R19

B.Tech.
(COMPUTER SCIENCE AND BUSINESS SYSTEMS)

B.Tech. R19 CBCS Curriculum

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

An Autonomous, ISO 9001:2015 & QS I-Gauge Diamond Rated Institute, Accredited by NAAC with 'A++' Grade
NBA Accreditation for B.Tech. CE, EEE, ME, ECE, CSE, EIE, IT Programmes
Approved by AICTE, New Delhi, Affiliated to JNTUH, NIRF 113 Rank in Engineering Category
Recognized as "College with Potential for Excellence" by UGC
Vignana Jyothi Nagar, Pragathi Nagar, Nizampet (S.O), Hyderabad – 500 090, TS, India.
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VISION OF THE INSTITUTE

To be a World Class University providing value-based education, conducting interdisciplinary research in cutting edge technologies leading to sustainable development of the nation

MISSION OF THE INSTITUTE

- To produce technically competent and socially responsible engineers, managers and entrepreneurs, who will be future ready.

- To involve students and faculty in innovative research projects linked with industry, academic and research institutions in India and abroad.

- To use modern pedagogy for improving the teaching-learning process.

DEPARTMENT OF

COMPUTER SCIENCE AND BUSINESS SYTEMS

VISION OF THE DEPARTMENT

To achieve academic and research excellence in essential technologies of Computer Science and Engineering by promoting a creative environment for learning and innovation.

MISSION OF THE DEPARTMENT

- To provide dynamic, innovative and flexible curriculum which equip the students with the necessary problem driven skills to strengthen their career prospects and potential to pursue higher studies.
- To foster inquisitive-driven research among students and staff so as to reinforce the domain knowledge and address contemporary societal issues.
- To inculcate ethical values, leadership qualities and professional behaviour skills for improving the living standards of people

B.TECH.

(COMPUTER SCIENCE AND BUSINESS SYSTEMS)

B.TECH. (CSE)

PROGRAM EDUCATIONAL OBJECTIVES

PEO-I: The graduates of the program will become proficient in the principles and practices of computer science, mathematics and science, enabling them to solve a wide range of computing related problems.

PEO-II: To enable the students with innovative applications of engineering knowledge and programming skills to spearhead the progress of society in the information age.

PEO-III: To mould the students into competent, successful, and practicing engineers in their career and/or in pursuing their higher studies through the spirit of innovation and entrepreneurship.

PEO-IV: To provide exposure to cutting edge technologies, adequate training and opportunities to work individually and as teams on multidisciplinary projects with effective analytical skills.

PEO-V: To acquire and practice the profession with ethics, integrity and leadership qualities with due consideration to environmental issues in conformance with societal needs.

B.TECH. (CSE)

PROGRAM OUTCOMES

PO-1: To apply and integrate knowledge of computing to the engineering discipline.

PO-2: To identify, analyse, formulate and solve complex problems related to computer science and engineering.

PO-3: To design, construct and evaluate a computer based system, process or component, to meet the evolving needs.

PO-4: To demonstrate application of engineering skills and techniques for efficient development of projects and products

PO-5: To use modern techniques and tools necessary for computing practice that drives towards entrepreneurship

PO-6: To develop innovative ideas that can be translated into commercial products benefiting the society and the economic growth

PO-7: To understand the impact of engineering solutions in a social, global, environmental and economic context.

PO-8: To posses leadership and management skills with best professional, ethical practices and social concern

PO-9: To interact professionally with others in the workplace and to function effectively as an individual and in a group

PO-10: To demonstrate quality skills so as to speak, listen and present effectively the acquired technical knowledge to a range of audience

PO-11: To utilize project management skills and principles of finance and economics in the construction of hardware and software systems with business objective

PO-12: To substantiate contemporary knowledge and technological developments by being a continuous learner.

B.TECH. (CSE)

PROGRAM SPECIFIC OUTCOMES

PSO-1: Apply the Knowledge of Programming Languages, Networks and Databases for development of Software Applications.

PSO-2: Identify, Analyse, Formulate and Solve Real Time Complex Engineering Problems.

PSO-3: Design, Implement And Deploy a Quality Based Software System to meet the Evolving needs.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY HYDERABAD
B.TECH. I YEAR
(COMPUTER SCIENCE AND BUSINESS SYSTEMS)

I SEMESTER **R19**

Course Code	Title of the Course	L	T	P/D	Contact Hours/ Week	Credits
19BS1MT02	Discrete Mathematics	3	0	0	3	3
19BS1MT03	Introductory Topics in Statistics, Probability and Calculus	3	0	0	3	3
19ES1CB01	Fundamentals of Computer Science	2	1	0	3	3
19ES1EE03	Principles of Electrical Engineering	3	0	0	3	3
19BS1PH03	Physics for Computing Science	3	0	0	3	3
19ES2CB01	Fundamentals of Computer Science Laboratory	0	0	2	2	1
19ES2EE03	Principles of Electrical Engineering Laboratory	0	0	2	2	1
19BS2PH03	Physics for Computing Science Laboratory	0	0	2	2	1
19HS2EN02	Business Communication and Value Science - I	1	0	2	3	2
Total		**15**	**1**	**8**	**24**	**20**
19MN6HS01	Induction Program	**-**	**-**	**-**	**-**	**-**

II SEMESTER **R19**

Course Code	Title of the Course	L	T	P/D	Contact Hours/ Week	Credits
19BS1MT06	Linear Algebra	2	1	0	3	3
19BS1MT07	Statistical Modeling	3	0	0	3	3
19ES1CB02	Data Structures and Algorithms	2	1	0	3	3
19ES1EC01	Principles of Electronics Engineering	3	0	0	3	3
19HS1MG01	Fundamentals of Economics	3	0	0	3	3
19BS2MT01	Statistical Modeling Laboratory	0	0	2	2	1
19ES2CB02	Data Structures and Algorithms Laboratory	0	0	2	2	1
19ES2EC01	Principles of Electronics Engineering Laboratory	0	0	2	2	1
19HS2EN03	Business Communication and Value Science – II	1	0	2	3	2
Total		**14**	**2**	**8**	**24**	**20**
19MN6HS02	Environmental Science	2	0	0	2	0

L – Lecture T – Tutorial P – Practical D – Drawing

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY HYDERABAD
B.TECH. II YEAR
(COMPUTER SCIENCE AND BUSINESS SYSTEMS)

III SEMESTER **R19**

Course Code	Title of the Course	L	T	P/D	Contact Hours/ Week	Credits
19PC1CB01	Formal Language and Automata Theory	2	1	0	3	3
19PC1CB02	Computer Organization and Architecture	3	1	0	4	4
19PC1CB03	Object Oriented Programming	2	1	0	3	3
19PC1CB04	Computational Statistics	2	1	0	3	3
19PC1CB05	Software Engineering	2	1	0	3	3
19PC2CB01	Object Oriented Programming Laboratory	0	0	2	2	1
19PC2CB02	Computational Statistics Laboratory	0	0	2	2	1
19PC2CB03	Software Engineering Laboratory	0	0	2	2	1
Total		**11**	**5**	**6**	**22**	**19**
19MN6HS04	Indian Constitution	**2**	**0**	**0**	**2**	**0**

IV SEMESTER **R19**

Course Code	Title of the Course	L	T	P/D	Contact Hours/ Week	Credits
19PC1CB06	Operating Systems	2	1	0	3	3
19PC1CB07	Database Management System Concepts	2	1	0	3	3
19PC1CB08	Software Design With UML	2	1	0	3	3
19HS1IE01	Introduction to Innovation, IP Management and Entrepreneurship	2	1	0	3	3
19ES1ME10	Operations Research	2	1	0	3	3
19PC2CB04	Operating Systems (Unix)Laboratory	0	0	2	2	1
19PC2CB05	Database Management System Concepts Laboratory	0	0	2	2	1
19PC2CB06	Software Design With UML Laboratory	0	0	2	2	1
19ES2ME10	Operations Research Laboratory	0	0	2	2	1
19HS2EN04	Business Communication and Value Science – III	1	0	2	3	2
Total		**11**	**5**	**10**	**26**	**21**
19MN6HS05	Essence of Indian Traditional Knowledge	2	0	0	2	0

L – Lecture T – Tutorial P – Practical D – Drawing

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY HYDERABAD
B.TECH. III YEAR
(COMPUTER SCIENCE AND BUSINESS SYSTEMS SYLLABUS)

V SEMESTER **R19**

Course Code	Title of the Course	L	T	P	Contact Hours/ Week	Credits
19PC1CB09	Design and Analysis of Algorithms	2	1	0	3	3
19PC1CB10	Computer Networks	2	1	0	3	3
19HS1MG05	Fundamentals of Management	3	0	0	3	3
19PC1CB11	Design Thinking	3	0	0	3	3
	Professional Elective – I					
19PE1CB01	Conversational Systems	3	0	0	3	3
19PE1CB02	Cloud, Microservices and Applications					
19PE1CB03	Machine Learning					
	Open Elective – I					
19OE1CB01	Business Strategy	3	0	0	3	3
19OE1CB02	Scripting Languages					
19OE1CB03	Mobile Application Development					
	Professional Electives-1 Laboratory					
19PE2CB01	Conversational Systems Laboratory	0	0	2	2	1
19PE2CB02	Cloud, Microservices and Applications Laboratory					
19PE2CB03	Machine Learning Laboratory					
19PC2CB07	Design and Analysis of Algorithms Laboratory	0	0	2	2	1
19PC2CB08	Computer Networks Laboratory	0	0	2	2	1
19PW4CB01	Internship	0	0	0	0	1
Total		**16**	**2**	**6**	**24**	**22**

VI SEMESTER **R19**

Course Code	Title of the Course	L	T	P	Contact Hours/ Week	Credits
19PC1CB12	Compiler Design	2	1	0	3	3
19PC1CB13	Artificial Intelligence	2	1	0	3	3
19PC1CB14	Information Security	2	1	0	3	3
	Professional Elective – II					
19PE1CB04	Modern Day Robotics and Its Industrial Applications	3	0	0	3	3
19PE1CB05	Modern Web Applications					
19PE1CB06	Data Mining and Analytics					
	Open Elective – II					
19OE1CB04	Financial and Cost Accounting	3	0	0	3	3
19OE1CB05	Augmented Reality and Virtual Reality					
19OE1CB06	Distributed Systems					
	Professional Electives - II Laboratory					
19PE2CB04	Modern Day Robotics and Its Industrial Applications Laboratory	0	0	2	2	1
19PE2CB05	Modern Web Applications Laboratory					
19PE2CB06	Data Mining and Analytics Laboratory					
19PC2CB09	Compiler Design and Information Security Laboratory	0	0	2	2	1
19PC2CB10	Artificial Intelligence Laboratory	0	0	2	2	1
19HS2EN06	Business Communication and Value Science – IV	1	0	2	3	2
Total		**13**	**3**	**8**	**24**	**20**
19MN6HS03	Gender Sensitization	2	0	0	2	0

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VII SEMESTER **R19**

Course Code	Title of the Course	L	T	P	Contact Hours/ Week	Credits
19PC1CB15	Usability Design of Software Applications	2	1	0	3	3
19HS1MG06	Financial Management	3	0	0	3	3
	Professional Elective – III					
19PE1CB07	Cognitive Science and Analytics	2	1	0	3	3
19PE1CB08	Introduction to IoT					
19PE1CB09	Cryptology					
	Professional Elective – IV					
19PE1CB10	Quantum Computation and Quantum Information	2	1	0	3	3
19PE1CB11	Advanced Social, Text and Media Analytics					
19PE1CB12	Mobile Computing					
	Open Elective – III					
19OE1CB07	Human Resource Management	3	0	0	3	3
19OE1CB08	Blockchain Technologies					
19OE1CB09	Advanced Operating Systems					
	Professional Electives-IV Laboratory					
19PE2CB07	Quantum Computation and Quantum Information Laboratory	0	0	2	2	1
19PE2CB08	Advanced Social, Text and Media Analytics Laboratory					
19PE2CB09	Mobile Computing Laboratory					
19PC2CB11	Usability Design of Software Applications Laboratory	0	0	2	2	1
19PW4CB02	Mini-Project*	0	0	4	4	2
19PW4CB03	Major Project Phase - I	0	0	8	8	4
Total		**12**	**3**	**16**	**31**	**23**

