsky hierarchy (regular, context-free, recursively enumerable)
- Convert among equivalently powerful notations for a language, including among DFAs, NFAs, and regular expressions, and between PDAs and CFGs
- Explain why the halting problem has no algorithmic solution

UNIT – I

Introduction, Finite state automata, Non-deterministic finite state automata, FA with ε-transitions, Regular expressions, FA with outputs, Applications of FA. Properties of regular sets-Pumping Lemma, Closure properties, Myhill-Nerode Theorem, Minimization of FA, Decision Algorithms.

UNIT – II

Context Free Grammars and Languages–Derivations, Parse-trees, Ambiguity in Grammars and Languages. Pushdown Automata–Definitions, The languages of PDA, Equivalence of PDAs and CFGs, Deterministic Pushdown Automata(DPDA).

UNIT – III

Properties of CFLs–Normal forms for CFGs, Pumping Lemma, Closure properties, Decision algorithms, Deterministic Context Free Languages, Predicting machines, Decision properties, LR(0) grammars, LR(0) and DPDA, LR(k) grammars.

UNIT – IV

Turing Machines–Introduction, Computational Languages and Functions,Techniques for construction of Turing machines. Modifications of TM, TM as enumerator, Restricted TM.

UNIT – V

Undecidability: Recursive and Recursively enumerable languages, UTM and undecidable problem, Rice Theorem, Post's correspondence problem. Chomsky's Hierarchy – Regular grammars, Unrestricted grammar, CSL, Relationship between classes of languages.

Suggested Readings:

1. John E. Hopcroft, Jeffrey D. Ullman, Introduction to Automata Theory, Languages and Computation, Narosa, 1979
2. Zvi Kohavi, Switching and Finite Automata Theory, TMH, 1976

Course Code	Course Title						Core/Elective
PE 513 CS	PRINCIPLES OF PROGRAMMING LANGUAGES						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives

- Introduce important paradigms of programming languages
- To provide conceptual understanding of high-level language design and implementation

Course Outcomes

- Acquire the skills for expressing syntax and semantics in formal notation
- Identify and apply a suitable programming paradigm for a given computing application
- Gain knowledge of and able to compare the features of various programming languages

UNIT - I

Preliminary Concepts: Reasons for Studying Concepts of Programming Languages, Programming Domains, Language Evaluation Criteria, Influences on Language Design, Language Categories, Language Design Trade-Offs, Implementation Methods, Programming Environments .

Syntax and Semantics: General Problem of Describing Syntax and Semantics, Formal Methods of Describing Syntax, Attribute Grammars, Describing the Meanings of Programs .

UNIT - II

Names, Bindings, and Scopes: Introduction, Names, Variables, Concept of Binding, Scope, Scope and Lifetime, Referencing Environments, Named Constants.

Data Types: Introduction, Primitive Data Types, Character String Types, User Defined Ordinal Types, Array, Associative Arrays, Record, Union, Tuple Types, List Types, Pointer and Reference Types, Type Checking, Strong Typing, Type Equivalence .

Expressions and Statements: Arithmetic Expressions, Overloaded Operators, Type Conversions, Relational and Boolean Expressions, Short Circuit Evaluation, Assignment Statements, Mixed-Mode Assignment .

Control Structures – Introduction, Selection Statements, Iterative Statements, Unconditional Branching, Guarded Commands.

UNIT - III

Subprograms and Blocks: Fundamentals of Sub-Programs, Design Issues for Subprograms, Local Referencing Environments, Parameter Passing Methods, Parameters that Are Subprograms, Calling Subprograms Indirectly, Overloaded Subprograms, Generic Subprograms, Design Issues for Functions, User Defined Overloaded Operators, Closures, Coroutines .

Implementing Subprograms: General Semantics of Calls and Returns, Implementing Simple Subprograms, Implementing Subprograms with Stack-Dynamic Local Variables, Nested Subprograms, Blocks, Implementing Dynamic Scoping Abstract Data Types: The Concept of Abstraction, Introductions to Data Abstraction, Design Issues, Language Examples, Parameterized ADT, Encapsulation Constructs, Naming Encapsulations.

UNIT - IV

Concurrency: Introduction, Introduction to Subprogram Level Concurrency, Semaphores, Monitors, Message Passing, Java Threads, Concurrency in Function Languages, Statement Level Concurrency. Exception Handling and Event Handling: Introduction, Exception Handling in Ada, C++, Java, Introduction to Event Handling, Event Handling with Java and C#.

UNIT – V

Functional Programming Languages: Introduction, Mathematical Functions, Fundamentals of Functional Programming Language, LISP, Support for Functional Programming in Primarily Imperative Languages, Comparison of Functional and Imperative Languages

Logic Programming Language: Introduction, an Overview of Logic Programming, Basic Elements of Prolog, Applications of Logic Programming.

Scripting Language: Pragmatics, Key Concepts, Case Study: Python – Values and Types, Variables, Storage and Control, Bindings and Scope, Procedural Abstraction, Data Abstraction, Separate Compilation, Module Library.

Suggested Readings:

1. Concepts of Programming Languages Robert. W. Sebesta 10/E, Pearson Education.
2. Programming Language Design Concepts, D. A. Watt, Wiley Dreamtech, 2007.
3. Programming Languages, 2nd Edition, A.B. Tucker, R. E. Noonan, TMH.
4. Programming Languages, K. C. Louden, 2nd Edition, Thomson, 2003

Course Code	Course Title						Core/Elective
PE 514 CS	ADVANCED OPERATING SYSTEMS						Elective
	Contact Hours per Week				CIE	SIE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- To study, learn, and understand the main concepts of advanced operating systems (parallel processing systems, distributed systems, real time systems, network operating systems, and open source operating systems)
- Hardware and software features that support these systems.

Course Outcomes: Students will be able to

- Understand the design approaches of advanced operating systems
- Analyze the design issues of distributed operating systems.
- Evaluate design issues of multi processor operating systems.
- Identify the requirements Distributed File System and Distributed Shared Memory.
- Formulate the solutions to schedule the real time applications.

UNIT I

Architectures of Distributed Systems: System Architecture Types, Distributed Operating Systems, Issues in Distributed Operating Systems, Communication Primitives.

Theoretical Foundations: Inherent Limitations of a Distributed System, Lamports Logical Clocks, Vector Clocks, Causal Ordering of Messages, Termination Detection.

UNIT III

Distributed Deadlock Detection: Preliminaries, Deadlock Handling Strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control Organizations for Distributed Deadlock Detection, Centralized- Deadlock - Detection Algorithms, Distributed Deadlock Detection Algorithms, Hierarchical Deadlock Detection Algorithms

UNIT IV

Multiprocessor System Architectures: Introduction, Motivation for multiprocessor Systems, Basic Multiprocessor System Architectures

Multi Processor Operating Systems: Introduction, Structures of Multiprocessor Operating Systems, Operating Design Issues, Threads, Process Synchronization, Processor Scheduling.

Distributed File Systems: Architecture, Mechanisms for Building Distributed File Systems, Design Issues

UNIT-V

Distributed Scheduling: Issues in Load Distributing, Components of a Load Distributed Algorithm, Stability, Load Distributing Algorithms, Requirements for Load Distributing, Task Migration, Issues in task Migration

Distributed Shared Memory: Architecture and Motivation, Algorithms for Implementing DSM, Memory Coherence, Coherence Protocols, Design Issues

Suggested Readings:

1. Advanced Concepts in Operating Systems, Mukesh Singhal, Niranjan G. Shivaratri, Tata McGraw-Hill Edition 2001
2. Distributed Systems: Andrew S. Tanenbaum, Maarten Van Steen, Pearson Prentice Hall, Edition – 2, 2007

Course Code	Course Title						Core/Elective
PE 515 CS	GRAPH THEORY						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- To familiarize a variety of different problems in Graph Theory
- To learn various techniques to prove theorems
- To understand and analyze various graph algorithms

Course Outcomes: Student will be able to

- Write precise and accurate mathematical definitions of objects in graph theory
- Validate and critically assess a mathematical proof
- Develop algorithms based on diverse applications of Graphs in different domains

UNIT-I

Preliminaries: Graphs, isomorphism, sub graphs, matrix representations, degree, operations on graphs, degree sequences

Connected graphs and shortest paths: Walks, trails, paths, connected graphs, distance, cut-vertices, cut-edges, blocks, connectivity, weighted graphs, shortest path algorithms **Trees:** Characterizations, number of trees, minimum spanning trees

UNIT- II

Special classes of graphs: Bipartite graphs, line graphs, choral graphs

Euleran graphs: Characterization, Flurry's algorithm, Chinese-postman-problem

UNIT -III

Hamilton graphs: Necessary conditions and sufficient conditions

Independent sets, coverings, matching's: Basic equations, matching's in bipartite graphs, perfect matching's, greedy and approximation algorithms

Rev
CHAIRPERSON

UNIT- IV

Vertex colorings: Chromatic number and cliques, greedy coloring algorithm, coloring of chordal graphs, Brook's theorem

Edge colorings: Gupta-Vizing theorem, Class-1 graphs and class-2 graphs, equitable edge-coloring

UNIT- V

Planar graphs: Basic concepts, Eulers formula, polyhedrons and planar graphs, charactrizations, planarity testing, 5-color-theorem

Directed graphs: Out-degree, in-degree, connectivity, orientation, Eulerian directed graphs, Hamilton directed graphs, tournaments.

Suggested Readings:

1. F.Harry, Graph theory, Narosa Publications, 1988.
2. C.Berge: Graphs and Hypergraphs, North Holland/Elsevier, 1973
3. J A Bondy and U.S. R Murthy, Graph Theory with Applications, Elsevier Science Ltd, 1976.
4. Douglas B West, Introduction to Graph Theory, Prentice Hall, 2004

Course Code	Course Title						Core/Elective
PCC 511 CS	DATABASE MANAGEMENT SYSTEMS LAB						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	4	25	50	2

Course Objectives:

- To practice various DDL commands in SQL
- To write simple and Complex queries in SQL
- To familiarize PL/SQL

Course Outcomes: Student will be able to

- Design and implement a database schema for a given problem
- Populate and query a database using SQL and PL/SQL
- Develop multi-user database application using locks

1. SQL

a. Creating Database (Exercising commands like DDL,DML,DCL and TCL)

b. Exercising all types of Joins

c. Creating tables in I Normal, II Normal, III Normal and BCNF Form.

d. Creating table using combination of constraints.

e .Exercising Simple to Complex Queries

f .Usage of Stored Functions.

g .Creating Password and Security features for an Application.

h .Usage of File locking, Table locking facilities in an Applications

2. PL/SQL

a)Demonstration of Blocks, Cursors, Procedures, Functions and Packages.

b)Demonstrate Exception Handling .

c)Usage of Triggers to perform operation on Single and Multiple Tables.

d)PL/SQL Procedures for data validation

3. Report Generation Using SQL Report

4. Creation of Small Full pledged Database Application

Note : *The creation of sample database for the purpose of the experiments is Expected to be pre-decided by the instructor.*

Course Code	Course Title						Core/Elective
PCC 512 CS	SOFTWARE ENGINEERING LAB						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	4	25	50	2

Course Objectives:

- To understand the software engineering methodologies involved in the phases for project development.
- To gain knowledge about open source tools used for implementing software engineering methods.
- To exercise developing product-startups implementing software engineering methods.
- Open source Tools: Star UML / UML Graph / Top cased

Course Outcomes : Student will be able to

- To produce efficient, reliable, robust and cost-effective software solutions and perform independent research and analysis
- To analysis and design of complex systems and meet ethical standards, legal responsibilities
- To produce efficient, reliable, robust and cost-effective software solutions and perform independent research and analysis

List of Projects

Choose any one project and do the following exercises for that project

a. Student Result Management System

b. Library management system

c. Inventory control system

d. Accounting system

e. Fast food billing system

f. Bank loan system

g. Blood bank system

h. Railway reservation system

i. Automatic teller machine

j. Video library management system

k. Hotel management system

l. Hostel management system

m. E-ticking

n. Share online trading

o. Hostel management system

p. Resource management system

q. Court case management system

Exercises:

1. Write down the problem statement for a suggested system of relevance.
2. Do requirement analysis and develop Software Requirement Specification Sheet (SRS) for suggested system.
3. To perform the function oriented diagram: Data Flow Diagram (DFD) and Structured chart.
4. To perform the user's view analysis for the suggested system: Use case diagram.
5. To draw the structural view diagram for the system: Class diagram, object diagram.
6. To draw the behavioral view diagram : State-chart diagram, Activity diagram
7. To perform the behavioral view diagram for the suggested system : Sequence diagram, Collaboration diagram
8. To perform the implementation view diagram: Component diagram for the system.
9. To perform the environmental view diagram: Deployment diagram for the system
10. To perform various testing using the testing tool unit testing, integration testing for a sample code of the suggested system.
11. Perform Estimation of effort using FP Estimation for chosen system.
12. To Prepare time line chart/Gantt Chart/PERT Chart for selected software project.

NOTE:- At least 8 Experiments out of the list must be done in the semester.

Course Code	Course Title						Core/Elective
ESC 513 CS	DATA SCIENCE LAB						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	2	25	50	1

Course Objectives:

- The objective of this course is to provide comprehensive knowledge of python programming paradigms required for Data Science.

Course Outcomes:

- Understand and demonstrate the usage of built-in objects in Python
- Analyze the significance of python program development environment and apply it to solve real world applications
- Implement numerical programming, data handling and visualization through NumPy, Pandas and MatplotLib modules.

List Of Programs:

1. Introduction to Python Libraries- Numpy , Pandas, Matplotlib , Scikit
2. Perform Data exploration and preprocessing in Python
3. Implement regularised Linear regression
4. Implement Naive Bayes classifier for dataset stored as CSVfile.
5. Implement regularized logistic regression
6. Build models using different Ensembling techniques
7. Build models using Decision trees
8. Build model using SVM with different kernels
9. Implement K-NN algorithm to classify a dataset.
10. Build model to perform Clustering using K-means after applying PCA and determining the value of K using Elbowmetho

Dept. copy AICTE

UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY

B.TECH (CBCS) 4 YEAR (8 SEMESTER) REGULAR PROGRAMME

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

(Applicable from the batch admitted from the Academic Year 2018-19 and onwards)

Faculty of Engineering & Technology

Scheme of Instruction and Syllabus

For

B.TECH (CBCS) –VI SEMESTER

Of

Four Year Degree Course

In

COMPUTER SCIENCE & ENGINEERING

Mahatma Gandhi University

Nalgonda

Telangana State

508 254

UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY

B.TECH (CBCS) 4 YEAR (8 SEMESTER) REGULAR PROGRAMME

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

(Applicable from the batch admitted from the Academic Year 2018-19 and onwards)

SEMESTER – VI

S.No	Course Code	Course Title	Scheme of Instructions				Scheme of Examinations		Credits
			L	T	P/Dg	Contact Hrs/Wk	CIE	SEE	
THEORY									
1.	PCC 601 CS	Compiler Design	3	1	0	4	30	70	4
2.	PCC 602 CS	Computer Networks	3	1	0	4	30	70	4
3.	*OE-I	Open Elective-I	3	0	0	3	30	70	3
4.	#PE -II	Professional Elective-II	3	0	0	3	30	70	3
5.	#PE -III	Professional Elective-III	3	0	0	3	30	70	3
6.	##MC	Mandatory Course	3	0	0	3	30	70	-
PRACTICALS									
7.	PCC 611 CS	Compiler Design Lab	0	0	2*2	4	25	50	2
8.	PCC 612 CS	Computer Networks Lab	0	0	2*2	4	25	50	2
9.	#PE-II LAB	Professional Elective –II lab	0	0	2*2	4	25	50	2
10.	PCC 613 CS	Mini Project	0	0	2	2	25	-	1
		Total	**18**	**2**	**10**	**30**	**255**	**520**	**24**

#PE-II	Professional Elective –II	#PE-II Lab	Professional Elective –II Lab
PE 621 CS	Distributed Systems	PEC 621 CS	Distributed Systems Lab
PE 622 CS	Web Programming	PE C 622 CS	Web Programming Lab
PE 623 CS	Computer Graphics	PEC 623 CS	Computer Graphics Lab

UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY

B.TECH (CBCS) 4 YEAR (8 SEMESTER) REGULAR PROGRAMME

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

(Applicable from the batch admitted from the Academic Year 2018-19 and onwards)

# PE-III	Professional Elective –III
PE 632 CS	Information Security
PE 633 CS	Object Oriented Analysis & Design
PE 634 CS	Image Processing

*OE-I	Open Elective –I
OE 611 ME	Industrial Robotics
OE 612 ME	Material Handling
OE 613 CS	Natural Language Processing
OE 614 CS	Machine Learning
OE 615 EC	Digital Communication
OE 616 EC	Micro Processors And Micro Controllers

# MC	Mandatory Course
MC 601	Constitution Of India
MC 602	Essence Of Indian Traditional Knowledge
MC 603	Technical Communication & Soft Skills

Course Code	Course Title						Core/Elective
PCC 601 CS	COMPILER DESIGN						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	1	0	0	30	70	4

Course Objectives:

- To introduce the steps in language translation pipeline and runtime data structures used in translation
- To learn about Scanning (lexical analysis) process using regular expressions and use of LEX to generate scanner
- To introduce different Parsing strategies including top-down (e.g., recursive descent, Earley parsing, or LL) and bottom-up (e.g., backtracking or LR) techniques
- Describe semantic analyses using an attribute grammar
- To learn how to build symbol tables and generate intermediate code.
- To introduce techniques of program analysis and code optimization

Course Outcomes: Student will be able to

- Create lexical rules and grammars for a given language
- Generate scanners and parsers from declarative specifications.
- Describe an abstract syntax tree for a small language.
- Use program analysis techniques for code optimization
- Develop the compiler for a subset of a given language

UNIT – I

Introduction: Compilers, The translation process, Data structures and issues in compiler structure, Bootstrapping and Porting.

Scanning: The scanning process, Regular expressions, Finite Automata, Regular expressions to DFA's, use of LEX to generate scanner.

UNIT – II

Context Free Grammars & Parsing: The parsing process, Context free grammars, Parse tree & Abstract syntax trees, EBNF and syntax diagrams, and Properties of CFLs.

Top Down Parsing: Recursive descent parsing, LL (1) parsing, First and follow sets, Recursive descent parser, and Error recovery in top down parsers.

UNIT – III

Bottom-up Parsing: Overview, LR (0) items and LR (0) Parsing, SLR (1) Parsing, general LR(1) and LALR(1) parsing, YACC, and Error recovery in bottom-up parsers.

UNIT – IV

Semantic Analysis: Attributes and attribute grammars, Algorithms for attribute computation, Symbol table, Data types and Type checking.

Runtime Environments: Memory organization during program execution, Fully static runtime environments, Stack-based runtime environments, Dynamic memory, and Parameter parsing mechanisms.

UNIT – V

Code Generation: Intermediate code and data structures for code generation, Basic code generation techniques, Code generation of data structure references, Code generation of control statements and logical expressions, Code generation of procedure and function calls, Code generation in commercial compilers, Code optimization techniques, and Data flow equation.

Suggested Readings:

1. Kenneth C. Louden, —*Compiler Construction: Principles and Practice*l, Thomson Learning Inc., 1997
2. Ravi Sethi, Aho & Ullman JP, —*Compilers: Principles, Techniques and Tools*l, Addison Wesley publishing co., 1986.
3. J.P. Tremblay and P.S. Sorenson, —*The Theory and Practice of Compiler Writing*l, TMH-1985.

Course Code	Course Title						Core/Elective
PCC 602 CS	COMPUTER NETWORKS						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	1	0	0	30	70	4

Course Objectives:

- To study the design issues in network layer and various routing algorithms
- To introduce internet routing architecture and protocols
- To learn the flow control and congestion control algorithms in Transport Layer
- To introduce the TCP/IP suite of protocols and the networked applications supported by it
- To learn basic and advanced socket system calls

Course Outcomes: Student will be able to

- Explain the function of each layer of OSI and trace the flow of information from one node to another node in the network
- Understand the principles of IP addressing and internet routing
- Describe the working of various networked applications such as DNS, mail, file transfer and www
- Implement client-server socket-based networked applications.

UNIT I

DATA COMMUNICATIONS : Components , analog and digital signals and Encoders, Modems , RS232 Interfacing

Switching : Circuit Switching, Message Switching and Packet Switching.

Topologies – Concept of layering.-Protocols and Standards – ISO / OSI model, TCP/IP

UNIT II

DATA LINK LAYER : Error Control: Error detection and correction (CRC and Hamming code for single bit correction)

Flow Control : stop and wait – - sliding window protocols-go back-N ARQ – selective repeat ARQ

MAC LAYER: Ethernet IEEE 802.3LAN, Manchester encoding, Binary exponential algorithm, Efficiency calculation , ARP and RARP

UNIT III

NETWORK LAYER : Internetworks – virtual circuit and Datagram approach

Routing – Distance Vector Routing ,Link State Routing , OSPF and BGP, IPv4 , addressing , Subnetting, IPv6, CIDR, ICMP and IGMP protocols

UNIT IV

TRANSPORT LAYER : Services of transport layer, Multiplexing and crash recovery

Transmission Control Protocol (TCP) – TCP window management Congestion Control , timer management and User Datagram Protocol (UDP)

UNIT V

Socket Programming : Primitive and advanced system calls, client/server iterative and concurrent programs,IO multiplexing, Asynchronous IO and select system call.

APPLICATION LAYER : Domain Name Space (DNS) – SMTP – FTP – HTTP

Suggested Readings:

1. Computer Networks (5th Edition), Authors: Andrew S. Tanenbaum , David J. Wetherall , Pearson
2. Computer Networks: A Systems Approach, Authors: Larry Peterson and Bruce Davie, Elsevier
3. Computer Networking: A Top-Down Approach (6th Edition), Authors: James F. Kurose , Keith W. Ross , Pearson

Course Code	Course Title						Core/Elective
OE 611 ME	INDUSTRIAL ROBOTICS						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- Gain knowledge of Robotics and automation.
- Understand the working methodology of robotics and automation.
- Write the program for robot for various applications

Course Outcomes: Students will

- Have knowledge of Robotics, automation, robotics motion, sensors and control, machine vision, robotic programming and roles of robots in industry
- Understand the working methodology of robotics and automation, motion and control, machine vision and programming, application of robots in industry.
- Write the program for robot for various applications

UNIT – I

Introduction: Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications. Components of the Industrial Robotics: common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, Design of end effectors, Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

UNIT – II

Motion Analysis: Basic Rotation Matrices, Equivalent Axis and Angle, Euler Angles, Composite Rotation Matrices. Homogeneous transformations as applicable to rotation and translation – problems. Manipulator Kinematics-H notation-H method of Assignment of frames-H Transformation Matrix, joint coordinates and world coordinates, Forward and inverse kinematics – problems on Industrial Robotic Manipulation.

UNIT – III

Differential transformation of manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Euler formations – Problems. Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint interpolated motion – straight line motion.

UNIT- IV

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparision of Actuators, Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors.

UNIT- V

Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

Suggested Readings:

1. Mikell P. Groover, Mitchel Weiss, Roger N. Nagel, Nicholas G. Odrey and Ashish Dutta, Industrial Robotics: Technology, Programming and Applications, 2 nd Edition, Tata McGraw Hill, 2012.
2. Roland Siegwart, Illah R. Nourbakhsh, an d Davide Scaramuzza, "Introduction to Autonomous Mobile Robots, 2 nd Edition, PHI, 2011
3. S.P. SukhatMT, Solar Energy: principles of Thermal Collection and Storage, Tata McGraw-Hill (1984).
4. C. S. Solanki, Solar Photovoltaic's: FundaMTntal Applications and Technologies, Prentice Hall of India, 2009.
5. L.L. Freris, Wind Energy Conversion Systems, Prentice Hall, 1990

Course Code	Course Title						Core/Elective
OE 612 ME	MATERIAL HANDLING						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- To know about the working principle of various material handling equipments
- To understand the Material handling relates to the loading, unloading and movement of all types of materials
- To understand the estimation of storage space and maintenance of material handling equipments

Course Outcomes:

- Ability to understand various conveying systems that available in industry
- Ability to understand various bulk solids handling systems and their design features
- Ability to understand and various modern material handling systems and their integration.
- Ability to calculate number of MH systems required, storage space, cost and maintenance.

UNIT- I

Mechanical Handling Systems: Belt Conveyors and Design, Bucket Elevators, Package conveyors, Chain and Flight Conveyors, Screw Conveyors, Vibratory Conveyors, Cranes and Hoists.

UNIT -II

Pneumatic and Hydraulic Conveying Systems: Modes of Conveying and High pressure conveying systems, Low Velocity Conveying System. Components of Pneumatic Conveying Systems: General Requirements, Fans and Blowers, Boots-Type Blowers, Sliding-Vane Rotary Compressors, Screw Compressors, Reciprocating Compressors, Vacuum Pumps.

UNIT -III

Bulk Solids Handling: Particle and Bulk Properties. Adhesion, Cohesion and Moisture Content. Gravity Flow of Bulk Solids: Static and Dynamic Pressure Distribution in Bulk Solids. Modes of Flow: Mass Flow, Funnel Flow and Expanded Flow from Hoppers, Bins and Silos.

UNIT -IV

Modern Material Handling Systems: Constructional features of (i) AGV (ii) Automated storage and retrieval systems. Sensors used in AGVs and ASRS. Bar code systems and RFID systems: Fundamentals and their integration with computer-based information systems.

UNIT -V

Total MH Throughput: Calculation for no. of MH systems; storage space estimation based on no of aisles. Maintenance of MH equipment, spare parts management, cost of materials handling, cost per unit load computations.

Suggested Readings:

1. Dr. Mahesh Varma, "Construction Equipment and its Planning & Application", Metropolitan Book Co.(P) Ltd., New Delhi, India 1997.
2. James M. Apple, "Material Handling Systems Design", The Ronald Press Company, New York, USA, 1972.
3. Woodcock CR. and Mason J.S., "Bulk Solids Handling: An Introduction to Practice Technology", Leonard Hill USA, Chapman and Hall, New York.
4. M P Groover etal, "Industrial Robotics", Me Graw Hill, 1999

Course Code	Course Title						Core/Elective
OE 613 CS	NATURAL LANGUAGE PROCESSING						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- This course is intended to introduce the fundamental concepts and ideas in Natural Language Processing (NLP).
- Provides an understanding of the algorithms available for the processing of linguistic information and the underlying computational properties of natural languages.
- The course covers methods for parsing and semantic interpretation with applications to practical engineering tasks such as part-of-speech tagging, word sense disambiguation, information retrieval and extraction, natural language generation and machine translation.

Course Outcomes:

- Understand the mathematical and linguistic concepts of NLP.
- Design and implement algorithms for NLP problems

UNIT- I

Introduction: Knowledge in speech and language processing - Ambiguity – Models and Algorithms - Language, Thought and Understanding.

Regular Expressions and Automata: Regular expressions - Finite-State automata.

Morphology and Finite-State Transducers: Survey of English morphology - Finite- State Morphological parsing - Combining FST lexicon and rules - Lexicon-Free FSTs: The porter stammer - Human morphological processing

UNIT -II

Word Classes and Part-of-Speech Tagging: English word classes – Tag sets for English - Part-of-speech tagging - Rule-based part-of-speech tagging - Stochastic part-of-speech tagging - Transformation-based tagging - Other issues.

Context-Free Grammars for English: Constituency - Context-Free rules and trees - Sentence-level constructions - The noun phrase - Coordination - Agreement - The verb phase and sub categorization -

Auxiliaries - Spoken language syntax - Grammars equivalence and normal form - Finite-State and Context-Free grammars - Grammars and human processing.

Parsing with Context-Free Grammars: Parsing as search - A Basic Top-Down parser - Problems with the basic Top-Down parser - The early algorithm - Finite-State parsing methods.

UNIT- III

Features and Unification: Feature structures - Unification of feature structures – Features structures in the grammar - Implementing unification - Parsing with unification constraints - Types and Inheritance. Lexicalized and Probabilistic Parsing: Probabilistic context-free grammar - problems with PCFGs - Probabilistic lexicalized CFGs - Dependency Grammars - Human parsing.

UNIT- IV

Representing Meaning: Computational desiderata for representations - Meaning structure of language - First order predicate calculus - Some linguistically relevant concepts – Related representational approaches - Alternative approaches to meaning.

Semantic Analysis: Syntax-Driven semantic analysis - Attachments for a fragment of English - Integrating semantic analysis into the early parser - Idioms and compositionality - Robust semantic analysis.

Lexical semantics: relational among lexemes and their senses - WordNet: A database of lexical relations - The Internal structure of words - Creativity and the lexicon.

UNIT- V

Word Sense Disambiguation and Information Retrieval: Selectional restriction-based disambiguation - Robust word sense disambiguation - Information retrieval – other information retrieval tasks.

Natural Language Generation: Introduction to language generation - Architecture for generation - Surface realization - Discourse planning - Other issues.

Machine Translation: Language similarities and differences - The transfer metaphor – The interlingua idea: Using meaning - Direct translation - Using statistical techniques - Usability and system development.

Course Code	Course Title						Core/Elective
OE 614 CS	MACHINE LEARNING						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course objectives:

- To introduce the basic concepts of machine learning and range of problems that can be handled by machine learning
- To introduce the concepts of instance based learning and decision tree induction
- To introduce the concepts of linear separability , Perceptron and SVM
- To learn the concepts of probabilistic inference, graphical models and evolutionary learning
- To learn the concepts of ensemble learning, dimensionality reduction and clustering

Course Outcomes: Student will be able to

- Explain the strengths and weaknesses of many popular machine learing approaches
- Recognize and implement various ways of selecting suitable model parameters for different machine learning techniques
- Design and implement various machine learning algorithms in a range of real-world applications

UNIT-I

Introduction: Learning, Types of Machine Learning.

Concept learning: Introduction, Version Spaces and the Candidate Elimination Algorithm.

Learning with Trees: Constructing Decision Trees, CART, Classification Example

UNIT-II

Linear Discriminants: The Perceptron, Linear Separability, Linear Regression

Multilayer Perceptron (MLP): Going Forwards, Backwards, MLP in practices, Deriving back **Propagation SUPPORT Vector Machines**: Optimal Separation, Kernels

UNIT-III

Some Basic Statistics: Averages, Variance and Covariance, The Gaussian, The Bias-Variance Tradeoff

Bayesian learning: Introduction, Bayes theorem. Bayes Optimal Classifier, Naive Bayes Classifier.

Graphical Models: Bayesian networks, Approximate Inference, Making Bayesian Networks, Hidden Markov Models, The Forward Algorithm.