*** Mini-Project to be pursued during summer vacation after VI semester and evaluated in VII semester**

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VIII SEMESTER **R19**

Course Code	Title of the Course	L	T	P	Contact Hours/ Week	Credits
	Professional Elective – V					
19PE1CB13	Behavioural Economics	2	1	0	3	3
19PE1CB14	Computational Finance and Modeling					
19PE1CB15	Psychology					
	Professional Elective – VI					
19PE1CB16	Enterprise Systems	2	1	0	3	3
19PE1CB17	Advance Finance					
19PE1CB18	Image Processing and Pattern Recognition					
	Open Elective – IV					
19OE1CB10	IT Project Management	3	0	0	3	3
19OE1CB11	Services Science and Service Operational Management					
19OE1CB12	Marketing Research and Marketing Management					
19PW4CB04	Major Project Phase - II	0	0	12	12	6
Total		**7**	**2**	**12**	**21**	**15**

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. I Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19BS1MT02) DISCRETE MATHEMATICS

COURSE PRE-REQUISITES: Set, Relation, Mapping, Permutations and Combinations

COURSE OBJECTIVES:
- To learn concepts of sets and relation to understand Group's and Ring theory
- To learn combinatorics techniques in solving the system by various methodology
- To learn Boolean expressions, operations and truth tables
- To learn graphs serve as models for many standard problems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Represent characteristics of Sets, Groups, Rings and Fields
CO-2: Explain and exemplify tautology, contradiction and contingency
CO-3: Identify underlying combinatorial structures
CO-4: Analyse the design of various combinational & sequential logic circuits using the concepts of Boolean Algebra
CO-5: Apply graph theory based tools in solving practical problems

UNIT-I:
Abstract Algebra: Sets, Finite sets, Power sets, Set Operations, Algebra of sets and duality, Partitions, Relations, Types of relations, Closure properties, Equivalence relations, Partial Ordering, Groups, subgroups, Lagrange's theorem on finite groups. Introduction to Ring, Integral domain and Field.

UNIT-II:
Logic: Propositional calculus - propositions and connectives, truth assignments and truth tables, validity and satisfiability, tautology; Logical Equivalence and normal forms; Algebra of propositions, Conditional and Bi-conditional statements, Logical implication, Quantifiers, Negation of quantified statements.

UNIT-III:
Combinatorics: Introduction, Basic counting, Factorial notation, Bionomial coefficients, generating functions, recurrence relations, pigeonhole principle, principle of mathematical induction.

UNIT-IV:
Boolean Algebra: Introduction of Boolean algebra, principle of duality, Basic logic gates, truth table, Boolean expressions, canonical form, Karnaugh map.

UNIT-V:
Graph Theory: Graphs, Types of Graphs, digraphs, adjacency matrix, isomorphism, Trees, Properties of trees, Spanning trees, Minimal Spanning trees using Kruskal's and Prims Algorithms.

UNIT-VI:

Graph Theory Applications: Eulerian paths and circuits in graphs and digraphs, Hamiltonian paths and circuits in graphs, Planar graphs, dual of a planer graph, Euler's formula, chromatic number, statement of Four-color theorem.

TEXT BOOKS:

1. Topics in Algebra, I. N. Herstein, 2nd Edition, John Wiley and Sons, 1975.
2. Digital Logic & Computer Design, M. Morris Mano, 2nd Edition, Pearson, 2017.
3. Elements of Discrete Mathematics, C. L. Liu, 2nd Edition, McGraw Hill, New Delhi, 1985.
4. Graph Theory with Applications, J. A. Bondy and U. S. R. Murty, 2nd Edition, Macmillan Press, London, 1978.
5. Mathematical Logic for Computer Science, L. Zhongwan, 2nd Edition, World Scientific, Singapore, 1998.

REFERENCES:

1. Introduction to Linear Algebra. Gilbert Strang, 5th Edition, Wellesley, 2017.
2. Introductory Combinatorics, R. A. Brualdi, North-Holland, New York, 3rd Edition, Prentice Hall, 1998.
3. Graph Theory with Applications to Engineering and Computer Science, N. Deo, Prentice Hall, Englewood Cliffs, 1974.
4. Introduction to Mathematical Logic, (Second Edition), E. Mendelsohn, Van-Nostrand, London.

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B.Tech. I Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19BS1MT03) INTRODUCTORY TOPICS IN STATISTICS, PROBABILITY AND CALCULUS

COURSE PRE-REQUISITES: Permutations, Combinations and Basic Calculus

COURSE OBJECTIVES:
- To learn basic probability theory and statistical parameters
- To learn different types of probability distributions
- To learn basic objectives of statistic and classification of data
- To learn descriptive measures and frequency distributions
- To learn differential and integral calculus

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Compute expected values of discrete and continuous random variables
CO-2: Identify the suitable probability distribution to solve the problems
CO-3: Classify and analyze the given data through basic statistics
CO-4: Apply basic optimization techniques to the problems involving functions of two variables
CO-5: Calculate areas and volumes of solids by applying multiple integrals

UNIT-I:
Basic Probability& Mathematical Expectations: Concept of experiments, sample space, event, Definition of Combinatorial Probability. Conditional Probability, Baye's Theorem. Discrete and continuous random variables, Expected values and moments: mathematical expectation and its properties, Moments (including variance) and their properties, interpretation, Moment generating function.

UNIT-II:
Probability Distributions: Discrete distributions: Binomial, Poisson and Geometric distribution. Continuous distributions: Uniform, Exponential, Normal, Chi-square, t and F distributions

UNIT-III:
Introduction to Statistics: Definition of Statistics, Basic objectives, Applications in various branches of science with examples, Collection of Data: Internal and external data, Primary and secondary Data, Population and sample, Representative sample.

UNIT-IV:
Descriptive Statistics: Classification and tabulation of univariate data, graphical representation, Frequency curves.
Descriptive measures - central tendency and dispersion. Bivariate data. Summarization, marginal and conditional frequency distribution.

UNIT-V:
Differential Calculus: Limit of functions, continuity, derivatives, Taylor's and Maclaurin's series expansions, Partial derivatives, Maxima and minima of function of two variables.

UNIT-VI:

Integral Calculus: Length of a plane curve, Volume of solid of revolution, Area of surface of a solid of revolution (Cartesian form). Multiple Integrals- double integrals with constant and variable limits (Cartesian and polar form), change of order of integration (Cartesian form), triple integrals (Cartesian coordinates), applications of double and triple integrals: Area as double integration in Cartesian coordinates and Volume as a triple integration.

TEXT BOOKS:

1. Introduction of Probability Models, S. M. Ross, 11th Edition, Academic Press, N.Y., 2014.
2. Introduction to Probability and Statistics for Engineers and Scientists, Sheldon M. Ross, 4th Edition, Academic Press, 2009.
3. Fundamentals of Statistics, Vol. I & II, A. Goon, M. Gupta and B. Dasgupta, World Press, 2016.

REFERENCES:

1. Probability and Statistics for Engineers, I. R. Miller, J.E. Freund and R. Johnson, 4th Edition, PHI, 2011.
2. Introduction to the Theory of Statistics, A. M. Mood, F.A. Graybill and D.C. Boes, 3rd Edition, McGraw Hill Education, 2017.
3. Advanced Engineering Mathematics, Peter V. O'Neil, 7th Edition, Cengage learning, 2011.
4. Advanced Engineering Mathematics, M. D. Greenberg, 2nd Edition, Pearson Education, 2002.
5. Applied Mathematics, P. N. Wartikar and J. N. Wartikar, Vol. I & II, Vidyarthi Prakashan, 2010.

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B.Tech. I Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19BS1PH03) PHYSICS FOR COMPUTING SCIENCE

COURSE PRE-REQUISITES: 10+2 Physics

COURSE OBJECTIVES:
- To discuss the fundamentals of oscillatory systems
- To analyze various phenomena of light- Interference, Diffraction and Polarization.
- To explain the basic concepts in quantum physics, crystallography and semiconductors
- To apply the basic principles of LASER to various laser systems and optical fibers
- To state the laws of thermodynamics and their applications

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Describe the fundamentals of oscillatory systems
CO-2: Extend the importance of Interference in thin films, diffraction and Polarization
CO-3: Apply quantum mechanics to the behavior of a particle, to identify different types of crystals and importance of semiconductors
CO-4: Explain the lasing action of various laser sources and optical fiber materials
CO-5: Recall the importance of laws of thermodynamics and their applications

UNIT-I:
Oscillations: Periodic motion-simple harmonic motion-characteristics of simple harmonic motion-vibration of simple spring- mass system. Resonance-definition., damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators.

UNIT-II:
Wave Optics: Interference-principle of superposition-young's experiment, Temporal and Spatial Coherence, Theory of interference fringes-types of interference-Fresnel's prism-Newton's rings, Diffraction- Two kinds of diffraction-Difference between interference and diffraction-Fresnel's half period zone and zone plate-Fraunhofer diffraction at single slit-plane diffraction grating.
Polarization of Light: Polarization, Concept of production of polarized beam of light from two SHM acting at right angle; plane, elliptical and circularly polarized light, Brewster's law, double refraction.

UNIT-III:
Basic Idea of Electromagnetism: Continuity equation for current densities, Maxwell's equations in vacuum and non-conducting medium.

UNIT-IV:
Quantum Mechanics: Introduction - Planck's quantum theory- Matter waves, de-Broglie wavelength, Heisenberg's Uncertainty principle, time independent and time dependent Schrödinger's wave equation, Physical significance of wave function, Particle in a one dimensional potential box, Heisenberg Picture.

Semiconductor Physics: Basic concept of Band theory; conductor, semiconductor and Insulator.

UNIT-V:

Laser and Fiber Optics: Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: Ruby Laser, CO2 and Neodymium lasers; laser speckles, applications of lasers in engineering.

Fiber optics, Types of optical fibers and Applications,

UNIT-VI:

Crystallography: Basic terms-types of crystal systems, Bravais lattices, miller indices, d spacing, Atomic packing factor for SC, BCC, FCC and HCP structures.

Thermodynamics: Zeroth law of thermodynamics, first law of thermodynamics, brief discussion on application of 1st law, second law of thermodynamics and concept of Engine, entropy, change in entropy in reversible and irreversible processes.

TEXT BOOKS:

1. Physics, Vol. 2, Halliday, Rensick and Krane, 5th Edition, John Willey & Sons, 2014.
2. Engineering Physics, R. K. Gaur and S. L. Gupta, 8th Edition, Dhanpat Rai and Sons, 2011.
3. Introduction to Semiconductor Materials and Devices, M. S. Tyagi, 3rd Edition, Wiley India, 2014.

REFERENCES:

1. A Textbook of Engineering Physics, M. N. Avadhanulu and P. G. Kshirsagar, 4th Edition, S. Chand, 2014.
2. Optics, A. Ghatak, 2nd Edition, McGraw Hill Education, 2014.
3. Introduction to Solid State Physics, Charles Kittel, 8th Edition, John Wiley & Sons, 2014.
4. Engineering Physics, B. K. Pandey and S. Chaturvedi, 5th Edition, Cengage Learning, 2015.
5. Concepts of Modern Physics, Arthur Beiser, 6th Edition, McGraw Hill Inc, 2016.

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B.Tech. I Semester	**L**	**T/P/D**	**C**
	2	**1**	**3**

(19ES1CB01) FUNDAMENTALS OF COMPUTER SCIENCE

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To relate basics of programming language constructs and problem solving techniques
- To classify and implement control structures and derived data types
- To analyze and develop effective modular programming
- To construct mathematical problems and real time applications using C language

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand fundamentals of computers and Illustrate the flowchart, algorithm, pseudo code for a given problem, develop programs using various data types and operators

CO-2: Apply conditional and iterative statements for a given problem

CO-3: Exercise on programs using arrays, pointers, dynamic memory management, structures and unions

CO-4: Develop solution for a given problem using modular approach and perform file handling

UNIT-I:

General Problem Solving Concepts: Algorithm, and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops.