UNIT-IV

Evolutionary Learning: Genetic Algorithms, Genetic Operators, Genetic Programming

Ensemble learning: Boosting, Bagging

Dimensionality Reduction: Linear Discriminant Analysis, Principal Component Analysis

UNIT-V

Clustering: Introduction, Similarity and Distance Measures, Outliers, Hierarchical Methods, Partitional Algorithms, Clustering Large Databases, Clustering with Categorical Attributes, Comparison

Suggested Readings:

1. Tom M. Mitchell, *Machine Learning*, Mc Graw Hill, 1997
2. Stephen Marsland, *Machine Learning - An Algorithmic Perspective*, CRC Press, 2009
3. Margaret H Dunham, *Data Mining*, Pearson Edition., 2003.
4. Galit Shmueli, Nitin R Patel, Peter C Bruce, *Data Mining for Business Intelligence*, Wiley India Edition, 2007
5. Rajjan Shinghal, *Pattern Recognition*, Oxford University Press, 2006.

Course Code	Course Title						Core/Elective
OE 615 EC	DIGITAL COMMUNICATION						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives: This course aims to:

1. To interpret the principles of information theory.
2. To understand wave form coding techniques.
3. To get familiarized with various error coding techniques.
4. To analyze various digital carrier modulation techniques.
5. To understand the concept of spread spectrum modulation.

Course Outcomes: Upon completion of this course, students will be:

1. Able to acquires knowledge about information theory and assesses entropy and efficiency of various channels.
2. Able to learn to design an optimum receiver and analyze the error performance of base band and band pass data transmission.
3. Able to understand to design block codes, convolution and cyclic codes.
4. Able to apply suitable digital carrier modulation techniques and coding techniques for various applications for improved spectral efficiency.
5. Able to analyze the performance of spread spectrum communication system.

UNIT- I

Information Theory: Introduction, Information entropy, properties of entropy, information rate, types of information sources, channels, types of channels, joint entropy, conditional entropy, redundancy, mutual information, channel capacity.

UNIT- II

Digital Coding Techniques: Elements of digital communication system, sampling theorem, quantization noise, source coding techniques: PCM, DPCM, DM, noise in PCM, DM system. Performance comparison of above systems.

UNIT-III

Error Control Coding: Binary discrete channels, types of transmission errors, need for error control coding , Coding theory: Introduction, source coding/decoding, Huffman coding. , Shannonfano coding, linear block codes, binary cyclic codes, characteristics of BCH codes, convolution codes ,tree diagram, comparison of the above codes,

UNIT – IV

Digital carrier modulation techniques: optimum receiver, coherent and non-coherent ASK, FSK, PSK, DPSK, MSK, and QPSK schemes, M-ary signalling schemes, and synchronization methods.

UNIT – V

Spread spectrum modulation: introduction, generation and characteristics of PN sequences. Direct sequence spread spectrum system; frequency hopping spread spectrum system and their application, acquisition scheme for spread spectrum receivers, tracking of FH and DS signals.

Suggested Readings:

1. K Sam Shanmugam, "Digital and Analog Communication Systems", John Wiley & sons, 1979.
2. John G.Proakis, "Digital Communications", 4th Edition, Tata McGraw- Hill publishing company Limited, New Delhi, 2003.
3. P Ramakrishna Rao, "Digital Communication", Tata McGraw- Hill Education Private Limited, New Delhi, 2011.

Course Code	Course Title						Core/Elective
OE 616 EC	MICRO PROCESSORS & MICRO CONTROLLERS						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives :

- To develop an in-depth understanding of the operation of microprocessors.
- To master the assembly language programming using concepts like assembler directives,procedures, macros, software interrupts etc.
- To create an exposure to basic peripherals, its programming and interfacing techniques
- To understand the concept of Interrupts and interfacing details of 8086.
- To impart the basic concepts of serial communication in 8086.

Course Outcomes : Student will be able to:

- Understand the architecture of micro processors and micro controller
- Understand the programming model of micro processors and micro controllers
- Interface different external peripheral devices with micro processors and micro controllers
- Analyze a problem and formulate appropriate computing solution for processor or controller based application.
- Develop an assembly language program for specified application

UNIT-I

8086 architecture: 8086 architecture- functional diagram, Register organization, memory segmentation, programming model, Memory addresses, physical memory organization, Signal descriptions of 8086-common function signals, timing diagrams, Interrupts of 8086.

UNIT-II

Instruction set and assembly language programming of 8086: Instruction formats.Addressing modes, instruction set, assembler directives. Macros, Simple programs involving logical,branch and call instructions.Sorting, evaluating arithmetic expressions, string manipulations.

UNIT-III

I/O Interface: 8255 PPI, various modes of operation and interfacing to 8086,Interfacing of key board, display. Stepper motor interfacing, D/A &A/D converter.

Interfacing With advanced devices: Memory interfacing to 8086,Interrupts of 8086, Vector interrupt table, Interrupt service routine, Serial communication standards, serial data transfer schemes, 8251 USART architecture and Interfacing.

UNIT-IV

Introduction to microcontrollers: overview of 8051 microcontroller,Architecture, I/O ports, Memory organization, addressing modes and instruction set of 8051, Simple programs.

UNIT-V

8051 Real Time Control: Programming Timer interrupts, programming external hardware interrupts, Programming the serial communication interrupts, Programming 8051 timers and counters.

Suggested Readings:

1. D.V.Hall, Microprocessors and Interfacing. TMGH, 2nd edition 2006.
2. Kenneth.J.Ayala. The 8051 microcontroller, 3rd edition,Cengage learning,2010
3. Advanced microprocessors and peripherals-A.K ray and K.M.Bhurchandani, TMH, 2nd edition 2006.
4. The 8051 microcontrollers, architecture and programming and applications-K.Uma Rao, AndhePallavi., Pearson, 2009.
5. Micro computer system 8086/8088 family architecture, programming and design- By Liu and GA Gibson, PHI, 2nd Ed.,
6. Microcontrollers and application, Ajay.V.Deshmukh,TMGH,2005
7. The 8085 microprocessor: Architecture, programming and interfacing- K.Uday Kumar, B.S.Umashankar,2008,Pearson
8. Microprocessors and microcontrollers- S.V.Altaf

Course Code	Course Title						Core/Elective
PE 621 CS	DISTRIBUTED SYSTEMS						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- To acquire an understanding of the issues in distributed systems
- To study architectures and working of distributed file systems
- To expose the students to distributed transaction management, security issues and replication

Course Outcomes: Student will be able to :

- Describe the problems and challenges associated with distributed systems.
- Implement small scale distributed systems .
- Understand design tradeoffs in large-scale distributed systems

UNIT-I

Introduction: Goals and Types of Distributed Systems

Architectures: Architectural Styles, System Architectures, Architectures versus Middleware, and Self-Management in Distributed Systems.

Processes: Threads, Virtualization, Clients, Servers, and Code Migration.

Communication: Fundamentals, Remote Procedure Call, Message-Oriented Communication, Stream-Oriented Communication, and Multicast Communication.

UNIT-II

Naming: Names, Identifiers and Addresses, Flat Naming, Structured Naming, and Attribute-Based Naming.

Synchronization: Clock Synchronization, Logical Clocks, Mutual Exclusion, Global Positioning of Nodes, and Election Algorithms.

Consistency and Replication: Introduction, Data-Centric Consistency Models, Client-Centric Consistency Models, Replica Management, and Consistency Protocols.

UNIT-III

Fault Tolerance: Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, and Recovery.

Distributed Object-Based Systems: Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

UNIT-IV

Distributed File Systems: Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

Distributed Web-Based Systems: Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

UNIT-V

Distributed Coordination-Based Systems: Introduction to Coordination Models, Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

Map-Reduce: Example, Scaling, programming model, Apache Hadoop, Amazon Elastic Map Reduce, Mapreduce.net, Pig and Hive.

Suggested Readings:

1. Andrew S. Tanenbaum and Maarten Van Steen, —*Distributed Systems*l, PHI 2nd Edition, 2009.
2. R.Hill, L.Hirsch, P.Lake, S.Moshiri, —*Guide to Cloud Computing*, Principles and Practicel, Springer, 2013.
3. R.Buyya, J.Borberg, A.Goscinski,l*Cloud Computing-Principles and Paradigms*l,Wiley 2013.

Course Code	Course Title						Core/Elective
PE 622 CS	WEB PROGRAMMING						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- To learn HTML5 and JavaScript
- To familiarize the tools and technologies to process XML documents
- To learn various server-side and database connectivity technologies

Course Outcomes: Student will be able to

- Design a website with static and dynamic web pages
- Develop a web application with session tracking and client side data validations
- Develop web content publishing application that accesses back-end data base and publishes data in XML format

UNIT- I

HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets;

XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML, Parsing XML Data – DOM and SAX Parsers in java.

UNIT – II

Client-side Scripting: Introduction to Javascript, Javascript language – declaring variables, scope of variables, functions, event handlers (onclick, onsubmit etc.), Document Object Model, Form validation.

UNIT-III

Introduction to Servlets: Common Gateway Interface (CGI), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

UNIT - IV

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives,Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP.

UNIT - V

Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads, Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies.

Suggested Readings:

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill
3. Web Programming, building Internet applications, Chris Bates 2" edition, Wiley Dreamtech
4. Java Server Pages – Hans Bergsten, SPD O'Reilly.
5. Java Script, D.Flanagan
6. Beginning Web Programming-Jon Ducket WROX

Course Code	Course Title						Core/Elective
PE 623 CS	COMPUTER GRAPHICS						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- To introduce the concept of synthetic camera model , programmable pipeline and OpenGL API
- To study different interaction modes and data structures that store 2-D and 3-D geometric objects
- To understand different transformations in 2-D and 3-D To study different rasterization and rendering algorithms

Course Outcomes: Student will be able to:

- Describe the steps in graphics programming pipe line
- Write interactive graphics applications using OpenGL geometric primitives
- Apply affine transformations for viewing and projections
- Create realistic images of 3-d objects that involve lighting shading aspects
- Describe the mathematical principles to represent curves and surfaces

UNIT-I

Graphics Systems and Models: Graphics system, Images, Physical and Synthetic, Imaging system, Synthetic camera model, Programming interface, Graphics architectures, Programmable pipelines, Performance characteristics. Graphics Programming: Programming two-dimensional applications, Open GLAPI, Primitives and attributes, Color, Viewing and Control functions.

UNIT-II

Input and Interaction: Input devices, Clients and Servers, Display lists, Display lists and modeling, Programming event-driven input, Picking, Building interactive models, Animating interactive programs and Logic operations. Geometric Objects: Three-dimensional primitives, Coordinate systems and frames, Frames in OpenGL, Modeling colored cube.

UNIT-III

Transformations: Affine transformations, Transformations in homogeneous coordinates, Concatenation of transformations, OpenGL transformation matrices. Viewing: Classical and Computer views, Viewing with a computer, Positioning of camera, Simple projections, Projections in OpenGL, Hidden surface removal, Parallel-projection matrices, Perspective-projection matrices.

UNIT-IV

LightingandShading: Lightsources, ThePhonglightingmodel, Computationalvectors, Polygonal shading, Light sources in OpenGL, Specification of matrices in OpenGL, Global illumination.

FromVerticestoFrames: Basicimplementationstrategies,Line-segmentclipping,Polygonclipping, Clipping of other primitives, Clipping in three dimensions, Rasterization, Bresenham'salgorithm, Polygon Rasterization, Hidden- surface removal, Anti-aliasing, Display considerations.

UNIT-V

Modeling & Hierarchy: Hierarchal models, Trees and traversal, Use of treed at a structure, Animation, Graphical objects, Scene graphs and Simple scene graph API, Open Scene graph, Other tree structures.

Curves & Surfaces: Representation of curves and surfaces, Design criteria, Bezier curves and surfaces, Cubic B-splines, General B-splines, Rendering curves and surfaces, Curves and surfaces in OpenGL.

Suggested Readings:

1. Edward Angel, Interactive Computer Graphics: A Top-Down Approach Using OpenGL, Pearson Education, 5th edition, 2009

2. Francis S Hill Jr., Stephen MKelley, Computer Graphics using OpenGL, Prentice HallInc., 3rd edition, 2007

3. JimX.Chen, Foundations of 3D Graphics Programming using JOGL and Java3D, Springer Verlag, 2006

4. Hearn Donald, Pauline MBaker, Computer Graphics, 2nd edition,1995

Course Code	Course Title						Core/Elective
PE 632 CS	INFORMATION SECURITY						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives :

- To learn legal and technical issues in building secure information systems
- To provide an understanding of network security
- To expose the students to security standards and practices

Course Outcomes : After completing this course, the student will be able to

- Describe the steps in Security Systems development life cycle (SecSDLC)
- Understand the common threats and attack to information systems
- Understand the legal and ethical issues of information technology
- Identify security needs using risk management and choose the appropriate risk control strategy based on business needs
- Use the basic knowledge of security frameworks in preparing security blue print for the organization
- Usage of reactive solutions, network perimeter solution tools such as firewalls, host solutions such as antivirus software and Intrusion Detection techniques and knowledge of ethical hacking tools
- Use ethical hacking tools to study attack patterns and cryptography and secure communication protocols Understand the technical and non-technical aspects of security project implementation and accreditation

UNIT-I

Introduction: History, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC. Need for Security: Business Needs, Threats, Attacks, and Secure Software Development

UNIT-II

Legal, Ethical and Professional Issues: Law and ethics in Information Security, Relevant U.S. Laws, International Laws and Legal Bodies, Ethics and Information Security. Risk Management: Overview,

Risk Identification, Risk Assessment, Risk Control Strategies, selecting a Risk Control Strategy, Quantitative versus Qualitative Risk Control Practices, Risk Management Discussion Points, Recommended Risk Control Practices.

UNIT-III

Planning for Security: Security policy, Standards and Practices, Security Blue Print, Security Education, Continuity strategies. Security Technology: Firewalls and VPNs: Physical Design, Firewalls, Protecting Remote connections.

UNIT-IV

Security Technology: Intrusion Detection, Access Control, and other Security Tools: Intrusion Detection and Prevention Systems-Scanning, and Analysis Tools- Access Control Devices. Cryptography: Foundations of Cryptology, Cipher methods, Cryptographic Algorithms, Cryptographic Tools, Protocols for Secure Communications, Attacks on Cryptosystems

UNIT-V

Implementing Information Security: Information security project management, Technical topics of implementation, Non-Technical Aspects of implementation, Security Certification and Accreditation. Security and Personnel: Positioning and staffing security function, Employment Policies and Practices, and Internal Control Strategies. Information Security Maintenance: Security management models, Maintenance model, and Digital Forensics.

Suggested Readings:

1. Michael E Whitman and Herbert J Mattord, Principles of Information Security, Cengage Learning, 2011.
2. Thomas R Peltier, Justin Peltier, John Blackley, Information Security Fundamentals, Auerbach Publications, 2010.
3. Detmar W Straub, Seymour Goodman, Richard L Baskerville, Information Security, Policy, Processes, and Practices, PHI, 2008. 1
4. Mark Merkow and Jim Breithaupt, Information Security Principle and Practices, Pearson Education, 2007

Course Code	Course Title						Core/Elective
PE 633 CS	OBJECT ORIENTED ANALYSIS & DESIGN						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	4	25	50	2

Course Objectives:

- It introduces the concepts of Basic Structural Modelling.
- It provides the mechanism for relationships, object diagrams and components.
- It provides the mechanism for deployments and collaborations.
- It provides the architectural mechanisms for interactive and incremental process.

Course Outcomes:

- Ability to construct Class diagrams.
- Ability to construct relations among objects.
- Ability to construct deployment and collaboration diagrams.
- Ability to construct use case diagrams.

UNIT – I

UML Introduction: Necessity of a Model; Introducing the UML, Hello World.

Basic Structural Modeling: Classes, Relationships, Common Mechanisms, Diagrams, Class Diagrams.

Advanced Structural Modeling: Advanced classes, Advanced Relationships, Interfaces, Types and Roles, Packages, Instances, Object Diagrams, Components.

UNIT – II

Basic Behavioral Modeling: Interactions, Use Cases, Use Case Diagrams, Interaction diagrams, Activity diagrams, Interaction diagrams, and Activity diagrams.

Advanced Behavioral Modeling: Events and Signals, State Machines, Processes and Threads, Time and Space, State Chart Diagrams.

UNIT – III

Architectural Modeling: Artifacts, Deployment Collaborations, Patterns and Frame-works, Artifact Diagrams, Deployment diagrams, Systems and models.

UNIT – IV

Unified Software Development: The Unified Process, The Four Ps, A Use Case Driven Process, An Architecture-Centric Processes, An Iterative and Incremental Process.

UNIT – V

Core Workflows: Requirements Capture, Capturing Requirements as Use Case, Analysis, Design, Implementation, and Test.

Suggested Readings:

1. Grady Booch, James Rumbaugh, Ivor Jacobson, "The Unified Modeling Language-User Guide"(Covering UML 2.0), 2nd Edition Pearson Education, India, 2007.
2. Ivor Jacobson, Grady Booch, James Rumbaugh: "The Unified Software Development, Processes" Pearson Education, India, 2008.

Course Code	Course Title						Core/Elective
PE 634 CS	IMAGE PROCESSING						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives :

- To introduce basics of visual perception, sampling, quantization and representation of digital images
- To introduce spatial domain and frequency domain filtering techniques necessary for image processing operations
- To learn advanced image analysis techniques such as image compression, image segmentation, and object recognition
- To learn techniques of colour image processing, multi resolution methods, wavelets and morphological processing

Course Outcomes : After completing this course, the student will be able to

- Analyse images in the frequency domain using various transforms
- Design and implement algorithms that perform image processing operations such as histogram equalization, enhancement, restoration, filtering and denoising
- Explain colour spaces, restoration and enhancement of colour images
- Develop simple object recognition systems

UNIT-I

Image Processing: Introduction, Examples, Fundamental steps, Components, Elements of visual perception, Light and Electromagnetic Spectrum, Image sensing and Acquisition, Image Sampling and Quantization, Basic relationships between pixels. Intensity Transformations and Spatial Filtering: Background, some basic intensity transformation functions, Histogram processing, Fundamentals of Spatial filtering, smoothing spatial filters, sharpening spatial filters, Combining Spatial Enhancement Methods.

UNIT-II

Filtering in the Frequency Domain: Background, Preliminary concepts, Sampling and Fourier Transform of Sampled Functions, Discrete Fourier Transform (DFT) of one variable, Extension to functions of two variables, Some Properties of the 2-D Discrete Fourier Transform, Basics of Filtering in the Frequency Domain, Image Smoothing, Image Sharpening, Homomorphic Filtering, Image Restoration: Noise Models, Restoration in the presence of noise Only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear Degradation, Position-invariant Degradation, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error Filtering, Constrained Least Squares Filtering, Geometric Mean Filter.

UNIT-III

Colour Image Processing: Colour fundamentals, Colour models, Pseudocolour Image Processing, Basics of Full-colour Image Processing, Colour Transformations, Smoothing and Sharpening, Colour-based Image Segmentation, Noise in Colour Images, Colour Image Compression. Wavelets and Multi resolution Processing: Background, Multiresolution Expansions, Wavelet Transforms in One Dimension, The Fast Wavelet Transform, Wavelet Transforms in Two Dimensions, Wavelet Packets.

UNIT-IV

Image Compression: Fundamentals, Image Compression Models, Elements of Information Theory, Errorfree Compression, Lossy Compression, Image Compression Standards, Some Basic Compression Methods. Morphological Image Processing: Preliminaries, Erosion and Dilation, Opening and Closing, The Hit-orMiss Transformation, Some Basic Morphological Algorithms, Some Basic Gray-Scale Morphological Algorithms.

UNIT-V

Image Segmentation: Fundamentals, Point, Line and Edge Detection, Thresholding, Region-based Segmentation, Segmentation using Morphological Watersheds, The use of Motion in Segmentation. Object Recognition: Patterns and Pattern Classes, Recognition based on Decision-theoretic Methods, Structural Methods.

Suggested Readings:

1. Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing. PHI Learning Pvt. Limited, 3rd Edition, 2008
2. William K. Pratt, Digital Image Processing, John Wiley & Sons, Inc., 3rd Edition, 2001.

Course Code	Course Title						Core/Elective
MC 601	CONSTITUTION OF INDIA						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	-

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it "as one of the strongest court in the world".

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

Course Code	Course Title						Core/Elective
PE 601 CS	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	-

Course Objectives:

- The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society andnature.
- Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
- The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic healthcare system.

Course Outcomes:

- After learning the contents of this course, the student would be able to,
- Ability to understand, connect up and explain basics of Indian Traditional knowledge modern scientific perspective.
- To explain holistic life style of yoga science
- Understand basic structure of Indian knowledge system

Course Content

Basic Structure of Indian Knowledge System (i) वेद, (ii) उपवेद (आयुर्वेद, धनुर्वेद, गन्धर्वेद, स्थापत्य आदि) (iii) वेदांग (शिक्षा, कल्प, निरुत, व्याकरण, ज्योतिष छंद), (iv) उपाइग (धर्म शास्त्र, मीमांसा, पुराण, तर्कशास्त्र)

- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case Studies.

Suggested Text/Reference Books

1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. Fritzof Capra, Tao of Physics
4. Fritzof Capra, The wave of Life
5. V N Jha (Eng. Trans,), Tarkasangraha of Annam Bhatta, Inernational Chinmay Foundation, Velliarnad, Amaku,am
6. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta
7. GN Jha (Eng. Trans.) Ed. R N Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakasham, Delhi, 2016
8. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016
9. P R Sharma (English translation), Shodashang Hridayam

Course Code	Course Title						Core/Elective
MC 603	TECHNICAL COMMUNICATION AND SOFT SKILLS						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives :

- To encourage the all round development of students by focusing on soft skills.
- To make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.
- To develop and nurture the soft skills of the students through individual and group activities.
- To expose students to right attitudinal and behavioral aspects and to build the same through activities

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

- Effectively communicate through verbal/oral communication and improve the listening skills
- Write precise briefs or reports and technical documents
- Actively participate in group discussion / meetings / interviews and prepare & deliver presentations .
- Become more effective individual through goal/target setting, self motivation and practicing creative thinking.
- Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality

UNIT-I

Technical Writing, Grammar and Editing – Technical writing process, forms of discourse, Writing drafts and revising. Collaborative writing, creating indexes, technical writing style and language. Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style.

UNIT – II

Technical Communications: Introduction to advanced technical communication, Usability, Hunan factors, Managing technical communication projects, time estimation, Single sourcing, Localization.

UNIT-III

Self-Development and Assessment – Self Assessment, Awareness, Perception and Attitudes, Values and belief, personal goal setting, career planning, Self-esteem Communication and Technical Writing – Public Speaking, Group Discussion.

Unit- IV

Presentation Skills - Oral presentation, Interviews, Graphic presentation, Presentation aids, Personality Development. Writing reports, project proposals, brochures, newsletters, technical articles, manuals, official notes, business letters, memos, progress reports, minutes of meetings, event report.

UNIT-V

Professional Ethics – Business ethics, Etiquettes in Social and Office settings, Email etiquettes, Telephone Etiquettes, Engineering ethics, Managing time, Role and responsibility of engineer, Work culture in jobs, personal memory, Rapid reading, Taking notes, Complex problem solving, Creativity.

Suggested Readings:

1. David F. Beer and David Mc Murrey, Guide to writing as an Engineer, John Willey. New York, 2004
2. Diane Hacker, pocket Style Manual, Bedford Publicatiion, New York, 2003. (ISBN 0312406843)
3. Shiv Khera, You Can Win, Macmillan Books, New York, 2003.
4. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.
5. Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN: 07828357-4)
6. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002.
7. Xebec. Presentation Book, TMH New Delhi, 2000. (ISBN 0402213)

Course Code	Course Title						Core/Elective
PCC 611 CS	COMPILER DESIGN LAB						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	4	25	50	2

Course objectives:

- To implement Lexical Analyzer using Lex tool & Syntax Analyzer or parser using YACC Tool
- To implement NFA and DFA from a given regular expression
- To implement front end of the compiler by means of generating Intermediate codes.
- To implement code optimization techniques.

Course outcomes: Student will be able to

- Design a compiler given a set of language features
- Use the knowledge about patterns, tokens, & regular expressions for lexical analysis.
- Use LEX tools and YACC tools to develop a scanner &parser
- Design and implement LL(1),SLR(1),LR(1),LALR and operator precedence parsers
- Generation of machine code.

List of Experiments:

1. Design a DFA to accept all strings containing a sub string (010).
2. Design a DFA to accept Identifiers.
3. Design a DFA to accept positive and negative numbers.
4. Write a LEX program to scan Reserved Words & Identifiers of C language.
5. Write a LEX program to scan Integers as Float numbers in c language.
6. Implement predictive parsing algorithm.
7. Implement RD Parser for the grammar
   a. S->AB
   b. A->a/Є
   c. B->b/Є
8. Write a C program to generate three address code.
9. Implement operator precedence parsers.
10. Write a c program to implement Shift-Reduce parser.

11. Implement SLR (1) Parsing algorithm.

12. Write a YACC program to parse the strings.

Course Code	Course Title						Core/Elective
PCC 612 CS	COMPUTER NETWORKS LAB						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	4	25	50	2

Course Objectives:

- Intended to provide practical exposure of the concepts in computer networks.
- Provide hands on experience of designing, modelling, and evaluation of computer networks

Course Outcomes:

- Implement data link layer framing methods.
- Implement error correction and detection techniques.
- Implement data link layer protocols.
- Implement routing and congestion algorithms.
- Implement encryption algorithms.
- Able to create a scenario and study the performance of computer networks and protocols.

LIST OF EXPERIMENTS:

1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
3. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-N mechanism.
4. Implement Dijkstra's algorithm to complete the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement instance vector routing algorithm for obtaining routing tables at each node.
7. Using a simulation software
   i. Create a scenario and study the performance of CSMA/CD protocol
   ii. Create a scenario and study the performance of token bus and token ring
   iii. Study Transmission Control Protocol

Course Code	Course Title						Core/Elective
PEC 621 CS	DISTRIBUTED SYSTEMS LAB						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- To implement client and server programs using sockets
- To learn about working of NFS
- To use Map, reduce model for distributed processing
- To develop mobile applications

Course Outcomes: After completing this course, the student will be able to

- Write programs that communicate data between two hosts
- Configure NFS
- Use distributed data processing frameworks and mobile application tool kits

LIST OF EXPERIMENTS

1. Implementation FTP Client
2. Implementation of Name Server
3. Implementation of Chat Server
4. Understanding of working of NFS (Includes exercises on Configuration of NFS)
5. Implementation of Bulletin Board.
6. Implement a word count application which counts the number of occurrences of each word a large collection of documents Using Map Reduce model.
7. Develop an application (small game-like scrabble, Tic-tac-Toe) using Android SDK.

Course Code	Course Title						Core/Elective
PEC 622 CS	WEB PROGRAMMING LAB						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	4	25	50	1.5

Course objectives:

- Understand the importance of the web as a medium of communication.
- Understand the principles of creating an effective web page, including an in-depth consideration of information architecture.
- Develop skills in analyzing the usability of a web site.
- Learn the language of the web: HTML and CSS.
- Be able to embed social media content into web pages.
- Implement and understand how to interpret basic web analytics.
- Use JavaScript to access and use web services for dynamic content

Course outcomes: Students will be able to:

- Use Javascript and XHTML to create web pages with advanced interactivity
- Program basic functions in Javascript and XHTML
- Use javascript to create functional forms
- Us Javasript to control browser frames and windows
- Use cascading style sheets to design web pages

List of experiments:

1. Home page Development static pages (using Only HTML) of an online Book store. The website should consist the following pages.
   i. Registration and user Login
   ii. User Profile Page

iii. Books catalog
iv. Shopping Cart
v. Payment By credit card
vi. Order Conformation

2. Validate the Registration, user login and payment by credit card pages using JavaScript.
3. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
4. Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10and outputs HTML text that displays the resulting values in an HTML table format.
5. Write a JavaScript code that displays text "TEXT-GROWING" with increasing font size in the interval of 100ms in RED COLOR. when the font size reaches 50pt it displays "TEXT-SHRINKING" in BLUE color. Then the font size decreases to 5pt.
6. To write a program, which takes user id as input and displays the user details by taking the user information from the XML document.
7. Create an XML document template to describe the result of students in an examination.The description should include the student's roll number,name,three subject names and marks,total marks,percentage and results.
8. Write a PHP program to keep track of the number of visitors visiting the web pageand to display this count of visitors. with proper headings.
9. Write a PHP program to display a digital clock which displays the current time of theserver.
10. Write the PHP programs to do the following:
    a) Implement simple calculator operations.
    b) Find the transpose of a matrix.
    c) Multiplication of two matrices.
    d) Addition of two matrices.

Course Code	Course Title						Core/Elective
PEC 623 CS	COMPUTER GRAPHICS LAB						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- Learn to use basic geometric primitives and transformations in OpenGL
- To practice various interactive input methods in OpenGL
- Learn to use rendering primitives in OpenGL

Course Outcomes: Student will be able to:

- Write interactive graphics applications using OpenGL geometric primitives
- Create realistic images of 3-d objects with light sources and shading
- Write animation and walkthrough programs using OpenGL

List of Experiments:

1. Program to draw simple 2-D images using basic OpenGL functions.
2. Program to draw simple 3-D shapes using polygonal approximations.
3. Program to demonstrate the usage of display lists.
4. Createa simple game with interactive graphics programming.
5. Program to demonstrate animation effect using transformations and double buffering.
6. Createa simple walk through program.
7. Program using projections in OpenGL.
8. Programwith light sources and shading.
9. Program that defines and renders a scene graph using Open Scene Graph API.
10. Program using OpenGL Bezier curves and B-Splines.

Course Code	Course Title						Core/Elective
PCC 614 CS	MINI PROJECT						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	2	25	-	1

The object of Project Work is to enable the student to take up investigative study in the board field of Computer Science & Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor.

This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:

1. Survey and study of published literature on the assigned topic;
2. Working out a preliminary Approach to the problem relating to the assigned topic;
3. Conducting preliminary Analysis/Modeling/Simulation/Experiment/Design/Feasibility;
4. Preparing a Written Report on the study conducted for presentation to the Department;
5. Final Seminar, as oral presentation before a department committee.