UNIT- II:

Imperative Languages: Introduction to imperative language; syntax and constructs of a specific language (ANSI C)Types Operator and Expressions with discussion of variable naming and Hungarian Notation: Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, proper variable naming and Hungarian Notation

UNIT-III:

Control Flow with Discussion on Structured and Unstructured Programming: Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, Goto Labels, structured and un- structured programming

UNIT-IV:

Functions and Program Structure with Discussion on Standard Library: Basics of functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialization, Recursion, Preprocessor, Standard Library Functions and return types

UNIT-V:

Pointers, Arrays and Structures: Pointers and address, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Multi-dimensional array and Row/column major formats, Initialization of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated. Basic Structures, Structures and Functions, Array of structures, Pointer of structures, Self-referral Structures, Table look up, typedef, Unions, Bit-fields

UNIT-VI:

Input and Output, Unix System Interface, Programming Method: Standard I/O, Formatted Output – printf, Formatted Input – scanf, Variable length argument list, file access including FILE structure, fopen, stdin, sdtout and stderr, Error Handling including exit, perror and error.h, Line I/O, related miscellaneous functions. File Descriptor, Low level I/O – read and write, Open, create, close and unlink, Random access – lseek, Discussions on Listing Directory, Storage allocator. Debugging, Macro, User Defined Header, User Defined Library Function, make file utility.

TEXT BOOKS:

1. The C Programming Language, B. W. Kernighan and D. M. Ritchi, Second Edition, PHI.
2. Programming in C, B. Gottfried, Second Edition, Schaum Outline Series.

REFERENCES:

1. C: The Complete Reference, Herbert Schildt, Fourth Edition, McGraw Hill.
2. Let Us C, Yashavant Kanetkar, BPB Publications.

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B.Tech. I Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19ES1EE03) PRINCIPLES OF ELECTRICAL ENGINEERING

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:
- To understand the basic concepts of electrical and magnetic circuits
- To understand the electromechanical energy conversion process in machines
- To identify the types of sensors and measure quantities in AC and DC systems
- To study various electrical installation components and safety measures

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the basic concepts and terminology of electrical quantities
CO-2: Analyze the DC circuit using various network theorems
CO-3: Analyze the electrical parameters of AC circuits with R-L-C elements
CO-4: Analyze the Static and dynamic characteristics of Electro-static and Electromagnetic fields
CO-5: Apply the concept of sensors in measurement of various electrical quantities and understand the electrical safety norms

UNIT-I:
Basic Circuit Concepts and Theorems: Concept of potential difference, voltage, current- Fundamental linear passive and active elements to their functional current-voltage relation, Terminology and symbols in order to describe electric networks, voltage source and current sources, ideal and practical sources, concept of dependent and independent source- Kirchhoff's laws- series and parallel connections- Network solutions using mesh and nodal analysis-star delta transformations- DC circuits: Thevinin's and Norton's theorems, Maximum power transfer theorem- Superposition theorem-Concept of work, power and energy

UNIT-II:
AC Circuit Analysis: Generation of Sinusoidal alternating currents- RMS and average values, form factor and peak factor-series RL, RC and RLC circuits, parallel RLC circuits-phasor representation in polar and rectangular form, concept of impedance, admittance - active, reactive and apparent powers, power factor- Three phase balanced circuits: Star and delta connections

UNIT-III:
Electrostatic and Electromagnetic Fields: Electrostatic Fields: electric field intensity and strength, absolute and relative permitivities, capacitors in series and parallel, energy stored in a capacitor, charging and discharging of capacitors
Electromagnetic Fields: Electricity and magnetism, magnetic field and Faraday's laws, self and mutual inductances, Ampere's law, magnetic circuit, magnetic materials and BH curve

UNIT-IV: Transformers and DC Machines:

Transformer: Single phase transformer principle, emf equation, Transformation ratio, KVA rating, Efficiency and regulation

DC Machines: Electromechanical energy conversion principle, DC generator construction, principle, emf generated, types, DC motor principle, back emf

UNIT-V:

Measurements and Transducers: Measurements and Transducers: Introduction to electrical measurements, types of instruments, indicating type instruments (MC and MI)(Elementary treatment only), integrating type instruments (Induction type Energy meter), (Elementary treatment only) , Measurement of voltage, current and power in DC and single phase AC circuits – Transducers: Piezoelectric and Thermo-couple related to electrical signals

UNIT-VI:

Electrical Wiring and Batteries: Basic layout of wiring in domestic installations, types of wiring Systems, wiring accessories,

Earthing: Need and types, safety devices) (Elementary treatment only)

Batteries: Principle, types, construction and applications

TEXT BOOKS:

1. Basic Electrical Engineering, D. C. Kulshreshtha, 2nd Edition, TMH, Revised 2019.
2. Basic of Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2011.
3. Electromagnetic Field Theory, K. A. Gangadhar, P. M. Ramanathan, Sixteenth Edition, Khanna Publishers, 2011.

REFERENCES:

1. Basic Electrical Engineering, V. K. Mehta, S. Chand and Company Ltd., New Delhi.
2. Circuits and Networks Analysis and Synthesis, A. Sudhakar, Shyammohan S. Palli, Tata McGraw Hill, 2010.
3. Engineering Electromagnetics, William H. Hayt, Jr. John A. Buck, 8th Revised Edition, McGraw Hill Higher Education, 2011.
4. Fundamentals of Electrical and Electronics Engineering, Smarjith Ghosh, Prentice Hall (India) Pvt. Ltd., 2010.
5. Basic Electrical Engineers, P. Ramana, M. Surya Kalavathi, G. T. Chandra Sekhar, S. Chand Technical Publications, 2018.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. I Semester	**L**	**T/P/D**	**C**
	0	**2**	**1**

(19BS2PH03) PHYSICS FOR COMPUTING SCIENCE LABORATORY

COURSE OBJECTIVES:

- To practically learn interaction of light with matter through physical phenomena like interference, diffraction and dispersion
- To understand the periodic motion and formation of standing waves and know the characteristics of the capacitors and resistors
- To study semiconductor devices
- To experience resonance phenomena
- To compare the experimental results with the class room learning

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Demonstrate the optical phenomena with formation of Newton Rings, pure spectrum through prism and to evaluate grating parameters
CO-2: Illustrate periodic motion by measuring rigidity modulus of a material and also discharging of a capacitor
CO-3: Asses the various characteristics semiconductor devices
CO-4: Realize tangent law of magnetism and resonance phenomenon in Melde's and Sonometer experiment
CO-5: Correlate the experimental results with the class room learning

LIST OF EXPERIMENTS:

1) Magnetic field along the axis of current carrying coil – Stewart and Gee
2) Determination of Hall coefficient of semi-conductor
3) Determination of Plank constant
4) Determination of wavelength of light by Laser diffraction method
5) Determination of wavelength of light by Newton's Ring method
6) Determination of laser and optical fiber parameters
7) Determination of Stefan's Constant.

TEXT BOOKS:

1. Beiser A., Concepts of Modern Physics, Fifth Edition, McGraw Hill International.
2. David Halliday, Robert Resnick, Jearl Walker, Fundamentals of Physics, Wiley Plus.

REFERENCES:

1. Ajoy Ghatak, Optics, Fifth Edition, Tata McGraw Hill.
2. Sears & Zemansky, University Physics, Addison-Wesley.
3. Jenkins and White, Fundamentals of Optics, Third Edition, McGraw-Hill.

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B.Tech. I Semester	**L**	**T/P/D**	**C**
	0	**2**	**1**

(19ES2CB01) FUNDAMENTALS OF COMPUTER SCIENCE LABORATORY

COURSE OBJECTIVES:

- To gain a working knowledge of C programming to write modular, efficient and readable C programs by Identifying the structural elements and layout of C source code
- To declare and manipulate single and multi-dimensional arrays of the C data types and derived data types like structures, unions
- To use functions from the portable C library and to describe the techniques for creating program modules using functions and recursive functions
- To manipulate character strings in C programs. Utilize pointers to efficiently solve problems

COURSE OUTCOMES: After the completion of the course, the student should be able to

CO-1: Use various data types for a specified problem
CO-2: Design, implement, debug a given problem using appropriate language constructs
CO-3: Implement programs using modular approach, file I/O
CO-4: Solve a given problem using C language

LIST OF EXPERIMENTS:

WEEK 1:
Algorithm and flowcharts of small problems like GCD
Structured code writing with:

WEEK 2:
Small but tricky codes

WEEK 3:
Proper parameter passing

WEEK 4:
Command line Arguments

WEEK 5:
Variable parameter

WEEK 6:
Pointer to functions

WEEK 7:
User defined header

WEEK 8:
Make file utility

WEEK 9:
Multi file program and user defined libraries

WEEK 10:
Interesting substring matching / searching programs

WEEK 11 & WEEK 12:
Parsing related assignments.

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B.Tech. I Semester	**L**	**T/P/D**	**C**
	0	**2**	**1**

(19ES2EE03) PRINCIPLES OF ELECTRICAL ENGINEERING LABORATORY

COURSE OBJECTIVES:

- To design electrical systems
- To analyze a given network by applying various network theorems
- To verify phase relationships in star and delta connected three phase networks
- To study various electrical measuring instruments and transducers

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the basic concepts and terminology of electrical quantities
CO-2: Analyze the DC circuit using various network theorems
CO-3: Analyze the electrical parameters of AC circuits with R-L-C elements
CO-4: Simulate the electrical circuits using suitable software

LIST OF EXPERIMENTS:

PART-A:

1. Demonstration of electrical elements and sources
2. Demonstration of measuring instruments
3. Demonstration of transducers

PART-B:

1. Measurement of electrical quantities in DC and AC circuits
2. Determination of resistance temperature coefficient
3. Verification of KVL and KCL
4. Verification of Thevenin's and Norton's theorems
5. Verification of superposition theorem
6. Verification of maximum power transfer theorem
7. Verification of relation between phase and line quantities in a 3-phase balanced star and delta connected systems
8. Simulation of series RLC circuit (XL>XC ,and XL< XC)
9. Simulation of time response of RC circuit
10. Load test on single phase transformer

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B.Tech. I Semester	**L**	**T/P/D**	**C**
	1	**2**	**2**

(19HS2EN02) BUSINESS COMMUNICATION AND VALUE SCIENCE - I

COURSE PRE-REQUISITES:

1. Basic communication in tenses (past, present, future)
2. Awareness of common words (adjectives used in daily verbal communication)
3. Basic idea of sentence formation and thereby paragraph building and writing
4. Communication according to daily and varied contextual scenarios
5. Basic communication model/channel (sender, receiver and feedback), Active and passive listening skills
6. Basic social etiquettes and knowledge of group work and communication that will enhance their professional growth

COURSE OBJECTIVES:

- To understand what life skills are and their importance in leading a happy and well-adjusted life
- To motivate students to look within and create a better version of self
- To introduce them to key concepts of values, life skills and business communication
- To enable them to practice basic communication

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Recognize the need for life skills and values
CO-2: Recognize own strengths and opportunities
CO-3: Apply the life skills to different situations
CO-4: Understand the basic tenets of communication
CO-5: Apply the basic communication practices in different types of communication

UNIT-I:

Overview of Leadership Oriented Learning:

i) Self Introduction
ii) Recognise the need of life Skills and Values
iii) Overview of Business Communication
iv) Identify Strengths and Opportunities- Idenity, body awareness
v) Stress- Management

UNIT-II:

Essential Grammar – I:

i) Parts of speech
ii) Tenses
iii) Sentence Formation (General & technical)
iv) Common errors
v) Voices

UNIT-III:

Overview of Communication Skills:

i) Importance of effective communication
ii) Types of communication- verbal and non - verbal

iii) Barriers of communication, effective communication
iv) Importance of Questioning
v) Listening Skills: Law of nature- Importance of listening skills, Difference between listening and hearing; Types of listening.