AICTE

With effect from the ACADEMIC YEAR 2020-21

NIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY
TECH (CBCS) 4 YEAR (8 SEMESTER) REGULAR PROGRAMME
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
(Applicable from the batch admitted from the Academic Year 2018-19 and onwards)

Faculty of Engineering & Technology

Scheme of Instruction and Syllabus

For

B.Tech (CBCS) – VII & VIII Semester

Of

Four Year Degree Course

In

COMPUTER SCIENCE & ENGINEERING

Mahatma Gandhi University

University College of Engineering & Technology

Nalgonda

Telangana State

508 254

UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY

B.TECH (CBCS) 4 YEAR (8 SEMESTER) REGULAR PROGRAMME

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

(Applicable from the batch admitted from the Academic Year 2018-19 and onwards)

SEMESTER – VII

Course Code	Course Title	Scheme of Instructions				Scheme of Examinations		Credits
		L	T	P/Dg	Contact Hrs/Wk	CIE	SEE	
THEORY								
PC 701 CS	Grid & Cloud Computing	3	1	0	4	30	70	3
#PE-IV	Professional Elective-IV	3	0	0	3	30	70	3
#PE-V	Professional Elective -V	3	0	0	3	30	70	3
*OE-II	Open Elective-II	3	0	0	3	30	70	3
PRACTICALS								
PCC 711 CS	Grid & Cloud Computing Lab	0	0	2*2	4	25	50	2
#PE-IV LAB	Professional Elective Lab	0	0	2*2	4	25	50	2
PC 781 CS	Project Stage-I	0	0	4	4	50	-	3
SI 790 CS	Summer Internship	Six weeks during summer vacation				50	-	-
	Total	**12**	**1**	**12**	**25**	**270**	**380**	**19**

- IV	Professional Elective-IV	*PE – V	Professional Elective-V
41 CS	Data Warehousing & Data Mining	PE 751 CS	Artificial Intelligence
42 CS	Data Engineering & Advanced DB	PE 752 CS	Web Mining
43 CS	Cryptography & Network Security	PE 753 CS	Software Testing Methodologies
-II	Open Elective-II	PE-IV Lab	Professional Elective -IV Lab
21 CS	Adhoc Sensor Networks	PEC 712 CS	Data Warehousing & Data Mining Lab
22 ME	Entrepreneurship Developments	PEC 713 CS	Advanced Databases Lab
23 CS	VLSI Design	PEC 714 CS	Cryptography & Network Security Lab

CHAIRPERSON
Board of Studies in
Computer Science & Engineering
Mahatma Gandhi University, NLG-508 254

Course Code	Course Title						Core/Elective
PC 701 CS	GRID & CLOUD COMPUTING						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	1	0	0	30	70	3

Course Objectives:

- This course provides a comprehensive study of cloud computing.
- Topics include- distributed system models, design of cloud computing platforms, and service oriented architectures, cloud programming and software environments, grid computing and resource management.

Course Outcomes:

- Ability to understand various service delivery models of a cloud computing architecture.
- Ability to understand the ways in which the cloud can be programmed and deployed.
- Ability to understand the security challenges and address the challenges.
- Ability to understand how Cloud computing helps in solving large scale scientific problems.

UNIT I

Distributed System Models and Enabling Technologies: scalable computing services over the Internet, technologies for network-based computing, system models for distributed and cloud computing, software environments for distributed systems and clouds, performance, security, and energy-efficiency.

UNIT II

Design of Cloud Computing Platforms: cloud computing and service models, datacenter design and interconnection networks, architecture design of compute and storage clouds, public cloud platforms, cloud resource management and exchanges, cloud security and trust management

UNIT III

Service Oriented Architectures: message-oriented middleware, portals and science gateways, discover, registries, metadata, and databases, workflow in service-oriented architectures

UNIT IV

Cloud Programming and Software Environments: features of cloud and grid platforms, parallel and distributed programming paradigms, programming support of Google App engine, Amazon Web Services programming, Microsoft Azure programming support, emerging cloud software environments

UNIT V

Grid Computing and Resource Management: grid architecture and service modeling, case studies of grid computing systems, grid resource management and brokering, middleware support for grid resource management, grid security infrastructure in GT4.

Suggested Readings:

1. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing:
2. Clusters, Grids, Clouds and the Future of Internet", First Edition, Morgan Kaufman Publisher, an imprint of Elsevier, 2012.
3. Tom White, "Hadoop The Definitive Guide", First Edition. O'Reilly, 2009.
4. Ian Foster, Carl Kesselman, "The Grid: Blueprint for a New Computing Infrastructure", 2nd Edition, Morgan Kaufmann, 2011.

Course Code	Course Title						Core/Elective
PE 741 CS	DATA WAREHOUSING & DATA MINING						Elective
	Contact Hours per Week				CIE	SE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- This course presents the techniques for preprocessing data before mining, and describes the concepts related to data warehousing, On-Line Analytical Processing (OLAP), and data generalization.
- It also presents methods for mining frequent patterns, associations, and correlations.
- It then describes methods for data classification and prediction, and data-clustering approaches.

Course Outcomes: Students will be able to

- Examine the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
- Apply preprocessing statistical methods for any given raw data.
- Devise efficient and cost effective methods for designing and maintaining data warehouses.
- Extract interesting patterns from large amounts of data that can be used for further analysis, for example in machine learning and prediction.
- Discover the role played by data mining in various fields.
- Choose and employ suitable data mining algorithms to build analytical applications
- Evaluate the accuracy of supervised and unsupervised models and algorithms.

UNIT- I

Data Mining: Data-Types of Data-, Data Mining Functionalities- Interestingness Patterns-Classification of Data Mining systems- Data mining Task primitives -Integration of Data mining system with a Data warehouse-Major issues in Data Mining-Data Preprocessing.

UNIT- II

Data Warehouse And Business Analysis: Data Warehouse-Data Warehouse Architecture-Multidimensional Data Model-Data cube and OLAP Technology-Data Warehouse Implementation -DBMS schemas for Decision support -Efficient methods for Data cube computation.

UNIT-III

Association Rule Mining And Classification: Mining Frequent Patterns-Associations and correlations- Mining Methods- Mining Various kinds of Association Rules- Correlation Analysis-Constraint based Association mining.-Classification and Prediction- Basic concepts-Decision tree induction-Bayesian classification, Rule-based classification - classification by Back propagation,-Support vector machines-.Associative Classification, Lazy learners-Other classification methods – Prediction.

UNIT- IV

Clustering And Applications: Cluster analysis-Types of Data in Cluster Analysis-Categorization of Major Clustering Methods- Partitioning Methods,-Hierarchical Methods- Density-Based Methods,-Grid-Based Methods,-Model-Based Clustering Methods- Clustering high dimensional data-Constraint-Based cluster analysis-Outlier Analysis

UNIT- V

Mining Data Streams, Time-Series And Sequence Data: Basic concepts- Mining data streams-Mining Time-series data--Mining sequence patterns in Transactional databases-.Mining Object-Spatial- Multimedia-Text and Web data- Spatial Data mining- Multimedia Data mining--Text Mining- Mining the World Wide Web.

Suggested Readings:

1. Data Mining – Concepts and Techniques - JIAWEI HAN & MICHELINE KAMBER, Elsevier, 2011.
2. Data Warehousing, Data Mining &OLAP- Alex Berson and Stephen J. Smith- Tata McGraw-Hill Edition, Tenth reprint 2007.
3. Building the DataWarehouse- W. H. Inmon, Wiley Dreamtech India Pvt. Ltd, 2002.
4. Data Mining Introductory and Advanced topics –MARGARET H DUNHAM, PEA, 2002.

Course Code	Course Title						Core/Elective
PE 742 CS	DATA ENGINEERING & ADVANCED DATABASES						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- This field covers all aspects of computing and information access across multiple processing elements connected by any form of communication network, either local area, or wide area
- There has been a steady growth in the development of contemporary applications that demonstrate their efficacy by connecting millions of users/applications/machines across the globe without relying on a traditional client-server approach.
- The general computing trend is to leverage shared resources and massive amounts of data over the Internet. This course aims to provide an understanding of theory and systems aspects of distributed

Course Outcomes : Student will be able to

- Describe the features added to modern database systems to distinguish them from standard relational systems.
- Understand different algorithms used in the implementation of query evaluation engine
- Understand the different concurrency control and commit protocols in distributed databases
- Demonstrate an understanding of the role and the concepts involved in special purpose databases such as Temporal, Spatial, Mobile and other similar database types

UNIT-I

Distributed Data Storage Technology : Server-centric IT architecture and its limitations , Storage-centric IT architecture and its advantages , Architecture of intelligent disk subsystems, Hard disks and internal i/o channels and JBOD, Storage virtualization using RAID, Introduction to NAS, SAN and DAS

Distributed File Systems & Security : File Models & Accessing models , File sharing Semantics, File Caching, File Replication, Fault Tolerance, File System Security

UNIT – II

Distributed Databases : Distributed DBMS , Architectural Models for DDBS, Distributed DBMS Architecture , Distributed Data Sources

Distributed Database Design Issues & Integration : Framework of Distribution , Distributed Design Issues, Top-Down Design Process , Fragmentation, Allocation , Bottom-Up Design Methodology, Schema Matching , Schema Integration , Schema Mapping, Data Cleaning

UNIT –III

Data and Access Control : Database Security, Discretionary Access Control, Multilevel Access Control, Distributed Access Control, View Management, Views in Centralized DBMSs, Views in Distributed DBMSs , Maintenance of Materialized Views

Data Replication : Consistency of Replicated Databases , Update Management Strategies , Replication Protocols, Replication and failures , Replication Mediator Service .

Parallel Database Systems : Parallel Database System Architectures , Parallel Data Placement, Load Balancing , Database Clusters

UNIT – IV

Web Data Management : Web Graph Management, Web Search, Web Crawling , Indexing, Ranking and Link Analysis , Keyword Search, Web Querying, Semi-structured Data Approach, Web Query Language Approach, Question Answering, Searching and Querying the Hidden Web

Hadoop & Big Data : Introduction, Hadoop Architecture, HDFS Operations, HDFS Commands, Big Data Overview, Multi Node Cluster, Map Reduce

UNIT - V

Advanced Application Development: Performance Tuning, Performance Benchmarks Other Issues in Application Development, Standardization.

Spatial and Temporal Data and Mobility: Motivation, Time in Databases, Spatial and Geographic Data, Multimedia Databases, Mobility and Personal Databases.

2. Distributed Operating Systems: Concepts And Design By Pradeep K. Sinha
3. "Storage Networks Explained" – by Ulf Troppens, Wolfgang Muller-Freidt, Rainer Wolafka, IBM Storage Software Development, Germany. Publishers: Wiley
4. Abraham Silberschatz, Henry F Korth, S Sudarshan, Database System Concepts, McGrawHill International Edition, 6th Edition, 2010.
5. Elmasri Navathe, Somayajulu, Gupta , Fundamentals of Database Systems, Pearson Education, 4th Edition, 2006.
6. CJ Date, A Kannan, S Swamynathan, An Introduction to Database Systems, Pearson Education, 8th Edition, 2006.
7. Raghu Ramakrishnan, and Johannes Gehrke, Database Management Systems, McGraw-Hill International Edition, 3rd Edition, 2002.

Course Code	Course Title						Core/Elective
	CRYPTOGRAPHY & NETWORK SECURITY						Elective
743 CS	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- To impart knowledge on network security issues, services, goals and mechanisms.
- To analyze the security of communication systems, networks and protocols.
- To apply algorithms used for secure transactions in real world applications

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

- Demonstrate the knowledge of cryptography and network security concepts and applications.
- Ability to apply security principles in system design.
- Ability to identify and investigate vulnerabilities and security threats and mechanisms to counter them.

UNIT- I

Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security.

UNIT- II

Conventional Encryption: Principles, Conventional encryption algorithms (DES, AES, RC4, and Blowfish), cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC.

UNIT- III

Number Theory: Modular Arithmetic, Euclid's Algorithm, Fermat's and Euler's Theorem, Chinese Remainder Theorem, Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management- Kerberos, X.509 Directory Authentication Service.

CHAIRPERSON
Board of Studies in
Computer Science & Engineering
Mahatma Gandhi University, NLG-508

UNIT- IV

Email privacy: Pretty Good Privacy (PGP) and S/MIME.

IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

UNIT- V

Web Security: Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET). Intruders, Viruses and related threats, Firewall Design principles, Trusted Systems, Intrusion Detection Systems.

Suggested Readings:

1. "Cryptography and Network Security" by William Stallings 3rd Edition, Pearson Education, 2017.
2. "Applied Cryptography" by Bruce Schneier, 2007.
3. Cryptography and Network Security by Behrouz A.Forouzan, 2015.

Course Code	Course Title						Core/Elective
PE 751 CS	ARTIFICIAL INTELLIGENCE						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- To learn the distinction between optimal reasoning Vs. human like reasoning
- To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, expert systems, machine learning and natural language processing

Course Outcomes: Student will be able to

- Formulate an efficient problem space for a problem expressed in natural language.
- Select a search algorithm for a problem and estimate its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique for a given problem
- Possess the ability to apply AI techniques to solve problems of game playing, expert systems, machine learning and natural language processing.

UNIT – I

Introduction: History Intelligent Systems, Foundations of Artificial Intelligence, Sub areas of AI, Applications.

Problem Solving - State - Space Search and Control Strategies: Introduction, General Problem Solving Characteristics of problem, Exhaustive Searches, Heuristic Search Techniques, Iterative - Deepening A*, Constraint Satisfaction.Game Playing, Bounded Look - ahead Strategy and use of Evaluation Functions, Alpha Beta Pruning.

UNIT – II

Logic Concepts and Logic Programming: Introduction, Propositional Calculus Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Table, A System in Propositional Logic, Resolution, Refutation in Propositional Logic, Predicate Logic, Logic Programming.

Knowledge Representation: Introduction, Approaches to knowledge Representation, Knowledge

Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.

UNIT - III

Expert System and Applications: Introduction, Phases in Building Expert Systems Expert System Architecture, Expert Systems Vs Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shells and tools.

Uncertainity Measure - Probability Theory: Introduction, Probability Theory, Bayesian Belief Networks, Certainity Factor Theory, Dempster - Shafer Theory.

UNIT - IV

Machine - Learning Paradigms: Introduction, Machine learning System, Supervised and Unsupervised Learning, Inductive Learning, Learning Decision Trees, Deductive Learning, Clustering, Support Vector Machines.

Artificial Neural Networks: Introduction Artificial Neural Networks, Single - Layer Feed Forward Networks, Multi - Layer Feed Forward Networks, Radial - Basis Function Networks, Design Issues of Artificial Neural Networks, Recurrent Networks

UNIT - V

Reinforcement Learning: Overview of reinforcement learning: the agent environment framework, successes of reinforcement learning, Bandit problems and online learning, Markov decision processes, Returns, and value functions, Solution methods: dynamic programming, Solution methods: Monte Carlo learning, Solution methods: Temporal difference learning learning, Eligibility traces, Value function approximation (function approximation), Models and planning (table lookup case), Case studies: successful examples of RL systems, Frontiers of RL research

Suggested Readings:

1. Saroj Kaushik, *Artificial Intelligence*, Cengage Learning India, First Edition, 2011.
2. Russell, Norvig, *Artificial Intelligence: A Modern Approach*, Pearson Education, 2nd Edition, 2004
3. Rich, Knight, Nair , *Artificial Intelligence*, Tata McGraw Hill, 3rd Edition 2009.

CHAIRPERSON

Course Code	Course Title						Core/Elective
PE 752 CS	WEB MINING						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- The purpose of the course is to introduce the concepts of extracting knowledge from web data
- The course introduces the mechanisms for effective web search and includes-WWW; fundamentals of data mining; information retrieval and web search; link analysis and web crawling; opinion mining and web usage mining;

Course Outcomes:

After completing this course, the student will able to:

- Design algorithms for generating association and classification rules from web data
- Design algorithms for clustering and managing the web documents
- Design algorithms for web searching and crawling.
- Perform sentiment analysis, opinion mining needed for recommendation systems
- Use web usage mining concepts for customization and personalization.

UNIT- I

Introduction to Web Data Mining and Data Mining Foundations: Introduction – World Wide Web(WWW), A Brief History of the Web and the Internet, Web Data Mining-Data Mining, Web Mining. Data Mining Foundations – Association Rules and Sequential Patterns – Basic Concepts of Association Rules, Apriority Algorithm- Frequent Item set Generation, Association Rule Generation, Data Formats for Association Rule Mining, Mining with multiple minimum supports – Extended Model, Mining Algorithm, Rule Generation, Mining Class Association Rules, Basic Concepts of Sequential Patterns, Mining Sequential Patterns on GSP, Mining Sequential Patterns on Prefix Span, Generating Rules from Sequential Patterns.

UNIT- II

Supervised and Unsupervised Learning: Supervised Learning - Basic Concepts, Decision Tree Induction – Learning Algorithm, Impurity Function, Handling of Continuous Attributes, Classifier

Evaluation, Rule Induction – Sequential Covering, Rule Learning, Classification Based on Associations, Naive Bayesian Classification , Naive Bayesian Text Classification - Probabilistic Framework, Naive Bayesian Model . Unsupervised Learning – Basic Concepts , K-means Clustering – K-means Algorithm, Representation of Clusters, Hierarchical Clustering – Single link method , Complete link Method, Average link method, Strength and Weakness.

UNIT- III

Information Retrieval and Web Search: Basic Concepts of Information Retrieval, Information Retrieval Methods - Boolean Model, Vector Space Model and Statistical Language Model, Relevance Feedback, Evaluation Measures, Text and Web Page Preprocessing – Stop word Removal, Stemming, Web Page Preprocessing, Duplicate Detection, Inverted Index and Its Compression – Inverted Index, Search using Inverted Index, Index Construction, Index Compression, Latent Semantic Indexing – Singular Value Decomposition, Query and Retrieval, Web Search, Meta Search, Web Spamming.

UNIT- IV

Link Analysis and Web Crawling: Link Analysis - Social Network Analysis, Co-Citation and Bibliographic Coupling, Page Rank Algorithm, HITS Algorithm, Community Discovery-Problem Definition, Bipartite Core Communities, Maximum Flow Communities, Email Communities. Web Crawling – A Basic Crawler Algorithm- Breadth First Crawlers, Preferential Crawlers, Implementation Issues – Fetching, Parsing, Stop word Removal, Link Extraction, Spider Traps, Page Repository, Universal Crawlers, Focused Crawlers, Topical Crawlers, Crawler Ethics and Conflicts.

UNIT- V

Opinion Mining and Web Usage Mining: Opinion Mining - Sentiment Classification – Classification ased on Sentiment Phrases, Classification Using Text Classification Methods , Feature based Opinion ining and Summarization – Problem Definition, Object feature extraction, Feature Extraction from Pros d Cons of Format1, Feature Extraction from Reviews of Format 2 and 3, Comparative Sentence and elation Mining, Opinion Search and Opinion Spam. Web Usage Mining - Data Collection and eprocessing- Sources and Types of Data, Key Elements of Web usage Data Preprocessing, Data odeling for Web Usage Mining, Discovery and Analysis of Web usage Patterns -Session and Visitor alysis, Cluster Analysis and Visitor Segmentation, Association and Correlation Analysis, Analysis of quential and Navigation Patterns.

CHAIRPERSON
Board of Studies In

Suggested Readings:

1. Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data by Bing Liu (Springer Publications.
2. Data Mining: Concepts and Techniques, Second Edition Jiawei Han, Micheline Kamber (Elsevier Publications).
3. Web Mining:: Applications and Techniques by Anthony Scime.
4. Mining the Web: Discovering Knowledge from Hypertext Data by Soumen Chakrabarti.

Course Code	Course Title						Core/Elective
PE 753 CS	SOFTWARE TESTING METHODOLOGIES						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- To provide knowledge of the concepts in software testing such as testing process, criteria, strategies, and methodologies.
- To develop skills in software test automation and management using latest tools.

Course Outcomes: The student will be able to

- Design and develop the best test strategies in accordance to the development model.

UNIT I

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs.

Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT II

Transaction Flow Testing: Transaction flows, transaction flow testing techniques.

Dataflow testing: Basics of data flow testing, strategies in data flow testing, application of dataflow testing.

Domain Testing:-domains and paths, nice & ugly domains, domain testing, domains and interfaces' testing, domain and interface testing, domains and testability.

UNIT III

Paths, Path products and Regular expressions: Path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

Logic Based Testing:- overview, decision tables, path expressions, kv charts, specifications.

UNIT IV

CHAIRPERSON

State, State Graphs and Transition testing: state graphs, good & bad state graphs, state testing, Testability tips.

UNIT V

Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like JMeter or Win-runner).

Suggested readings:

1. Software Testing techniques - Baris Beizer, Dreamtech, second edition.
2. Software Testing Tools – Dr.K.V.K.K.Prasad, Dreamtech.
3. The craft of software testing - Brian Marick, Pearson Education, 1994.
4. Software Testing Techniques – SPD(Oreille)
5. Software Testing in the Real World – Edward Kit, Pearson, 3rd Edition, 2008.
6. Effective methods of Software Testing, Perry, John Wiley, 3rd Edition, 2006.
7. Art of Software Testing – Meyers, John Wiley, 2nd Edition, 2004.

Course Code	Course Title						Core/Elective
OE 721 CS	ADHOC & SENSOR NETWORKS						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- To understand the concepts of sensor networks
- To understand the MAC and transport protocols for ad hoc networks
- To understand the security of sensor networks
- To understand the applications of adhoc and sensor networks

Course Outcomes:

- Ability to understand the state of the art research in the emerging subject of Adhoc and Wireless Sensor Networks
- Ability to solve the issues in real-time application development based on ASN
- Ability to conduct further research in the domain of ASN

UNIT- I

Introduction to Ad Hoc Networks - Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.

Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms, *Topology-based* routing algorithms-

Proactive: DSDV, WRP; **Reactive**: DSR, AODV, TORA; Hybrid: ZRP; *Position-based* routing algorithms-**Location Services**-DREAM, Quorum-based, GLS; **Forwarding Strategies:** Greedy Packet, Restricted Directional Flooding-DREAM, LAR; **Other routing algorithms**-QoS Routing, CEDAR.

UNIT- II

Data Transmission - Broadcast Storm Problem, **Rebroadcasting Schemes**-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbour Knowledge-based: SBA, Multipoint Relaying, AHBP. **Multicasting: Tree-based:** AMRIS, MAODV; **Mesh-based:** ODMRP, CAMP; **Hybrid:** AMRoute, MCEDAR and **Geocasting:** Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR.

UNIT- III

TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Adhoc. Basics of Wireless, Sensors and Applications :Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer.

UNIT- IV

Data Retrieval in Sensor Networks

Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.

UNIT -V

Security - Security in Ad Hoc networks, Key management, Secure routing, Cooperation in MANETs, Intrusion Detection systems.

Suggested Readings:

1. Ad Hoc and Sensor Networks – Theory and Applications, *Carlos Corderio Dharma P Aggarwal*, World Scientific Publications, March 2006, ISBN – 981-256-681-3
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman), 2004.

Course Code	Course Title						Core/Elective
	ENTREPRENEURSHIP DEVELOPMENT						Elective
OE 722 ME	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- To provide students an exposure to role of entrepreneurship and leadership qualities.
- To ensure that students begin to understand business opportunities.
- To gain a preliminary understanding of approaches of planning and launching.
- To enhance awareness of marketing and financial management.

Course Outcomes: Student will be

- Able to understand importance of entrepreneurship.
- Able to understand project planning.
- Able to understand factors effecting Major functions of enterprise management.

UNIT -I

Entrepreneurship definition, Significance of Entrepreneurship. Role of Entrepreneurship in development advantages and limitations. Characteristics of a person to become an entrepreneur, human factor in Entrepreneurship, Motivation, Leadership qualities and the essential skills of communication. Role of women entrepreneurship, Agencies dealing with entrepreneurship and small scale industries. Case studies in entrepreneurship. Identification of a variable business opportunity, various methods.

UNIT- II

Business opportunity selection, Opportunities in Various branches of engineering. Sources of new ideas, new product, service and trade. Planning and launching of an entrepreneurial activity. Screening, feasibility studies and market survey. forecasting the demand. Technical feasibility, financial viability. Break even analysis. Preparation of preliminary and bankable project reports planning infrastructure, raw material and human resource, requirements, fiscal incentives. An introduction to patents process, Trademarks etc.

UNIT -III

Project planning: Product planning and development process, Definition of a project, Sequential steps in executing a project, principles of layouts, types of layouts, factors influencing layouts. Choosing an optimum, layout suitable to the venture. Tenders, Call for Quotations, purchase orders, Procurement and installation of machinery and equipment, utilities etc. Fundamentals of production management, PPC Concepts, Functions, long and short run problems.

UNIT -IV

Marketing Management: Definition, Meaning, Functions and Segments.

Financial Management: Definition, Meaning, Objectives & Functions.

UNIT- V

Personnel and Human resource management:

Introduction, Definitions, Importance, Factors effecting major functions of enterprise management. Selection, Recruitment, Training, Placement, Development, Performance Appraisal Systems. Legal issues in entrepreneurship, Intellectual property Rights, Issues in setting up the organization.

Suggested Readings:

1. Robert D.Hisrich, Michael P. Peters, "Entrepreneurship", Fifth Edition, Tata McGraw-Hill,2002.
2. David H. Holt, Entrepreneurship New Venture Creation, Prentice hall of India.
3. Handbook for New Entrepreneurs, Entrepreneurship Development Institute of India, Ahmedabad.
4. T.R.Banga, Project Planning and Entrepreneurship Development, CBS Publishers, New Delhi.
5. Personnel efficiency in Entrepreneurship Development-A Practical Guide to Industrial Entrepreneurs, S.Chand & Co,New Delhi.

Course Code	Course Title						Core/Elective
OE 723 CS	VLSI DESIGN						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course objectives:

- In this course, the MOS circuit realization of the various building blocks that is common to any microprocessor or digital VLSI circuit is studied.
- Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology are discussed.
- The main focus in this course is on the transistor circuit level design and realization for digital operation and the issues involved as well as the topics covered are quite distinct from those encountered in courses on CMOS Analog IC design.

Course outcomes: Upon completion of the course, students should

- Explain the basic CMOS circuits and the CMOS process technology.
- Discuss the techniques of chip design using programmable devices.
- Model the digital system using Hardware Description Language.

UNIT I

Introduction To Mos Transistor :MOS Transistor, CMOS logic, Inverter, Pass Transistor, Transmission gate, Layout Design Rules, Gate Layouts, Stick Diagrams, Long-Channel I-V Charters tics, C-V Charters tics, Non ideal I-V Effects, DC Transfer characteristics, RC Delay Model, Elmore Delay, Linear Delay Model, Logical effort, Parasitic Delay, Delay in Logic Gate, Scaling.

UNIT II

Combinational Mos Logic Circuits: Circuit Families: Static CMOS, Ratioed Circuits, Cascode Voltage Switch Logic, Dynamic Circuits, Pass Transistor Logic, Transmission Gates, Domino, Dual Rail Domino,

CPL, DCVSPG, DPL, Circuit Pitfalls.

Power: Dynamic Power, Static Power, Low Power Architecture.

UNIT III

Sequential Circuit Design:Static latches and Registers, Dynamic latches and Registers, Pulse Registers, Sense Amplifier Based Register, Pipelining, Schmitt Trigger, Monostable Sequential Circuits, Astable Sequential Circuits.Timing Issues : Timing Classification Of Digital System, Synchronous Design.

UNIT IV

Design Of Arithmetic Building Blocks And Subsystem: Arithmetic Building block: Data Paths, Adders, Multipliers, Shifters, ALUs, power and speed tradeoffs, Case Study: Design as a tradeoff.Designing Memory and Array structures: Memory Architectures and Building Blocks, Memory Core, Memory Peripheral Circuitry.

UNIT V

Implementation Strategies And Testing: Fpga Building Block Architectures, Fpga Interconnect Routing Procedures. Design for Testability: Ad Hoc Testing, Scan Design, BIST, IDDQ Testing, Design for Manufacturability, Boundary Scan.

Suggested Readings:

1. Jan Rabaey, Anantha Chandrakasan, B.Nikolic, "Digital Integrated Circuits: A Design Perspective", Second Edition, Prentice Hall of India, 2003.
2. M.J. Smith, "Application Specific Integrated Circuits", Addisson Wesley, 1997
3. N.Weste, K.Eshraghian, "Principles of CMOS VLSI Design", Second Edition, Addision Wesley 1993
4. R.Jacob Baker, Harry W.LI., David E.Boyee, "CMOS Circuit Design, Layout and Simulation", Prentice Hall of India 2005 3. A.Pucknell, Kamran Eshraghian, "BASIC VLSI Design", Third Edition, Prentice Hall of India, 2007.

Course Code	Course Title						Core/Elective
PCC 711 CS	GRID & CLOUD COMPUTING LAB						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	4	25	50	2

Course Objectives:

- This course provides hands-on experience with using Hadoop, Amazon EC2, Google Compute Engine, Windows Azure and Globus toolkit.

Course Outcomes:

- Ability to install and configure Hadoop
- Ability to install and configure Globus Toolkit
- Ability to create an instance using Amazon EC2, Google Compute Engine and Windows Azure
- Ability to create a database instance on the cloud.

List of Experiments:

1. Installation and configuration of Hadoop
2. Using Hadoop for counting word frequency using map reduce
3. Create an Amazon EC2 instance and set up a web-server on the instance and associate an IP address with the instance.
4. Repeat Exercise-3 using Google Compute Engine.
5. Repeat Exercise-3 using Windows Azure Virtual Machine.
6. Create a database instance in the cloud using Amazon RDS.
7. Create a database instance in the cloud using Google Cloud SQL
8. Installation and Configuration of Globus Toolkit
9. Build and deploy a grid server, then build the client and execute the application

Course Code	Course Title						Core/Elective
PEC 712 CS	DATA WAREHOUSING & DATA MINING LAB						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	4	25	50	2

Course Objectives:

- The course is intended to obtain hands-on experience using data mining software.
- Intended to provide practical exposure of the concepts in data mining algorithms

Course Outcomes:

- Apply preprocessing statistical methods for any given raw data.
- Gain practical experience of constructing a data warehouse.
- Implement various algorithms for data mining in order to discover interesting patterns from large amounts of data.