UNIT-IV:
Verbal Communication and Vocabulary Enrichment:
A. Vocabulary Enrichment:
i) Exposure to words from General Service List (GSL) by West,
ii) Academic word list (AWL) technical specific terms related to the field of technology, phrases, idioms,
iii) Significant abbreviations formal business vocabulary

B. Phonetics:
i) Pronunciation, Clarity of Speech
ii) Reduction of MTI in spoken English
iii) Importance of Questionin: Question formation with emphasis on common errors made during conversation.

UNIT-V:
Written Communication:
i) Letter Writing –Formal and Informal letter writing, Application letters, Job application letter
ii) Summary writing
iii) Story Writing
iv) Report writing
v) Building Curriculum Vitae.

UNIT-VI:
Realities of Facing Life:
i) Stress management Working with rthym and balance, Team work
ii) Need for Life skills and values, importance, Critical life skills
iii) Multiple Intelligences- Embracing diversity
iv) Values: Leadership, Teamwork, dealing with ambiguity, motivation, creativity, result orientation.

TEXT BOOKS:
There are no prescribed texts for semester I – there will be handouts and reference links shared.

REFERENCES:
1. Strategic Writing, Charles Marsh
2. The Seven Basic Plots, Christopher Booker
3. Business Communication, Saroj Hiremath
4. English vocabulary in Use, Alan McCarthy and O'Dell

WEB REFERENCES:
- **Train your mind to perform under pressure- Simon sinek**

https://curiosity.com/videos/simon-sinek-on-training-your-mind-to-perform-under-pressure-capture-your-flag/

- **Brilliant way one CEO rallied his team in the middle of layoffs**

https://www.inc.com/video/simon-sinek-explains-why-you-should-put-people-before-numbers.html

- **Will Smith's Top Ten rules for success**

https://www.youtube.com/watch?v=bBsT9omTeh0

Online Resources:

- https://www.coursera.org/learn/learning-how-to-learn
- https://www.coursera.org/specializations/effective-business-communication

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B.Tech. II Semester	**L**	**T/P/D**	**C**
	2	**1**	**3**

(19BS1MT06) LINEAR ALGEBRA

COURSE PREREQUISITES: Matrices, Determinants, Rank and Vectors

COURSE OBJECTIVES: To learn
- Concepts of Matrices, vectors and Linear combinations.
- Rank of a matrix, Echolen form and Augmented form of a matrix.
- Concepts of vector spaces such as independence, basis, dimensions and orthogonality.
- Eigen Values, Eigen Vectors and Singular Value Decomposition.

COURSE OUTCOMES: Student should be able to
CO-1: Analyze the methods and solve a simultaneous linear system of equations**.**
CO-2: Apply the Matrix tools in solving the linear system of equations.
CO-3: Understand the Rank, Basis and Matrix Invertibility theorems to describe matrices and subspaces.
CO-4: Use eigenvectors to represent a linear transformation of a matrices.
CO-5: Apply the knowledge of singular value decomposition in applications of image processing and machine learning.

UNIT-I:
Introduction to Matrices and Determinants; Solution of Linear Equations, Cramer's rule, Inverse of a Matrix.

UNIT-II:
Vectors and linear combinations, Rank of a matrix, Gaussian elimination, LU Decomposition.

UNIT-III:
Solving Systems of Linear Equations using the tools of Matrices.

UNIT-IV:
Vector space, Dimension, Basis, Orthogonality, Projections, Gram-Schmidt orthogonalization and QR decomposition.

UNIT-V:
Eigenvalues and Eigenvectors, Positive definite matrices, Linear transformations, Hermitian and unitary matrices.

UNIT-VI:
Singular value decomposition and Principal component analysis, Introduction to their applications in Image Processing and Machine Learning.

Note:
Assignments & tutorials covering the following: Vectors and linear combinations, Matrices, Linear transformations, Complete solution to Ax = b, Determinants, Eigen

values and Eigen vectors.

TEXT BOOKS:

1. Higher Engineering Mathematics, B. S. Grewal, 43rd Edition, Khanna, 2015.

REFERENCES:

1. Advanced Engineering Mathematics, Peter V. O'Neil, 7th Edition, Cengage, 2012.
2. Advanced Engineering Mathematics, Michael. D. Greenberg, 2nd Edition, Pearson, 2017.
3. Introduction to Linear Algebra, Gilbert Strang, 5th Edition, Wellesley, 2017.
4. Applied Mathematics, Vol. I & II, P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, 2010.
5. Digital Image Processing, R. C. Gonzalez and R. E. Woods, 4th Edition, Kluwer, 1997.

WEB SOURCE:

1. https://machinelearningmastery.com/introduction-matrices-machine-learning/

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B.Tech. II Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19BS1MT07) STATISTICAL MODELLING

COURSE OBJECTIVES: To learn
- Sampling techniques.
- Methods of calculating correlation and regression
- Various methods to test the hypothesis
- Basic concepts of Time series analysis.

COURSE OUTCOMES: Students will be able to
CO-1: Characterise the huge data using sampling techniques.
CO-2: Calculate correlation, regression, rank correlation coefficients.
CO-3: Apply the knowledge of different probability distributions to Test of Hypothesis.
CO-4: Use Least squares method to compute time series

UNIT-I:
Sampling Techniques: Random sampling. Sampling from finite and infinite populations. Estimates and standard error (sampling with replacement and sampling without replacement), Sampling distribution of sample mean, stratified random sampling.

UNIT-II:
Linear Statistical Models: Simple line a regression & correlation, multiple regression & multiple correlation, Analysis of variance (one way, two way with as well as without interaction)

UNIT-III:
Estimation: Point estimation, criteria for good estimates (un-biasedness, consistency), Methods of estimation including maximum likelihood estimation.
Sufficient Statistic: Concept & examples, complete sufficiency, their application in estimation

UNIT-IV:
Test of hypothesis: Concept & formulation, Type I and Type II errors, Neyman Pearson lemma, Procedures of testing

UNIT-V:
Non-parametric Inference: Comparison with parametric inference, Use of order statistics. Sign test, Wilcoxon signed rank test, Mann-Whitney test, Run test, Kolmogorov-Smirnov test. Spearman's and Kendall's test. Tolerance region

UNIT-VI:
Basics of Time Series Analysis & Forecasting:
Stationary, ARIMA Models: Identification, Estimation and Forecasting.

TEXTBOOKS:

1. Probability and Statistics for Engineers, I. R. Miller, J. E. Freund and R. Johnson, 8th Edition, Pearson Publication, 2015
2. Probability and Statistics for Engineers and Scientists, Sheldon M. Ross, 4th Edition, Academic Press, 2009
3. The Analysis of Time Series: An Introduction, Chris Chatfield, 5th Edition, Chapman & Hall, 1996

REFERENCES:

1. Introduction to Linear Regression Analysis, D. C. Montgomery and E. Peck, 5th Edition, John Wiley & Sons, 2012
2. Introduction to the Theory of Statistics, A. M. Mood, F. A. Graybill & D. C. Boes, 3rd Edition, McGraw Hill, 1974

Applied Regression Analysis, N. Draper & H. Smith, 3rd Edition, John Wiley & Sons, 1998

DATA SOURCE:

- www.rbi.org.in

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B.Tech. II Semester	**L**	**T/P/D**	**C**
	2	**1**	**3**

(19ES1CB02) DATA STRUCTURES AND ALGORITHMS

COURSE PRE-REQUISITES: C Language

COURSE OBJECTIVES:
- To impart the basic concepts of data structures and algorithms
- To introduce various searching and sorting techniques
- To demonstrate operations of linear and non-linear data structure
- To develop an application using suitable data structure

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Analyze basic concepts of data structures, computation complexity
CO-2: Understand linear data structures, various sorting, searching techniques
CO-3: Apply various operations on linear and non-linear data structures
CO-4: Identify appropriate and efficient data structure to implement a given problem

UNIT-I:
Basic Terminologies & Introduction to Algorithm and Data Organization: Algorithm specification, Recursion, Performance analysis, Asymptotic Notation - The Big-O, Omega and Theta notation, Programming style, refinement of coding-time-Space trade off, testing, data abstraction

UNIT-II:
Linear Data Structure: Array, Stack, Queue, Linked-list and its types, Various Representations, Operations & Applications of Linear Data Structures

UNIT-III:
Non-linear Data Structure: Trees (Binary Tree, Threaded Binary Tree, Binary Search Tree, B& B+ Tree, AVL Tree, Splay Tree)

UNIT-IV:
Non-linear Data Structure: Graphs (Directed, Undirected), Various Representations, Operations (search and traversal algorithms and complexity analysis) & Applications of Non- Linear Data structures.

UNIT-V:
Searching and Sorting on Various Data Structures: Sequential Search, Binary Search, Breadth First Search, Depth First Search, Insertion Sort, Selection Sort, Shell Sort, Divide and Conquer Sort, Merge Sort, Quick Sort, Heap Sort, Introduction to Hashing

UNIT-VI:
File: Organization (Sequential, Direct, Indexed Sequential, Hashed) and various types of accessing schemes.

TEXT BOOKS:

1. Fundamentals of Data Structures, E. Horowitz and S. Sahni, 1977.
2. Data Structures and Algorithms, Alfred V. Aho, John E. Hopperoft, Jeffrey D. Ullman.

REFERENCES:

1. The Art of Computer Programming: Volume 1: Fundamental Algorithms, Donald E. Knuth
2. Introduction to Algorithms, Thomas, H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein.
3. Open Data Structures: An Introduction (Open Paths to Enriched Learning), 31st Edition, Pat Morin.

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B.Tech. II Semester	**L**	**T/P/D**	**C**
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(19ES1EC01) PRINCIPLES OF ELECTRONICS ENGINEERING

COURSE PRE-REQUISITE: Fundamentals of Physics

COURSE OBJECTIVES:

- To understand the principle of operation and characteristics of various semiconductor devices
- To study the applications of various semiconductor devices
- To understand the concepts of feedback in amplifiers
- To know about analog and digital IC's

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Explain the principles of operation and substantiate the applications of various semiconductor devices

CO-2: Understand the effect of feedback in amplifiers

CO-3: Apply the knowledge of analog IC's

CO-4: Use several digital IC's in various applications

UNIT-I:

Semiconductors: Crystalline material: Mechanical properties, Energy band theory, Fermi levels; Conductors, Semiconductors & Insulators: electrical properties, band diagrams; Semiconductors: intrinsic & extrinsic, energy band diagram, P and N-type semiconductors, drift & diffusion currents.

UNIT-II:

Diodes and Diode Circuits: Formation of P-N junction, energy band diagram, formation of depletion zone, built-in-potential, forward and reverse biased P-N junction, V-I characteristics, Linear piecewise model, Junction capacitance, Zener breakdown, Avalanche breakdown, Zener diode and its reverse characteristics. Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, regulation.

UNIT-III:

Bipolar Junction Transistors: Formation of PNP / NPN junctions; transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off, active and saturation mode, transistor action, injection efficiency, base transport factor and current amplification factors; Biasing and Bias stability: calculation of stability factor.

UNIT-IV:

Field Effect Transistors: Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET structure and characteristics, MOSFET structure and characteristics, depletion and enhancement type; CS, CG, CD configurations; CMOS: Basic Principles.

UNIT-V:

Feed Back Amplifier, and Operational Amplifiers: Feed Back Amplifier : Concept of feedback, Block diagram, feedback factor, open loop gain, loop gain, properties, positive and negative feedback, topologies of feedback amplifier, effect of feedback on gain, output impedance, input impedance, sensitivities (qualitative), bandwidth stability

Operational Amplifiers: Introduction to integrated circuits, operational amplifier and its terminal properties; Application of operational amplifier; Inverting and non-inverting mode of operation, Adders, Subtractors, Constant-gain multiplier, Voltage follower, Comparator, Integrator, Differentiator.

UNIT-VI:

Digital Electronics Fundamentals: Difference between analog and digital signals, Boolean algebra, Basic and Universal Gates, Symbols, Truth tables, logic expressions, Logic simplification using K- map, Logic ICs, half and full adder/subtractor, multiplexers, de-multiplexers, flip-flops, shift registers, counters.