LIST OF EXPERIMENTS:-

Experiments using Weka & Clementine Tools

1. Data Processing Techniques:
   i. Data cleaning
   ii. Data transformation – Normalization
   iii. Data integration
2. Partitioning - Horizontal, Vertical, Round Robin, Hash based
3. Data Warehouse schemas – star, snowflake, fact constellation
4. Data cube construction – OLAP operations
5. Data Extraction, Transformations & Loading operations
6. Implementation of Attribute oriented induction algorithm
7. Implementation of apriori algorithm
8. Implementation of FP – Growth algorithm
9. Implementation of Decision Tree Induction
10. Calculating Information gain measures
11. Classification of data using Bayesian approach
12. Classification of data using K – nearest neighbour approach
13. Implementation of K – means algorithm
14. Implementation of BIRCH algorithm
15. Implementation of PAM algorithm
16. Implementation of DBSCAN algorithm

CHAIRPERSON
Board of Studies in
Computer Science & Engineering
Mahatma Gandhi University, NLG-508 254

Course Code	Course Title						Core/Elective
PEC 713 CS	ADVANCED DATABASE LAB						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	0	50	-	-

Course Objectives :

- This lab work will enhance database handling, data manipulation and data processing skills through SQL & PL/SQL, which will help them in developing data centric computer applications.

List Of Exercises:

1. Familiarization of the MySQL database – creation and manipulation of tables.
2. Analyze a given situation, develop an ER model and convert the ER model to Relational model.
3. Implement the database using MySQL and manipulate the tables using SQL commands.
4. Course project topic selection , developing an ER model and converting ER model to a Scheme diagram
5. Developing a data flow diagram for the problem specification.
6. Implementation of front end pages.
7. Implementation of server side pages and verifying the normalization
8. Testing the constraints and project
9. Submission and evaluation of project

Course Code	Course Title						Core/Elective
PEC 714 CS	CRYPTOGRAPHY & NETWORK SECURITY LAB						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	0	50	-	-

Course Objectives:

- To impart practical knowledge on network security concepts and mechanisms.
- To practically analyze and monitor network communication in order to overcome security threats
- To practically analyze the network protocols, and configure applications for enhancing security.

Course Outcomes:

- Gain practical experience of designing and implementing network security algorithms and protocols.
- Gain practical experience of analyzing network protocols and communication network.

List Experiments:

1. Write a program to perform encryption and decryption using the following
2. substitution ciphers.
3. Caeser cipher
4. Play fair cipher
5. Hill Cipher
6. Write a program to implement the DES algorithm.
7. Write a program to implement the Blowfish algorithm.
8. Write a program to implement RSA algorithm.
9. Implement the Diffie-Hellman Key Exchange mechanism.
10. Calculate the message digest of a text using the SHA-1 algorithm.
11. Calculate the message digest of a text using the MD5 algorithm.
12. Working with sniffers for monitoring network communication (Wireshark).
13. Configuring S/MIME for email communication.
14. Using Snort, perform real time traffic analysis and packet logging.

Course Code	Course Title						Core/Elective
PCC 711 CS	PROJECT STAGE-I						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	4	50	-	2

Course Objectives:

- To enhance practical and professional skills.
- To familiarize tools and techniques of systematic literature survey and documentation
- To expose the students to industry practices and team work.
- To encourage students to work with innovative and entrepreneurial ideas

Course Outcomes:

- Demonstrate the ability to synthesize and apply the knowledge and skills acquired in the academic program to the real-world problems.
- Evaluate different solutions based on economic and technical feasibility
- Effectively plan a project and confidently perform all aspects of project management
- Demonstrate effective written and oral communication skills

The department can initiate the project allotment procedure at the end of VI semester and finalize it in the first two weeks of VII semester.

The department will appoint a project coordinator who will coordinate the following:

- Collection of project topics/ descriptions from faculty members (Problems can also be invited from the industries)
- Grouping of students (max 3 in a group)
- Allotment of project guides

The aim of project work is to develop solutions to realistic problems applying the knowledge and skills obtained in different courses, new technologies and current industry practices. This requires students to understand current problems in their domain and methodologies to solve these problems. To get awareness on current problems and solution techniques, the first 4 weeks of VII semester will be spent on special lectures by faculty members, research scholars, post graduate students of the department and invited lectures by engineers from industries and R&D institutions. After completion of these seminars

each group has to formalize the project proposal based on their own ideas or as suggested by the project guide. Seminar schedule will be prepared by the coordinator for all the students from the 5th week to the last week of the semester which should be strictly adhered to.

1. Each group will be required to:
2. Submit a one-page synopsis before the seminar for display on notice board.
3. Give a 30 minutes' presentation followed by 10 minutes' discussion.

Submit a technical write-up on the talk. At least two teachers will be associated with the Project Seminar to evaluate students for the award of sessional marks which will be on the basis of performance in all the 3 items stated above.

The seminar presentation should include the following components of the project:

1. Problem definition and specification
2. Literature survey
3. Broad knowledge of available techniques to solve a particular problem.
4. Planning of the work, preparation of bar (activity) charts
5. Presentation- oral and written.

Course Code	Course Title						Core/Elective
SI 790 CS	SUMMER INTERNSHIP						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	0	50	-	-

Course Objectives:

- To train and provide hands-on experience in analysis, design, and programming of information systems by means of case studies and projects.
- To expose the students to industry practices and team work.
- To provide training in soft skills and also train them in presenting seminars and technical report writing.

Course Outcomes: Student will be able to :

- Get Practical experience of software design and development, and coding practices within Industrial/R&D Environments.
- Gain working practices within Industrial/R&D Environments.
- Prepare reports and other relevant documentation.

Summer Internship is introduced as part of the curricula of encouraging students to work on problems of interest to industries. A batch of three students will be attached to a person from the Computer Industry/Software Companies/R&D Organization for a period of 8 weeks.

This will be during the summer vacation following the completion of the III year Course. One faculty coordinator will also be attached to the group of 3 students to monitor the progress and to interact with the industry co-ordinate (person from industry).

1. After the completion of the 8 week project, student will submit a brief technical report on the project executed and present the work through a seminar talk to be organized by the Department.
2. Award of sessional are to be based on the performance of the students, to be judged by a committee constituted by the department.
3. One faculty member will co-ordinate the overall activity of Industry Attachment Program.

AICTE

With effect from the ACADEMIC YEAR 2020-21

NIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY

TECH (CBCS) 4 YEAR (8 SEMESTER) REGULAR PROGRAMME

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

(Applicable from the batch admitted from the Academic Year 2018-19 and onwards)

Faculty of Engineering & Technology

Scheme of Instruction and Syllabus

For

B.Tech (CBCS) – VII & VIII Semester

Of

Four Year Degree Course

In

COMPUTER SCIENCE & ENGINEERING

Mahatma Gandhi University

University College of Engineering & Technology

Nalgonda

Telangana State

508 254

With effect from the ACADEMIC YEAR 2020-21

UNIVERSITY COLLEGE OF ENGINEERING & TECHNOLOGY

B.TECH (CBCS) 4 YEAR (8 SEMESTER) REGULAR PROGRAMME

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

(Applicable from the batch admitted from the Academic Year 2018-19 and onwards)

SEMESTER – VIII

	Course Code	Course Title	Scheme of Instructions				Scheme of Examinations		Credits
			L	T	P/Dg	Contact Hrs/Wk	CIE	SEE	
		THEORY							
	#PE-VI	Professional Elective-VI	3	0	0	3	30	70	3
	*OE - III	Open Elective – III	3	0	0	3	30	70	3
		PRACTICALS							
	PC 882 CS	Major Project-II	0	0	12	12	50	100	6
		Total	**6**	**0**	**12**	**18**	**110**	**240**	**12**

–VI	Professional Elective-VI	*OE-III	Open Elective –III
861 CS	Big Data Analytics	OE 831 CS	Fundamentals of IoT
862 CS	Computer Vision	OE 832 CS	Embedded Systems
863 CS	Soft Computing	OE 833 CE	Geo Spatial Techniques
		OE 834 EE	Reliability Engineering

Course Code	Course Title						Core/Elective
PE 861 CS	BIG DATA ANALYTICS						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- To know about Big Data, to learn the technologies to handle Big Data
- To learn about Hadoop, Hadoop Ecosystem and the tools.
- To learn HDFS, Map reduce and HBase
- To learn about Big Data and Data Warehouse in data storage
- To learn about NoSQL databases

Course Outcomes: Students will be able to

- Understand about Big Data and the technologies to handle Big Data
- Understand about Hadoop, Hadoop Ecosystem and various tools .
- Understand HDFS , Map reduce and HBase in Big Data Processing.
- Understand about Big Data and Data Warehouse in data storage.
- Understand about NOSQL databases
- Understand importance of Big Data in Social Media

UNIT - I

Getting an overview of Big Data: Introduction to Big Data, Structuring Big Data, Types of Data, Elements of Big Data, Big Data Analytics, advantages of Big Data Analytics.

Exploring the Use of Big Data in Business Context: Use of Big Data in Social Networking, Use of Big Data in Preventing Fraudulent Activities, Use of Big Data in Detecting Fraudulent Activities in Insurance Sector, Use of Big Data in Retail Industry.

CHAIRPERSON

Introducing Technologies for Handling Big Data: Distributed and Parallel Computing for Big Data, Introducing Hadoop, Cloud Computing and Big Data, and In-Memory Computing Technologies for Big Data.

UNIT – II

Understanding Hadoop Ecosystem: Introducing Hadoop, **Hadoop Distributed File System**- HDFS Architecture, Concept of Blocks in HDFS Architecture, Namenodes and Datanodes, Features of HDFS. MapReduce.

Introducing HBase - HBase Architecture, Regions, Storing Big Data with HBase, Combining HBase and HDFS, Features of HBase.

Understanding MapReduce Fundamentals and HBase: The MapReduce Framework ,Exploring the features of MapReduce, Working of MapReduce, Techniques to optimize MapReduce Jobs, Hardware/Network Topology, Synchronization, File system, Uses of MapReduce, Role of HBase in Big Data Processing- Characteristics of HBase.

Processing Your Date with MapReduce: Recollect the concept of MapReduce framework, Developing simple MapReduce application.

UNIT- III

Customizing MapReduce Execution and implementing MapReduce program: Controlling MapReduce Execution with input format, InputSplit, RecordReader, FileInputFormat, Implementing InputFormat for Compute Intensive Applications, Implementing InputFormat to Control the number of Maps, Implementing InputFormat for Multiple HBase Tables, Reading Data with Custom RecordReader, Organizing output Data with OutputFormat, Customizing data with RecordWriter, Optimizing MapReduce execution with Combiner, Controlling Reducer Execution with Partitioners.

Understanding Hadoop YARN Architecture: YARN Architecture, working of YARN, YARN Schedulers, Backward compatibility with YARN, YARN Configurations, YARN Commands, YARN Containers.

UNIT – IV

Exploring Hive: Introduction to Hive, Hive Services, Data types in Hive, Built-in Functions in Hive, Hive DDL, Data Manipulation in Hive, Data Retrieval Queries, Using Joins in Hive.

Analyzing Data with Pig: Introduction to Pig, Running Pig, Working with Operators in Pig, Debugging Pig, Working with functions in Pig.

Using Oozie: Introduction to Oozie, Oozie Coordinator, Oozie Bundle, Oozie Parameterization with EL, Oozie job Execution model, Oozie SLA.

UNIT –V

NoSQL Data Management: Introduction to NoSQL, Characteristics of NoSQL, Types of NoSQL Data Models- Key Value Data Model, Column Oriented Data Model, Document Data Model, Graph Databases, Schema-Less Databases, Materialized Views, Distribution Models, CAP Theorem.

Data Movement with Flume and Sqoop: Flume Architecture, Sqoop, Importing Data

Suggested Readings:

1. BIG DATA, Black Book TM, DreamTech Press, 2016 Edition.
2. Seema Acharya, Subhasni Chellappan , "BIG DATA and ANALYTICS", Wiley publications, 2016
3. Nathan Marz and James Warren, "BIG DATA- Principles and Best Practices of Scalable Real-Time Systems", 2010

Analyzing Data with Pig: Introduction to Pig, Running Pig, Working with Operators in Pig, Debugging Pig, Working with functions in Pig.

Using Oozie: Introduction to Oozie, Oozie Coordinator, Oozie Bundle, Oozie Parameterization with EL, Oozie job Execution model, Oozie SLA.

UNIT –V

NoSQL Data Management: Introduction to NoSQL, Characteristics of NoSQL, Types of NoSQL Data Models- Key Value Data Model, Column Oriented Data Model, Document Data Model, Graph Databases, Schema-Less Databases, Materialized Views, Distribution Models, CAP Theorem.

Data Movement with Flume and Sqoop: Flume Architecture, Sqoop, Importing Data

Suggested Readings:

1. BIG DATA, Black Book TM, DreamTech Press, 2016 Edition.
2. Seema Acharya, Subhasni Chellappan , "BIG DATA and ANALYTICS", Wiley publications, 2016
3. Nathan Marz and James Warren, "BIG DATA- Principles and Best Practices of Scalable Real-Time Systems", 2010

Course Code	Course Title						Core/Elective
PE 862 CS	COMPUTER VISION						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives :

- To build an understanding on detailed models of image formation.
- To expose the students to image feature detection and matching.
- To introduce fundamental algorithms for pattern recognition.
- To introduce various classification techniques.
- To expose the students to various structural pattern recognition and feature extraction techniques.

Course Outcomes : The students should be able to:

- To implement fundamental image processing techniques required for computer vision
- Understand Image formation process
- To perform shape analysis
- Extract features form Images and do analysis of Images
- Generate 3D model from images
- To develop applications using computer vision techniques
- Understand video processing, motion computation and 3D vision and geometry

UNIT-I

Introduction : Image Processing, Computer Vision and Computer Graphics , What is Computer Vision - Low-level, Mid-level, High-level , Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality.

UNIT-II

Image Formation Models : Monocular imaging system , Radiosity: The 'Physics' of Image Formation, Radiance, Irradiance, BRDF, color etc, Orthographic & Perspective Projection, Camera model and

Camera calibration, Binocular imaging systems, Multiple views geometry, Structure determination, shape from shading , Photometric Stereo, Depth from Defocus , Construction of 3D model from images.

UNIT -III

Image Processing and Feature Extraction: Image preprocessing, Image representations (continuous and discrete) , Edge detection

Motion Estimation : Regularization theory , Optical computation , Stereo Vision , Motion estimation , Structure from motion

UNIT-IV

Shape Representation and Segmentation : Contour based representation, Region based representation, Deformable curves and surfaces , Snakes and active contours, Level set representations , Fourier and wavelet descriptors , Medial representations , Multiresolution analysis

UNIT-V

Object recognition : Hough transforms and other simple object recognition methods, Shape correspondence and shape matching , Principal component analysis , Shape priors for recognition Image Understanding : Pattern recognition methods, HMM, GMM and EM

Suggested Readings:

1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
2. Introductory Techniques for 3D Computer Vision, by E. Trucco and A. Verri, Publisher: Prentice Hall.
3. R. C. Gonzalez, R. E. Woods. Digital Image Processing. Addison Wesley Longman, Inc., 1992.
4. D. H. Ballard, C. M. Brown. Computer Vision. Prentice-Hall, Englewood Cliffs, 1982.
5. Richard Szeliski, Computer Vision: Algorithms and Applications (CVAA). Springer, 2010
6. Image Processing, Analysis, and Machine Vision. Sonka, Hlavac, and Boyle. Thomson.
7. E. R. Davies, Computer & Machine Vision, Fourth Edition, Academic Press, 2012

Course Code	Course Title						Core/Elective
PE 863 CS	SOFT COMPUTING						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- Fundamentals of Neural Networks & Feed Forward Networks.
- Associative Memories & ART Neural Networks.
- Fuzzy Logic & Systems.
- Genetic Algorithms and Hybrid Systems.

Course Outcomes: The students will be able to

- Identify and employ suitable soft computing techniques in classification and optimization problems.
- Design hybrid systems to suit a given real – life problem.