TEXT BOOKS:

1. Millman's Integrated Electronics, Jacob Millman, Christos Halkias, Chetan Parikh, 2nd Edition, TMH, 2010.
2. Op-Amps and Linear ICs, Ramakanth A. Gayakwad, 4th Edition, PHI, 2016.
3. Digital Logic & Computer Design, M. Morris Mano, 4th Edition, PHI, 2016.

REFERENCES:

1. Electronic Devices and Circuit Theory, Robert L. Boylestad, Louis Nashelsky, 11th Edition, Pearson Publishers, 2015.
2. Solid State Electronic Devices, Ben Streetman, Sanjay Banerjee, 7th Edition, PHI, 2016.
3. Electronic Principle, Albert Paul Malvino, 3rd Edition, TMH, 2010.
4. Microelectronics, Jacob Millman, Arvin Grabel, 2nd Edition, TMH, 2000.
5. Electronics Devices and Circuits, S. Salivahanan, N. Suresh Kumar, A.Vallavaraj, 2nd Edition, TMH, 2011.

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B.Tech. II Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19HS1MG01) FUNDAMENTALS OF ECONOMICS

COURSE OBJECTIVES:

- To provide a unifying theme of managerial decision making around the theory of firm by introducing tools such as demand and supply analysis and to analyze consumer behavior w.r.t, select, buy, use and dispose goods, services and ideas based on the effects of price change, income change and substitutions.
- To get acquainted with various production theories, various costs and their role in cost minimization and various market structures such as perfect and imperfect competition.
- To gain knowledge on important elements of Nation's economic environment (National Income, National Product, Exports, Imports, Taxes, Subsidies, etc.), to evaluate economic models describing the demand and supply of money and to measure policies and paradigms which are influencing business cycle and stabilization

COURSE OUTCOMES: After completion of this course, the student should be able to :
CO-1: Explain the theory of the firm and various micro-economics tools such as demand, supply and consumer analysis that would help in forward planning and decision making.
CO-2: Summarize production theories, factors of production, various costs and revenue concepts and to apply the above conceptual knowledge to the various market structures under perfect and imperfect competition.
CO-3: Classify the components of National income with the help of income determination tools.
CO-4: Examine the policies and procedures of Government and external sectors of imports and exports in monitory operations by considering demand and supply of money.
CO-5: Compare the existing business cycles and its stabilization considering monetary policies & paradigms which are influencing price-wage rigidities and unemployment.

UNIT-I:
Principles of Demand and Supply — Supply Curves of Firms — Elasticity of Supply; Demand Curves of Households — Elasticity of Demand; Equilibrium and Comparative Statics (Shift of a Curve and Movement along the Curve); Welfare Analysis — Consumers' and Producers' Surplus — Price Ceilings and Price Floors

UNIT-II:
Consumer Behaviour — Axioms of Choice - Budget Constraints and Indifference Curves; Consumer's Equilibrium — Effects of a Price Change, Income and Substitution Effects —Derivation of a Demand Curve; Applications — Tax and Subsidies — Intertemporal Consumption — Suppliers' Income Effect

UNIT-IIII:
Theory of Production - Production Function and Iso-quants — Cost Minimization; Cost Curves — Total, Average and Marginal Costs — Long Run and Short Run Costs; Equilibrium of a Firm Under Perfect Competition; Monopoly and Monopolistic Competition

UNIT-IV:
National Income and its Components — GNP, NNP, GDP, NDP; Consumption Function; Investment; Simple Keynesian Model of Income Determination and the Keynesian Multiplier

UNIT-V:
Government Sector — Taxes and Subsidies; External Sector — Exports and Imports; Money — Definitions; Demand for Money —Transactionary and Speculative Demand; Supply of Money — Bank's Credit Creation Multiplier; Integrating Money and Commodity Markets — IS, LM Model

UNIT-VI:
Business Cycles and Stabilization — Monetary and Fiscal Policy — Central Bank and the Government; *The Classical Paradigm* — Price and Wage Rigidities — Voluntary and Involuntary Unemployment

TEXT BOOKS:
1. Microeconomics, Pindyck, Robert S., and Daniel L. Rubinfeld, 8th Edition, Pearson Education, 2017.
2. Macroeconomics, Dornbusch, Fischer and Startz, 13th Edition, McGraw-Hill, 2018.
3. Economics, Paul Anthony Samuelson, William D. Nordhaus, 19th Edition, McGraw-Hill, 2012.

REFERENCES:
1. Intermediate Microeconomics: A Modern Approach, Hal R. Varian, 9th Edition, Springer, 2014.
2. Principles of Macroeconomics, N. Gregory Mankiw, 7th Edition, Cengage India, 2012.

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B.Tech. II Semester	**L**	**T/P/D**	**C**
	0	**2**	**1**

(19BS2MT01) STATISTICAL MODELLING LABORATORY

COURSE OBJECTIVES: The objective(s) of this course is to,

- Explore various stages of data analytics life cycle and Tools used in data analytics.
- Understand the programming in R.
- Use various data analysis models like regression modelling
- Analyze the usage and importance of statistical methods in building computer applications.

COURSE OUTCOMES: After completion of the course, the student should be able to :

CO-1: Understand the importance of data analytics in real life through life cycle and explore the features of R and R Studio environment.

CO-2: Explore the data types and programming constructs of R with examples.

CO-3: Apply and use various statistical methods in building computer applications.

CO-4: Analyze the data using data models construction and using data mining techniques.

R statistical programming language: Introduction to R, Functions, Control flow and Loops, Working with Vectors and Matrices, Reading in Data, Writing Data, Working with Data, Manipulating Data, Simulation, Linear model, Data Frame, Graphics in R

LIST OF EXPERIMENTS:

1. Exploring R, R-Studio Environment and Installation process. Explore the features
2. Explore the data types of R and demonstrate the basic operations on datatypes.
3. Create vectors and matrices
4. Explore the control structures of R and demonstrate with one example under eachcase.
5. Create R functions and use them with simple scripts.
6. Explore Data Analytics Life Cycle.
7. Importing & exporting the data from i) CSV file ii) ExcelFile
8. Data Visualization through i) Histogram ii) Pie Chart iii)BoxPlot iv) DensityPlots
9. Demonstrate simple linear regression analysis. Analyze results in detail.
10. Demonstrate multiple regression model. Analyze results in detail.
11. Demonstrate Logistic regression model. Analyze results in detail.
12. Demonstrate other regression model. Analyze results in detail.

TEXT BOOKS:

1. R for Beginners, Sandip Rakshit, McGraw Hill Education, 1st Edition, 2017
2. R-The Statistical Programming Language, Mark Gardener, Wiley India Pvt. Ltd., 2017

REFERENCES:

1. R Programming, A. K. Verma, 1st Edition, Cengage Learning, 2017
2. Hands-on Programming with R, Garrett Grolemund, O'Reilly Media, 2014
3. R for Everyone: Advanced Analytics and Graphics, Jared P. Lander, 2nd Edition, Addison Wesley, 2014

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B.Tech. II Semester	**L**	**T/P/D**	**C**
	0	**2**	**1**

(19ES2CB02) DATA STRUCTURES AND ALGORITHMS LABORATORY

COURSE OBJECTIVES:
- To impart the basic concepts of data structures and algorithms
- To learn the concepts about searching and sorting
- To understand the basic concepts about stacks, queues, lists
- To know the concepts of trees and graphs

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Implement all operations on different linear data structures
CO-2: Develop all operations on different Non- linear data structures
CO-3: Apply various searching and sorting techniques
CO-4: Use appropriate data structure for any given problem

LIST OF EXPERIMENTS:

WEEK 1:
Towers of Hanoi using user defined stacks.

WEEK 2, 3 & 4:
Reading, writing, and addition of polynomials.

WEEK 5 & 6:
Line editors with line count, word count showing on the screen.

WEEK 7 & 8:
Trees with all operations.

WEEK 9 & 10:
All graph algorithms.

WEEK 11 & 12:
Saving / retrieving non-linear data structure in/from a file.

TEXTBOOKS:

1. Fundamentals of Data Structures, E. Horowitz and S. Sahni, 1977.
2. Data Structures and Algorithms, Alfred V. Aho, John E. Hopperoft, Jeffrey D. Ullman.

REFERENCES:

1. The Art of Computer Programming: Volume 1: Fundamental Algorithms, Donald E. Knuth
2. Introduction to Algorithms, Thomas, H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein.
3. Open Data Structures: An Introduction (Open Paths to Enriched Learning), 31st Edition, Pat Morin.

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B.Tech. II Semester	**L**	**T/P/D**	**C**
	0	**2**	**1**

(19ES2EC01) PRINCIPLES OF ELECTRONICS ENGINEERING LABORATORY

COURSE OBJECTIVES:

- To know the characteristics of various semiconductor devices
- To verify the functionality and applications of analog IC's
- To verify the functionality of digital IC's

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Analyze the characteristics of various semiconductor devices
CO-2: Apply the knowledge of semiconductors
CO-3: Understand the functionality of analog and digital IC's

LIST OF EXPERIMENTS:

Simulation of any 3 or 4 experiments using open source software

1. Forward and Reverse Bias V-I characteristics of PN junction Diode.
2. V-I characteristics of Zener diode.
3. Full wave rectifier.
4. Characteristics of a BJT under CB configuration.
5. Characteristics of a BJT under CE configuration.
6. JFET characteristics under CS configuration.
7. MOSFET characteristics under CS configuration.
8. Inverting and Non-Inverting amplifiers using IC 741 Op-Amp.
9. Adder, subtractor and comparator using IC 741 Op-Amp.
10. Integrator and Differentiator using IC 741 Op-Amp.
11. Truth table verification of Logic gates.
12. Truth table verification of Half-Adder and Full Adder.
13. Truth table verification of Multiplexer and De-multiplexer

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B.Tech. II Semester	**L**	**T/P/D**	**C**
	1	**2**	**2**

(19HS2EN03) BUSINESS COMMUNICATION AND VALUE SCIENCE – II

NATURE OF COURSE: Behavioral

COURSE PRE-REQUISITES: Basic Knowledge of English (verbal and written), Completion of all units from Semester 1

COURSE OBJECTIVES:

- Develop effective writing, reading, presentation and group discussion skills
- Help students identify personality traits and evolve as a better team player
- Introduce them to key concepts of Morality, Behavior and beliefs, Diversity & Inclusion

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Use tools of structured written communication and electronic/social media to share concepts and ideas

CO-2: Understand the basics of presentation and apply effective techniques to make presentations

CO-3: Understand and apply the basic concept of speed reading, skimming and scanning

CO-4: Identify individual personality types and role in a team and recognize the concepts of outward behavior and internal behavior

CO-5: Understand the basic concepts of Morality and Diversity

UNIT – I:

Team Building:

I. Introduction of Dr. Meredith Belbin and his research on team work
II. Belbin's 8 Team Roles
III. Lindgren's Big 5 personality traits
IV. Team Falcon Practical to identify individual personality traits with Belbin's 8 team player styles
V. Build a team for NGO

UNIT – II:

Essential Grammar and Reading Skills:

I. Good and Bad Writing -Discussion
II. Common errors, Punctuation rules
III. Lucid writing – writing techniques
IV. Speed Reading
V. Skimming and Scanning

UNIT – III:

Presentation and Social Media Skills-1:

I. Prepared Presentation
II. Design a street play and promote the play through social media
III. Prepare and Publish E-magazine
IV. Use electronic / social media to launch the E-magazine
V. Capture the reviews and likes

UNIT – IV:

Branding & Satori:

I. Importance of Branding
II. Types of Branding
III. Digital branding
IV. Sharing the learning with peers (Satori)
V. Branding: NGO and E-Magazine.

UNIT – V:

Diversity:

I. Diversity & Inclusion
II. Different forms of diversity in our society
III. Ethics, Morality and respect for Individual – Diversity
IV. Challenges faced by members of diverse group
V. Interviews of people from diverse groups.

UNIT -VI:

Creation of an organization - Mock NGO:

I. Three A's – Aware , Articulate and Amplify
II. Individual identification of Social Issues
III. Materials to create an identity of an organization –Vision, Mission, Values,
IV. Research on the Social cause and generate a Importance of Integrity, Responsibility, Excellence, Unity & Pioneering
V. Report writing

TEXT BOOKS:

There are no prescribed texts for semester II – there will be handouts and reference links shared.

REFERENCES:

1. Guiding Souls : Dialogues on the purpose of life; Dr. A.P.J Abdul Kalam, 2005; Co-author--Arun Tiwari
2. The Family and the Nation; Dr. A.P.J Abdul Kalam, 2015; Co- author: Acharya Mahapragya
3. The Scientific India: A twenty First Century Guide to the World around Us; Dr. A.P.J Abdul Kalam, 2011; Co-author- Y.S.Rajan
4. Forge Your Future: Candid, Forthright, Inspiring ; Dr. A.P.J Abdul Kalam, 2014

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B.Tech. II Semester	**L**	**T/P/D**	**C**
	0	**2**	**0**

(19MN6HS02) ENVIRONMENTAL SCIENCE

COURSE PRE-REQUISITES: Basic knowledge of environmental issues

COURSE DESCRIPTION:
Environmental science is the study of patterns and processes in the natural world and their modification by human activity. We as human beings are not an entity, separate from the environment around us, rather we are a constituent seamlessly integrated and co-exist with the environment around us. To understand current environmental problems, we need to consider physical, biological and chemical processes that are often the basis of those problems. The course requires the students to identify and analyse natural and human-made environmental problems, evaluate the relative risks associated with these problems, and examine alternative solutions for resolving or preventing them. This course will survey some of the many environmental science topics at an introductory level, ultimately considering the sustainability of human activities on the planet. We are not an entity so separate from the environment that we can think of mastering and controlling it rather we must understand that each and every action of ours reflects on the environment and vice versa.

COURSE OBJECTIVES:
- To recognize the impacts of human interventions towards environment
- To list out the benefits in creating a sustainable environment
- To sketch out various activities in achieving a cleaner environment
- To emphasize the role of an individual for a better planet to live

COURSE OUTCOMES:
CO-1: Gain a variety of experiences & acquire a basic knowledge about the environment & its allied problems
CO-2: Interpret the key components in safe guarding the environment
CO-3: Appraise the quality of environment in order to create a healthy atmosphere
CO-4: Familiarize with the individual responsibilities towards green revolution

MODULE 1: INTRODUCTION
Environmental Science: Introduction, Definition, scope and importance.

MODULE 2: AWARENESS ACTIVITIES
Small group meetings about:
- Water management
- Projects Vs Environment
- Generation of less waste
- Promotion of recycle use
- Impact of Science & Technology on Environment
- Avoiding electronic waste

MODULE 3: SLOGAN AND POSTER MAKING EVENT
- Food waste management
- Rain water harvesting

- Climate change
- Green Power
- Water conservation
- Green at work
- Role of IT in environment and human health
- Sustainable development

MODULE 4: EXPERT LECTURES ON ENVIRONMENTAL SCIENCE

- Environmental Impact Assessment
- Industrial waste treatment
- Organic farming/Vertical gardens/Hydroponics

MODULE 5: CLEANLINESS DRIVE

- Indoor air pollution
- Vehicular pollution
- Visual pollution
- Waste management at home
- Composting
- Plastic recycling

MODULE 6: CASE STUDIES

- HPCL disaster in Vizag
- Oleum gas leak in Delhi
- Mathura Refinery & Taj Mahal
- Conservation of Hussain Sagar lake
- The Cleanliest city of India-Surat
- Green Buildings in India
- KBR park in Hyderabad (Environmental protection Vs Development)
- Fluorosis
- Ecotourism & its impacts

TEXT BOOKS:

1. Environmental Studies for UG Courses, Erach Bharucha, UGC Publications, Delhi, 2004.
2. Textbook of Environmental Studies, Deeksha Dave, S. S. Katewa, Cengage Delmar Learning India Pvt., 2012.

REFERENCES:

1. Introduction to Environmental Science, Y. Anjaneyulu, BS Publications, 2004.
2. Environmental Studies, Anubha Kaushik & C. P. Kaushik, 4th Edition, New Age International Publishers.

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B.Tech. III Semester	**L**	**T/P/D**	**C**
	2	**1**	**3**

(19PC1CB01) FORMAL LANGUAGE AND AUTOMATA THEORY

COURSE OBJECTIVES:

- To discuss the relationships between languages and machines such as FA, PDA, LBA and TM
- To identify a language's location in the Chomsky hierarchy (regular sets, context-free, context-sensitive, and recursively enumerable languages)
- To convert among equivalently powerful notations for a language, including among DFAs, NFAs, and regular expressions, and between PDAs and CFGs
- To build the foundation for students to pursue research in the areas of automata theory, formal languages, compiler design and computational power of machines

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: List computational devices according to their computational power, and tools which will allow us to tell if a device is powerful enough to solve a given computational problem

CO-2: Relate the concept of the grammar with the concept of programming language

CO-3: Design Solutions for problems related to Finite Automata, RE, CFG, PDA and Turing Machine

CO-4: Analyze various problems and categorize them into P, NP, NP- Complete and NP-Hard problems

UNIT – I:

Introduction: Alphabet, languages and Chomsky hierarchy of languages, deterministic finite automata (DFA), nondeterministic finite automata (NFA) and equivalence with DFA, Myhill-Nerode theorem and its uses, minimization of finite automata.

UNIT – II:

Regular languages and finite automata: Regular expressions, deterministic finite automata (DFA) and equivalence with regular expressions, grammars, productions and derivation, and languages, regular grammars and equivalence with finite automata, properties of regular languages, Kleene's theorem, pumping lemma for regular languages.

UNIT – III:

Context-free languages and pushdown automata: Context-free grammars (CFG) and languages (CFL), Chomsky and Greibachnormal forms, deterministic push down automata, nondeterministic pushdown automata (PDA) and equivalence with CFG, pumping lemma for context-free languages, closure properties of CFLs. Context-sensitive languages:Context-sensitive grammars (CSG) and languages, linear bounded automata andequivalence with CSG.

UNIT – IV:

Turing machines: The basic model for Turing machines (TM), Turingrecognizable (recursively enumerable) and Turing-decidable (recursive) languages and theirclosure properties, variants of Turing machines, nondeterministic TMs and

equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMsas enumerators.

UNIT – V:

Undecidability: Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice s theorem, undecidable problems about languages.

UNIT – VI:

Basic Introduction to Complexity: Introductory ideas on Time complexity of deterministic and nondeterministic Turing machines, P and NP, NP- completeness, Cook's Theorem, other NP -Complete problems.

TEXT BOOKS:

1. Introduction to Automata Theory, Languages, and Computation John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman

REFERENCES:

1. Elements of the Theory of Computation, Harry R. Lewis and Christos H. Papadimitriou
2. Automata and Computability, Dexter C. Kozen
3. Introduction to the Theory of Computation, Michael Sipser
4. Introduction to Languages and the Theory of Computation, John Martin
5. Computers and Intractability: A Guide to the Theory of NP Completeness, M. R. Garey and D. S. Johnson

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B.Tech. III Semester	**L**	**T/P/D**	**C**
	3	**1**	**4**

(19PC1CB02) COMPUTER ORGANIZATION AND ARCHITECHTURE

COURSE OBJECTIVES:

- To describe the functional blocks of a computer to interpret the instructions and various addressing modes for the execution of instruction cycle
- To perform Arithmetic micro operations on integers and Floating point numbers
- To analyze the cost performance and design trade-offs in designing and constructing a computer processor including memory
- To discuss the different ways of communicating with I/O devices & interfaces and the design techniques to enhance the performance using pipelining, parallelism

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Interpret the functional architecture of computing systems
CO-2: Explore memory, control and I/O functions
CO-3: Impart the knowledge on micro programming
CO-4: Analyze instruction level parallelism, Concepts of advanced pipeline techniques

UNIT – I:
Revision of basics in Boolean logic and Combinational/Sequential Circuits
Functional blocks of a computer: CPU, memory, input-output subsystems, control unit.
Instruction set architecture of a CPU: Registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Outlining instruction sets of some common CPUs.

UNIT – II:
Data representation: Signed number representation, fixed and floating point representations, character representation.
Computer arithmetic: Integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and-add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic, IEEE 754 format.

UNIT – III:
Introduction to x86 architecture.
CPU control unit design: Hardwired and micro-programmed design approaches, design of a simple hypothetical CPU.

UNIT – IV:
Memory system design: Semiconductor memory technologies, memory organization. Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCII, USB

UNIT – V:
Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.

Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.

UNIT – VI:

Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

TEXT BOOKS:

1. Computer System Architecture M. M. Mano, 3rd Edition, Prentice Hall of India, New Delhi, 1993
2. Computer Organization and Design: The Hardware/Software Interface, David A. Patterson and John L. Hennessy
3. Computer Organization and Embedded Systems, Carl Hamacher

REFERENCES:

1. Computer Architecture and Organization, John P. Hayes
2. Computer Organization and Architecture: Designing for Performance, William Stallings
3. Computer System Design and Architecture, Vincent P. Heuring and Harry F. Jordan

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B.Tech. III Semester	**L**	**T/P/D**	**C**
	2	**1**	**3**

(19PC1CB03) OBJECT ORIENTED PROGRAMMING

COURSE OBJECTIVES:

- To understand the basics concepts of OOPs and features of C++
- To understand the creation and memory allocation of objects and concept of friend
- To understand the advanced concepts like inheritance, polymorphism, and exception handling
- To understand the Object-Oriented Analysis and Design tools for developing models

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply the object-oriented concepts for solving real time problems
CO-2: Create generic solutions for the given problem
CO-3: Understand how to apply the major object-oriented concepts like encapsulation, inheritance and polymorphism to implement programs in C++
CO-4: Design models by using oops concepts

UNIT – I:
Procedural programming, An Overview of C: Types Operator and Expressions, Scope and Lifetime, Constants, Pointers, Arrays, and References, Control Flow, Functions and Program Structure, Namespaces, error handling, Input and Output (C-way), Library Functions (string, math, stdlib), Command line arguments, Pre-processor directive
Some difference between C and C++: Single line comments, Local variable declaration within function scope, function declaration, function overloading, stronger type checking, Reference variable.

UNIT – II:
Parameter passing – value vs reference, passing pointer by value or reference, #define constant vs const, Operator new and delete, the typecasting operator, Inline Functions in contrast to macro, default arguments
The Fundamentals of Object Oriented Programming: Necessity for OOP, Data Hiding, Data Abstraction, Encapsulation, Procedural Abstraction, Class and Object.

UNIT – III:
More extensions to C in C++ to provide OOP Facilities: Scope of Class and Scope Resolution Operator, Member Function of a Class, private, protected and public Access Specifier, this Keyword, Constructors and Destructors, friend class, error handling (exception)

UNIT – IV:
Essentials of Object Oriented Programming: Operator overloading, Inheritance – Single and Multiple, Class Hierarchy, Pointers to Objects, Assignment of an Object to another Object, Polymorphism through dynamic binding, Virtual Functions, Overloading, overriding and hiding, Error Handling

UNIT – V:

Generic Programming: Template concept, class template, function template, template specialization

Input and Output: Streams, Files, Library functions, formatted output

UNIT – VI:

Object Oriented Design and Modelling: UML concept, Use case for requirement capturing, Class diagram, Activity diagram and Sequence Diagram for design, Corresponding C++ code from design

TEXT BOOKS:

1. The C++ Programming Language, Bjarne Stroustrup, Addison Wesley
2. C++ and Object-Oriented Programming Paradigm, Debasish Jana, PHI Learning Pvt. Ltd

REFERENCES:

1. Programming – Principles and Practice Using C++, Bjarne Stroustrup, Addison Wesley
2. The Design and Evolution of C++, BjarneStroustrup, Addison Wesley

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B.Tech. III Semester	**L**	**T/P/D**	**C**
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(19PC1CB04) COMPUTATIONAL STATISTICS

COURSE OBJECTIVES: To learn
- Multidimensional generalization of a univariate normal random variable.
- Concept of multivariable linear regression model
- linear discriminant function analysis
- Data Summarization and data reduction using Factor analysis
- Grouping the data using Cluster analysis

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Model the linear relationship between the explanatory (independent) variables and response (dependent) variables
CO-2: Make better decisions using linear regression techniques
CO-3: Develop discriminant functions that will discriminate between the categories of the dependent variable in a perfect manner
CO-4: Reduce a large number of variables into fewer numbers of factors using factor analysis

UNIT – I:
Multivariate Normal Distribution: Multivariate Normal Distribution Functions, Conditional Distribution and its relation to regression model, Estimation of parameters.