UNIT- I

Introduction to Soft Computing: Concept of computing systems."Soft" compiting versus "Hard" computing,Characteristics of Soft computing.Applications of Soft computing techniques

UNIT- II

Neural Networks: McCulloch-Pitts neuron – linear separability – hebb network – supervised learning network: perceptron networks – adaptive linear neuron, multiple adaptive linear neuron, BPN, RBF, TDNN-associative memory network: auto-associative memory network, hetero-associative memory network, BAM, hopfield networks, iterative auto associative memory network and iterative associative memory network -unsupervised learning networks: Kohonen self-organizing feature maps, LVQ – CP networks, ART network.

CHAIRPERSON
Board of Studies in

UNIT -III

Fuzzy Logic: Membership functions: features, fuzzification, methods of membership value assignments-Defuzzification: lambda cuts – methods – fuzzy arithmetic and fuzzy measures: fuzzy arithmetic - extension principle – fuzzy measures – measures of fuzziness -fuzzy integrals – fuzzy rule base and approximate reasoning : truth values and tables, fuzzy propositions, formation of rules-decomposition of rules, aggregation of fuzzy rules, fuzzy reasoning-fuzzy inference systems-overview of fuzzy expert system-fuzzy decision making.

UNIT- IV

Fuzzy Logic: Fuzzy Sets – Properties – Membership Functions - Fuzzy Operations. Fuzzy Logic and Fuzzy Inference System

UNIT- V

Hybrid Soft Computing Techniques and Applications: Neuro-fuzzy hybrid systems – genetic neuro hybrid systems – genetic fuzzy hybrid and fuzzy genetic hybrid systems – simplified fuzzy ARTMAP – Applications: A fusion approach of multispectral images with SAR, optimization of traveling salesman problem using genetic algorithm approach, soft computing based hybrid fuzzy controllers.

Suggested Readings:

1. J.S.R.Jang, C.T. Sun and E.Mizutani, Neuro-Fuzzy and Soft Computing, PHI / Pearson Education 2004.
2. S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt Ltd, 2011.
3. S.Rajasekaran and G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications", Prentice-Hall of India Pvt. Ltd., 2006.
4. George J. Klir, Ute St. Clair, Bo Yuan, Fuzzy Set Theory: Foundations and Applications Prentice Hall, 1997.
5. David E. Goldberg, Genetic Algorithm in Search Optimization and Machine Learning Pearson Education India, 2013.

CHAIRPERSON

6. James A. Freeman, David M. Skapura, Neural Networks Algorithms, Applications, and Programming Techniques, Pearson Education India, 1991.
7. Simon Haykin, Neural Networks Comprehensive Foundation Second Edition, Pearson Education 2005.

Course Code	Course Title						Core/Elective
OE 831 CS	FUNDAMENTALS OF IOT						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- Discuss fundamentals of IoT and its applications and requisite infrastructure
- Describe Internet principles and communication technologies relevant to IoT
- Discuss hardware and software aspects of designing an IoT system
- Describe concepts of cloud computing and Data Analytics
- Discuss business models and manufacturing strategies of IoT products

Course Outcomes: Student will be able to

- Understand the various applications of IoT and other enabling technologies.
- Comprehend various protocols and communication technologies used in IoT
- Design simple IoT systems with requisite hardware and C programming software
- Understand the relevance of cloud computing and data analytics to IoT
- Comprehend the business model of IoT from developing a prototype to launching a product.

UNIT- I

Introduction to Internet of Things:IOT vision, Strategic research and innovation directions, Iot Applications, Related future technologies, Infrastructure, Networks and communications, Processes, Data Management, Security, Device level energy issues.

UNIT- II

Internet Principles and communication technology: Internet Communications: An Overview -- IP,TCP,IP protocol Suite, UDP. IP addresses – DNS, Static and Dynamic IP addresses, MAC Addressess, TCP and UDP Ports, Application Layer Protocols –HTTP,HTTPS, Cost Vs Ease of Production, Prototypes and Production, Open Source Vs Closed Source.

UNIT- III

Prototyping and programming for IoT : Prototyping Embedded Devices – Sensors, Actuators, Microcontrollers, SoC, Choosing a platform, Prototyping, Hardware platforms – Arduino, Raspberry Pi. Prototyping the physical design – Laser Cutting, 3D printing, CNC Milling.Techniques for writing embedded C code: Integer data types in C, Manipulating bits - AND,OR,XOR,NOT, Reading and writing from I/ O ports. Simple Embedded C programs for LED Blinking, Control of motor using switch and temperature sensor for arduino board.

UNIT- IV

Cloud computing and Data analytics : Introduction to Cloud storage models -SAAS, PAAS, IAAS. Communication APIs, Amazon webservices for IoT, Skynet IoT Messaging Platform.Introduction to Data Analytics for IoT - Apache hadoop- Map reduce job execution workflow.

UNIT- V

IoT Product Manufacturing - From prototype to reality: Business model for IoT product manufacturing, Business models canvas, Funding an IoT Startup,Mass manufacturing - designing kits, designing PCB,3D printing, certification, Scaling up software, Ethical issues in IoT- Privacy, Control, Environment, solutions to ethical issues.

Suggested Readings:

1. Internet of Things - Converging Technologies for smart environments and Integrated ecosystems,River Publishers.
2. Designing the Internet of Things , Adrian McEwen, Hakim Cassimally. Wiley India Publishers
3. Fundamentals of embedded software: where C meets assembly by Daneil W lewies, Pearson.
4. Internet of things -A hands on Approach, Arshdeep Bahga, Universities press.

Course Code	Course Title						Core/Elective
OE 832 CS	EMBEDDED SYSTEMS						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- The aim of the course is to introduce the hardware and software design aspects of embedded systems.
- To equip the students with the knowledge and skills necessary to design and develop embedded applications by means of real-time operating systems.
- The course includes the basics of embedded systems, interfacing, embedded programming and real-time operating systems.

Course Outcomes:

- Ability to design a system, component, or process that meets the requirements within realistic constraints
- Gain the skills in programming embedded systems
- Gain the knowledge of typical interfacing standards and be able to interface to peripherals
- Ability to design and develop embedded applications by means of real-time operating Systems

UNIT -I

Introduction to Embedded Systems: Definition and Classification - Overview of Processors and hardware units in an embedded system - Software embedded into the system - Exemplary Embedded Systems – Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits.

UNIT -II

Devices and Buses for Devices Network: I/O Devices - Device I/O Types and Examples - Synchronous and Asynchronous Communications from Serial Devices - Examples of Internal Serial-Communication Devices - UART and HDLC - Parallel Port Devices - Sophisticated interfacing features in Devices/Ports- Timer and Counting Devices - 'I2C', 'USB',

UNIT -III

Programming Concepts and Embedded Programming in C: Programming in assembly language (ALP) vs. High Level Language - C Program Elements, Macros and functions -Use of Pointers - NULL Pointers - Use of Function Calls – Multiple function calls in a Cyclic Order in the Main Function Pointers - Function Queues and Interrupt Service Routines Queues Pointers

UNIT -IV

Real Time Operating Systems - Part – 1: Definitions of process, tasks and threads - Clear cut distinction between functions - ISRs and tasks by their characteristics - Operating System Services- Goals - Structures- Kernel -Process Management - Memory Management - Device Management - File System Organization and Implementation - I/O Subsystems - Interrupt Routines Handling in RTOS, RTOS Task scheduling models.

Inter Process Communication And Synchronization - Shared data problem - Use of Semaphore(s) Inter Process Communications using Signals – Semaphore Flag or mutex as Resource key – Message Queues - Mailboxes – Pipes.

UNIT- V

Real Time Operating Systems - Part – 2: Study of Micro C/OS-II or Vx Works or Any other popular RTOS - RTOS System Level Functions - Task Service Functions - Time Delay Functions Memory Allocation Related Functions - Semaphore Related Functions - Mailbox Related Functions Queue Related Functions.

Suggested Readings:

1. Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw-Hill, First reprint Oct. 2003
2. Steve Heath, Embedded Systems Design, Second Edition-2003
3. David E.Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.
4. Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design - Harcourt India, Morgan Kaufman Publishers, First Indian Reprint 2001
5. Frank Vahid and Tony Givargis, Embedded Systems Design - A Unified Hardware/Software Introduction, John Wiley, 2002

Course Code	Course Title						Core/Elective
OE 833 CE	GEO SPATIAL TECHNIQUES						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- Description about various spatial and non-spatial data types, and data base management techniques
- Development of the concepts and professional skills in utility of geospatial techniques
- Enhancement of knowledge of geospatial techniques to field problems

Course Outcomes:

- Able to understand and apply GIS tools
- Able to analyze and process data to apply to the GIS tools.
- Able to assimilate knowledge on field problems using remote sensing

UNIT – I

Introduction: Basic concepts, socioeconomic challenges, fundamentals of geographical information systems (GIS), history of geographical information system, components of geographical information systems.

Projections and Coordinate Systems: Map definitions, representations of point, line, polygon, common coordinate system, geographic coordinate system, map projections, transformations, map analysis.

UNIT –II

Data Acquisition and Data Management: data types, spatial, non spatial (attribute) data, data structure and database management, data format, vector and raster data representation, object structural model filters and files data in computer, key board entry, manual digitizing, scanner, aerial photographic data, remotely sensed data, digital data, cartographic database, digital elevation data, data compression, data storage and maintenance, data quality and standards, precision, accuracy, error and data uncertainty.

Data Processing: Geometric errors and corrections, types of systematic and non systematic errors, radiometric errors and corrections, internal and external errors.

UNIT –III

Data Modeling: Spatial data analysis, data retrieval query, simple analysis, recode overlay, vector data model, raster data model, digital elevation model, cost and path analysis, knowledge based system.
GIS Analysis and Functions: Organizing data for analysis, analysis function, maintenance and analysis of spatial data, buffer analysis, overlay analysis, transformations, conflation, edge matching and editing, maintenance and analysis of spatial and non spatial data

UNIT– IV

Applications of GIS: Environmental and natural resource management, soil and water resources, agriculture, land use planning, geology and municipal applications, urban planning and project management, GIS for decision making under uncertainty, software scenario functions, standard GIS packages, introduction to Global Positioning Systems (GPS) and its applications.

UNIT– V

Introduction to Remote Sensing: General background of remote sensing technology, objectives and limitations of remote sensing, electro-magnetic radiation, characteristics, interaction with earth surface and atmosphere, remote sensing platforms and sensors, satellite characteristics, digital image processing, IRS series and high resolution satellites, software scenario functions, remote sensing applications to watershed modeling, environmental modeling, urban planning and management.

Suggested Readings:

1. Burrough, P. A., and McDonnell R. A. (1998), 'Principles of Geographical Information Systems', Oxford University Press, New York
2. Choudhury S., Chakrabarti, D., and Choudhury S. (2009), 'An Introduction to Geographic Information Technology', I.K. International Publishing House (P) Ltd, New Delhi
3. Kang-tsung Chang. (2006), 'Introduction to Geographical information Systems', Tata McGraw-Hill Publishing Company Ltd., Third Edition, New Delhi
4. Lilysand T.M., and Kiefer R.W. (2002), 'Remote Sensing and Image Interpretation', John Wiley and Sons, Fourth Edition, New York
5. Sabins F.F. Jr. (1978), 'Remote Sensing Principles and Interpretations', W.H. Freeman and Company, San Francisco
6. Tor Bernhardsen. (2002), 'Geographical Information System', Wiley India (P) Ltd., Third Edition,

Course Code	Course Title						Core/Elective
OE 834 EE	RELIABILITY ENGINEERING						Elective
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	0	0	0	30	70	3

Course Objectives:

- To understand the concepts of different types of probability distributions. Importance of reliability evaluation of networks.
- To make the students understand about Reliability, availability model of Power Systems and markov modeling of Power Plants with identical and no identical units.

Course Outcomes: The student will be able to

- Model various systems applying reliability networks
- Evaluate the reliability of simple and complex systems
- Estimate the limiting state probabilities of repairable systems
- Apply various mathematical models for evaluating reliability of irrepairable systems

UNIT- I

Discrete and Continuous random variables, probability density function and cumulative distribution function. Mean and Variance. Binomial, Poisson, Exponential and Weibull distributions.

UNIT - II

Failure and causes of failure. Failure rate and failure density. Reliability function and MTTF. Bath tub curve for different systems. Parametric methods for above distributions. Non - Parametric methods from field data.

UNIT- III

Reliability block diagram. Series and parallel systems. Network reduction technique, Examples. Evaluation of failure rate, MTTF and reliability, Active and Standby Redundancy, r out of n configuration. Non-series - parallel systems. Path based and cut set methods.

UNIT- IV

Availability, MTTR and MTBF, Markov models and State transition matrices. Reliability models for single component. Two components, Load sharing and standby systems. Reliability and availability models of two unit parallel system with repair and standby systems with repair.

UNIT- V

Repairable Systems. maintainability. Preventive maintenance, Evaluation of reliability and JITTF. Overhauling and replacement. Optimum maintenance policy. Markov model of a power plant with identical units and non-identical units. Capacity outage probability table. Frequency of failures and Cumulative frequency.

Suggested Readings:

1. Charles E.Ebeling, Reliability and MAintainabelity Engineering,Mc Graw Hill Inetrnational Edition, 1997.
2. Balaguruswamy, Reliability Engineering,Tata McGraw Hill Publishing company Ltd,1984.
3. R.N.Allan. Reliability Evaluation of Engineering Systems,Pitman Publishing,1996.
4. Endrenyi. Reliability Modelling in Electric Power Systems. JohnWiley & Sons,1978.

w. e. f Academic Year 2021-22

Course Code	Course Title						Core/Elective
PCC 882 CS	MAJOR PROJECT WORK						Core
	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	0	0	0	12	50	100	6

Course Objectives :

- To enhance practical and professional skills.
- To familiarize tools and techniques of systematic Literature survey and documentation
- To expose the students to industry practices and team work.
- To encourage students to work with innovative and entrepreneurial ideas

Course Outcomes : Student will able to

- Demonstrate the ability to synthesize and apply the knowledge and skills acquired in the academic program to real-world problems.
- Evaluate different solutions based on economic and technical feasibility.
- Effectively plan a project and confidently perform all aspects of project management.
- Demonstrate effective written and oral communication skills.

The aim of Project work –II is to implement and evaluate the proposal made as part of Project Work - I. Students can also be encouraged to do full time internship as part of project work-II based on the common guidelines for all the departments. The students placed in internships need to write the new proposal in consultation with industry coordinator and project guide within two weeks from the commencement of instruction.

The department will appoint a project coordinator who will coordinate the following:

- Re-grouping of students - deletion of inters hip candidates from groups made as part of project work-I
- Re-Allotment of internship students to project guides
- Project monitoring at regular intervals
- All re-grouping/re-allotment has to be completed by the 1st week of VIIIth semester so that students get sufficient time for completion of the project.

All projects (internship and departmental) will be monitored at least twice in a semester through student presentation for the award of sessional marks. Sessional marks are awarded by a monitoring committee comprising of faculty members as well as by the supervisor. The first review of projects for 25 marks can be conducted after completion of five weeks. The second review for another 25 marks can be conducted after 12 weeks of instruction.

Common norms will be established for the final documentation of the project report by the respective departments. The students are required to submit draft copies of their project report within one week after completion of instruction.

Note: Three contact hours of work load will be assigned to each project guide.