UNIT – II:
Multiple Linear Regression Model: Standard multiple regression models with emphasis on detection of collinearity, outliers, non-normality and autocorrelation, Validation of model assumptions.

UNIT – III:
Multivariate Regression: Assumptions of Multivariate Regression Models, Parameter estimation, Multivariate Analysis of variance and covariance

UNIT – IV:
Discriminant Analysis: Statistical background, linear discriminant function analysis, Estimating linear discriminant functions and their properties.
Principal Component Analysis: Principal components, Algorithm for conducting principal component analysis, deciding on how many principal components to retain, H-plot.

UNIT – V:
Factor Analysis: Factor analysis model, Extracting common factors, determining number of factors, Transformation of factor analysis solutions, Factor scores.

UNIT – VI:
Cluster Analysis: Introduction, Types of clustering, Correlations and distances, clustering by partitioning methods, hierarchical clustering, overlapping clustering, K-Means Clustering-Profiling and Interpreting Clusters.

TEXT BOOKS:
1. An Introduction to Multivariate Statistical Analysis, T.W. Anderson

2. Applied Multivariate Data Analysis, Vol I & II, J.D. Jobson
3. Statistical Tests for Multivariate Analysis, H. Kris

REFERENCES:

1. Regression Diagnostics, Identifying Influential Data and Sources of Collinearety, D.A. Belsey, E. Kuh and R.E. Welsch
2. Applied Linear Regression Models, J. Neter, W. Wasserman and M.H. Kutner
3. Python for Data Analysis, Wes Mc Kinney
4. Applied Linear Regression Models, J. Neter, W. Wasserman and M.H. Kutner
5. Introduction to Linear Regression Analysis, D.C. Montgomery and E.A. Peck

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B.Tech. III Semester	**L**	**T/P/D**	**C**
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(19PC1CB05) SOFTWARE ENGINEERING

COURSE OBJECTIVES:

- To identify the software development activities and process models
- To understand the importance of Project planning and management
- To explore various metrics and quality assurance strategies
- To analyze different strategies for testing and risk management

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Analyse software engineering framework activities and process models that can be tailored with appropriate methods for developing the projects

CO-2: Understand the role of formal specifications in project design and be able to develop such specifications

CO-3: To design an interface and develop a prototype for a software system

CO-4: Understand the role of testing in the software development cycle and be capable of developing a test plan to deliver quality software

UNIT – I:

Introduction: Programming in the small vs. programming in the large; software project failures and importance of software quality and timely availability; engineering approach to software development; role of software engineering towards successful execution of large software projects; emergence of software engineering as a discipline.

UNIT – II:

Software Project Management: Basic concepts of life cycle models – different models and milestones; software project planning –identification of activities and resources; concepts of feasibility study; techniques for estimation of schedule and effort; software cost estimation models and concepts of software engineering economics; techniques of software project control and reporting; introduction to measurement of software size; introduction to the concepts of risk and its mitigation; configuration management.

UNIT – III:

Software Quality and Reliability: Internal and external qualities; process and product quality; principles to achieve software quality; introduction to different software quality models like McCall, Boehm, FURPS / FURPS+, Dromey, ISO – 9126; introduction to Capability Maturity Models (CMM and CMMI); introduction to software reliability, reliability models and estimation.

UNIT – IV:

Software Requirements Analysis, Design and Construction: Introduction to Software Requirements Specifications (SRS) and requirement elicitation techniques; techniques for requirement modelling – decision tables, event tables, state transition tables, Petri nets; requirements documentation through use cases; introduction to UML, introduction to software metrics and metrics based control methods; measures of code and design quality.

UNIT – V:

Object Oriented Analysis, Design and Construction: Concepts -- the principles of abstraction, modularity, specification, encapsulation and information hiding; concepts of abstract data type; Class Responsibility Collaborator (CRC) model; quality of design; design measurements; concepts of design patterns; Refactoring; object oriented construction principles; object oriented metrics.

UNIT – VI:

Software Testing: Introduction to faults and failures; basic testing concepts; concepts of verification and validation; black box and white box tests; white box test coverage – code coverage, condition coverage, branch coverage; basic concepts of black-box tests – equivalence classes, boundary value tests, usage of state tables; testing use cases; transaction based testing; testing for non-functional requirements – volume, performance and efficiency; concepts of inspection.

TEXT BOOKS:

1. Software Engineering, Ian Sommerville
2. Fundamentals of Software Engineering, Carlo Ghezzi, Jazayeri Mehdi, Mandrioli Dino
3. Software Requirements and Specification: A Lexicon of Practice, Principles and Prejudices, Michael Jackson

REFERENCES:

1. The Unified Development Process, Ivar Jacobson, Grady Booch, James Rumbaugh
2. Design Patterns: Elements of Object-Oriented Reusable Software, Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides
3. Software Metrics: A Rigorous and Practical Approach, Norman E Fenton, Shari Lawrence Pfleeger
4. Software Engineering: Theory and Practice, Shari Lawrence Pfleeger and Joanne M. Atlee
5. Object Oriented Software Engineering: A Use Case Driven Approach --Ivar Jacobson

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B.Tech. III Semester	**L**	**T/P/D**	**C**
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(19PC2CB01) OBJECT ORIENTED PROGRAMMING LABARATORY

COURSE OBJECTIVES:

- To identify and practice the basic concepts of object-oriented programming
- To familiarize students with advanced concepts of object-oriented programming in C++
- To facilitate students with the skills required to solve problems using object oriented programming
- To design models using object oriented programming

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the concepts of Object Oriented Programming
CO-2: Implement the advanced OOP concepts like inheritance and polymorphism
CO-3: Design the applications by using OOP concepts
CO-4: Represent user requirements using the artifacts of UML (use case, interaction diagrams) and design the activity diagram and state diagram for a given case study

WEEK 1
Moving towards C to C++ -- Sample programs using C++, Sample programs using classes

WEEK 2
Programs on Parameter passing methods, Inline functions, Static members, Access specifiers

WEEK 3
Programs on default arguments, constructors, Constructor overloading, destructors, "this" pointers

WEEK 4
Programs on Dynamic memory allocation, friend functions and classes

WEEK 5
Programs on function overloading, Operator Overloading

WEEK 6
Programs on function and class templates

WEEK 7
Programs on Inheritance- Different forms of inheritance 17

WEEK 8
Programs using abstract classes, polymorphism

WEEK 9
Sample Programs on Exception handling – Basic constructs Programs on multiple catch statement, Exceptions in Constructors and destructors

WEEK 10
Programs on different operations on files

WEEK 11
Programs on random access to files

WEEK 12
Design a Use case Diagram for ATM system, College Admission

WEEK 13
Design a class and activity diagrams for ATM and College admission

WEEK 14
Design a class and sequence diagrams for ATM and College admission

TEXT BOOKS:

1. The C++ Programming Language, Bjarne Stroustrup, Addison Wesley
2. C++ and Object-Oriented Programming Paradigm, Debasish Jana, PHI Learning Pvt. Ltd

REFERENCES:

1. Programming – Principles and Practice Using C++, Bjarne Stroustrup, Addison Wesley
2. The Design and Evolution of C++, Bjarne Stroustrup, Addison Wesley

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B.Tech. III Semester	**L**	**T/P/D**	**C**
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(19PC2CB02) COMPUTATIONAL STATISTICS LABORATORY

COURSE OBJECTIVES:
- To learn object oriented concepts in python
- To reading and writing data from different sources
- To learn the available libraries in python
- To relate statistical methods to real time applications

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply predefined libraries for various applications
CO-2: Analyze the results by applying various statistical methods
CO-3: Plot graphs for the given data sets
CO-4: Summarize the data by applying statistical analysis

WEEK 1,2,3,4:
Python Concepts, Data Structures, Classes: Interpreter, Program Execution, Statements, Expressions, Flow Controls, Functions, Numeric Types, Sequences and Class Definition, Constructors, Text & Binary Files - Reading and Writing

WEEK 5,6,7,8,9:
Visualization in Python: Matplotlib package, Plotting Graphs, Controlling Graph, Adding Text, More Graph Types, Getting and setting values, Patches

WEEK 10,11,12:
Multivariate data analysis: Multiple regression, multi variate regression, cluster analysis with various algorithms, factor analysis, PCA and linear discriminant analysis. Various datasets should be used for each topic

TEXT BOOKS:

1. An Introduction to Multivariate Statistical Analysis, T.W. Anderson
2. Applied Multivariate Data Analysis, Vol I & II, J.D. Jobson
3. Statistical Tests for Multivariate Analysis, H. Kris

REFERENCES:

1. Regression Diagnostics , Identifying Influential Data and Sources of Collinearety, D.A. Belsey, E. Kuh and R.E. Welsch
2. Introduction to Linear Regression Analysis, D.C. Montgomery and E.A. Peck
3. Programming Python, Mark Lutz
4. Python 3 for Absolute Beginners, Tim Hall and J-P Stacey
5. Python for Data Analysis, Wes Mc Kinney

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. III Semester	**L**	**T/P/D**	**C**
	0	**2**	**1**

(19PC2CB03) SOFTWARE ENGINEERING LABORATORY

COURSE OBJECTIVES:

- To understand the role of formal specifications in project design and be able to develop such specifications
- To be able to design an interface and develop a prototype for a complex software system;
- To understand the role of testing in the software development cycle and be capable of developing a test plan
- To be aware of and able to use Computer Aided Software Engineering (CASE) tool

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Develop requirement specifications for a software problem in hand
CO-2: Perform functional oriented and object oriented design
CO-3: Implement the concepts of object oriented to develop a real world application
CO-4: Prepare test cases to rigorously test the application for ensuring quality

WEEK 1& 2:
Phases in software development project, overview and need. Understand problems in existing systems and perform system analysis: Requirement analysis, SRS

WEEK 3:
To perform the function oriented design: Data flow diagrams and Structured chart

Week 4:
To perform the user's view analysis: Use case diagram

Week 5:
To draw the structural view diagram: Class diagram, object diagram.

Week 6:
To draw the behavioral view diagram: Sequence diagram, Collaboration diagram

Week 7:
To draw the behavioral view diagram: State-chart diagram, Activity diagram

Week 8:
To draw the implementation view diagram: Component diagram.

Week 9:
To draw the implementation view diagram: deployment diagram

Week 10:
To perform various techniques for testing using the testing tool: unit testing, integration.

Week 11&12:
Use a Software Configuration Management tool for tracking and controlling changes in the software.

TEXT BOOKS:
1. Software Engineering, Ian Sommerville
2. Fundamentals of Software Engineering, Carlo Ghezzi, Jazayeri Mehdi, Mandrioli Dino
3. Software Requirements and Specification: A Lexicon of Practice, Principles and Prejudices, Michael Jackson

REFERENCES:

1. The Unified Development Process, Ivar Jacobson, Grady Booch, James Rumbaugh
2. Design Patterns: Elements of Object-Oriented Reusable Software, Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides
3. Software Metrics: A Rigorous and Practical Approach, Norman E Fenton, Shari Lawrence Pfleeger
4. Software Engineering: Theory and Practice, Shari Lawrence Pfleeger and Joanne M. Atlee
5. Object Oriented Software Engineering: A Use Case Driven Approach --Ivar Jacobson

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B.Tech. III Semester	**L**	**T/P/D**	**C**
	2	**0**	**0**

(19MN6HS04) INDIAN CONSTITUTION

COURSE PRE-REQUISITES: Basic knowledge of Panchayat Raj and human rights studied at schooling level.

COURSE OBJECTIVE:

- To develop constitutional awareness
- To understand democracy at grass root level
- To familiarization of human rights and duties among students
- To inculcate responsibilities towards nation building through technology

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand constitutional creation its process and the process of Panchayat Raj and its working

CO-2: Get familiar with the science of Nation building through constitutional process of India

CO-3: Understand human rights, responsibilities and recognize the responsibilities for societal well-being

CO-4: Recognize the roles of constitution for corporate culture building

UNIT – I:

(Union Government and its Administration-Part 1)

Constitution' meaning of the term, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy,

UNIT – II:

(Union Government and its Administration-Part 2)

Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha.

UNIT – III:

(State Government and its Administration-Part 1)

Governor: Role and Position, CM and Council of ministers, State Secretariat: Organization, Structure and Functions.

UNIT – IV:

(State Government and its Administration-Part 2)

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational

Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT – V:

(Duties and Fundamental Rights-Part 1)

Features of fundamental rights, laws inconsistent with fundamental rights, right to equality, right to freedom, right against exploitation, right to freedom of religion, cultural and educational rights, right to constitutional remedies, criticism of fundamental rights, significance of fundamental rights

UNIT – VI:

(Duties and Fundamental Rights-Part 1)

Swaran Singh's Committees recommendation, list of fundamental duties, features of fundamental duties, Protection of Human Rights Act, 1993.

REFERENCE BOOKS:

1. Indian Polity' by Laxmikanth Pub Macgrow Hill
2. Indian Constitution by M.V. Pylee
3. Human Rights in Constitutional Law by Durgadas Basu
4. Indian Constitution Upkar Publication

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. IV Semester - CSBS	**L**	**T/P/D**	**C**
	2	**1**	**3**

(19PC1CB06) OPERATING SYSTEMS

COURSE OBJECTIVES:

- To analyze the tradeoffs inherent in operating system design
- To summarize various approaches to solve the problem of process concurrency in an operating system
- To evaluate the memory usage trade-offs in terms of size (main memory, auxiliary memory) and processor speed
- To understand disk storage strategies and file strategies with protection and security issues

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Identify System calls and evaluate process scheduling criteria of OS
CO-2: Develop procedures for process synchronization and scheduling services of an OS
CO-3: Distinguish disk access, file systems supported by an OS
CO-4: Extend operating systems virtual memory, protection and security aspects

UNIT – I:
Introduction: Concept of Operating Systems (OS), Generations of OS, Types of OS, OS Services, Interrupt handling and System Calls, Basic architectural concepts of an OS, Concept of Virtual Machine, Resource Manager view, process view and hierarchical view of an OS.
Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching.
Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads.

UNIT – II:
Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.
Scheduling algorithms: Pre-emptive and non-pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

UNIT – III:
Inter-process Communication: Concurrent processes, precedence graphs, Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Semaphores, Strict Alternation, Peterson's Solution, The Producer / Consumer Problem, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem, Barber's shop problem.

UNIT – IV:
Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.
Concurrent Programming: Critical region, conditional critical region, monitors, concurrent languages, communicating sequential process (CSP); Deadlocks - prevention, avoidance, detection and recovery.

UNIT – V:

Memory Management: Basic concept, Logical and Physical address maps, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page allocation, Partitioning, Paging, Page fault, Working Set, Segmentation, Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

UNIT – VI:

I/O Hardware: I/O devices, Device controllers, Direct Memory Access, Principles of I/O.

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed),Free-space management (bit vector, linked list, grouping), directory implementation(linear list, hash table), efficiency and performance.

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks.

Case study: UNIX OS file system, shell, filters, shell programming, programming with the standard I/O, UNIX system calls.

TEXT BOOKS:

1. Operating System Concepts Essentials. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne

REFERENCES:

1. Operating Systems: Internals and Design Principles. William Stallings
2. Operating System: A Design-oriented Approach. Charles Patrick Crowley
3. Operating Systems: A Modern Perspective. Gary J. Nutt
4. Design of the Unix Operating Systems. Maurice J. Bach
5. Understanding the Linux Kernel, Daniel Pierre Bovet, Marco Cesati

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B.Tech. IV Semester - CSBS	**L**	**T/P/D**	**C**
	2	**1**	**3**

(19PC1CB07) DATATBASE MANGEMENT SYSTEM CONCEPTS

COURSE OBJECTIVES:

- To introduction of Data Base Management systems concepts and to give the description of structure of Data Base systems
- To know the features of various models of data and query representations
- To prepare the database through normalization, Query optimization and understand the concepts of data storage
- To introduce the concepts and protocols related to transaction management, database recovery and security

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Appreciate the underlying concepts of database system architecture and technologies
CO-2: Query the database using the relevant programming language
CO-3: Develop database schema for a given scenario and implement optimization techniques
CO-4: Design schedules using multiple transactions, implement data base recovery and security

UNIT – I:
Introduction: Introduction to Database. Hierarchical, Network and Relational Models. Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).
Data models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

UNIT – II:
Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server.

UNIT – III:
Relational database design: Domain and data dependency, Armstrong's axioms, Functional Dependencies, Normal forms, Dependency preservation, Lossless design.

UNIT – IV:
Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.
Storage strategies: Indices, B-trees, Hashing.

UNIT – V:
Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

UNIT – VI:

Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

Advanced topics: Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

TEXT BOOKS:

1. Database System Concepts. Abraham Silberschatz, Henry F. Korth and S. Sudarshan

REFERENCES:

1. Principles of Database and Knowledge – Base Systems, Vol 1 by J. D. Ullman
2. Fundamentals of Database Systems. R. Elmasri and S. Navathe
3. Foundations of Databases. Serge Abiteboul, Richard Hull, Victor Vianu

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(19PC1CB08) SOFTWARE DESIGN WITH UML

COURSE OBJECTIVES:

- To understand how and why models are used during software development and maintenance
- To identify the different perspectives from which software can be modeled
- To distinguish between static and dynamic models and Identify the view or perspective provided by each type of model described
- To be able to create and interpret examples of each type of model described here

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Specify, analyse and organise requirements for a software product
CO-2: Model and analyse software requirements (use case modeling, Interaction Modeling) using UML
CO-3: Apply appropriate UML design patterns for creating static and dynamic models
CO-4: Apply appropriate UML design patterns and notations to the design of components of a product

UNIT – I:
Introduction to Object Oriented Technologies and the UML Method: Software development process: The Waterfall Model vs. The Spiral Model, The Software Crisis, description of the real world using the Objects Model, Classes, inheritance and multiple configurations, Quality software characteristics, Description of the Object Oriented Analysis process vs. the Structure Analysis Model.
Introduction to UML Language: Standards, Elements of the language, General description of various models, The process of Object Oriented software development, Description of Design Patterns, Technological Description of Distributed Systems.

UNIT – II:
Requirements Analysis Using Case Modeling: Analysis of system requirements, Actor definitions, Writing a case goal, Use Case Diagrams, Use Case Relationships.

UNIT – III:
Transfer from Analysis to Design in the Characterization Stage: Interaction Diagrams: Description of goal , Defining UML Method, Operation, Object Interface, Class, Sequence Diagram, Finding objects from Flow of Events, Describing the process of finding objects using a Sequence Diagram, Describing the process of finding objects using a Collaboration Diagram.

UNIT – IV:
The Logical View Design Stage: The Static Structure Diagrams: The Class Diagram Model, Attributes descriptions, Operations descriptions, Connections descriptions in the Static Model, Association, Generalization, Aggregation, Dependency, Interfacing, Multiplicity.

UNIT – V:

Package Diagram Model: Description of the model, White box, black box. Connections between packages., interfaces, Create Package Diagram, Drill Down. Dynamic Model: State Diagram / Activity Diagram: Description of the State Diagram, Events Handling, Description of the Activity Diagram, Exercise in State Machines.

UNIT – VI:

Component Diagram Model: Physical Aspect, Logical Aspect, Connections and Dependencies, User face, Initial DB design in a UML environment.

Deployment Model: Processors, Connections, Components, Tasks, Threads, Signals and Events.

TEXT BOOKS:

1. Object-Oriented Software Engineering: using UML, Patterns, and Java, Bernd Bruegge and Allen H. Dutoit

REFERENCES:

1. Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Richard Helm, Ralph Johnson, and John M. Vlissides

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B.Tech. IV Semester - CSBS	**L**	**T/P/D**	**C**
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(19HS1IE01) INTRODUCTION TO INNOVATION, IP MANAGEMENT AND ENTREPRENEURSHIP

COURSE PRE-REQUISITES: Good knowledge of Fundamentals of Management (Covered in Year 2, Semester 1)

COURSE OBJECTIVES:
The major emphasis of the course will be on creating a learning system through which management students

- To can enhance their innovation and creative thinking skills
- To acquaint themselves with the special challenges of starting new ventures
- To turn market opportunities into a business plan
- To use IPR as an effective tool to protect their innovations and intangible assets from exploitation

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Learn to be familiar with creative and innovative thinking styles
CO-2: Learn to investigate, understand and internalize the process of founding a startup
CO-3: Learn to manage various types of IPR to protect competitive advantage
CO-4: Independently formulate a business plan based on a business idea in technology, plan and implement a development project in a team,

UNIT – I:
Innovation: What and Why?
Innovation as a core business process, Sources of innovation, Knowledge push vs. need pull innovations.
Class Discussion- Is innovation manageable or just a random gambling activity?

UNIT – II:
Building an Innovative Organization: Creating new products and services, Exploiting open innovation and collaboration, Use of innovation for starting a new venture
Class Discussion- Innovation: Co-operating across networks vs. 'go-it-alone' approach

UNIT – III:
Entrepreneurship:

- Opportunity recognition and entry strategies
- Entrepreneurship as a Style of Management
- Maintaining Competitive Advantage- Use of IPR to protect Innovation

UNIT – IV:
Entrepreneurship- Financial Planning:

- Financial Projections and Valuation
- Stages of financing
- Debt, Venture Capital and other forms of Financing

UNIT – V:
Intellectual Property Rights (IPR)

- Introduction and the economics behind development of IPR: Business Perspective

- IPR in India – Genesis and Development
- International Context
- Concept of IP Management, Use in marketing

UNIT – VI:
Types of Intellectual Property
- Patent- Procedure, Licensing and Assignment, Infringement and Penalty
- Trademark- Use in marketing, example of trademarks- Domain name
- Geographical Indications- What is GI, Why protect them?
- Copyright- What is copyright
- Industrial Designs- What is design? How to protect?

Class Discussion- Major Court battles regarding violation of patents between corporate companies

HOME ASSIGNMENT:
Case study materials book will be given to students. Students are required to meet in groups before coming to class and prepare on the case for the day. Instructor may ask the student groups to present their analysis and findings to the class.
Further, the topic for class discussion will be mentioned beforehand and students should be ready to discuss these topics (in groups) in class. Students are required to meet in groups before coming to class and prepare on the topic. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

Topic 1- Is innovation manageable or just a random gambling activity?
Topic 2- Innovation: Co-operating across networks vs. 'go-it-alone' approach
Topic 3- Major Court battles regarding violation of patents between corporate companies

TEXT BOOKS:
1. Managing Innovation: Integrating Technological, Market and Organizational Change, Joe Tidd, John Bessant,
2. Case Study Materials: To be distributed for class discussion

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(19ES1ME10) OPERATIONS RESEARCH

COURSE OBJECTIVES:

- To introduces students to use quantitive methods and techniques for effective decisions–making
- To develop operational research models from the verbal description of the real system
- To model formulation and applications that are used in solving business decision problems
- To understand the mathematical tools that are needed to solve optimization problems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: The characteristics of different types of decision-making environments and the appropriate decision making approaches and tools to be used in each type
CO-2: Build and solve Transportation Models and Assignment Models
CO-3: Design new simple models, like: CPM, MSPT to improve decision – making and develop critical thinking and objective analysis of decision problems
CO-4: Practical and subject specific skills (Transferable Skills). - Be able to implement practical cases, by using TORA, WinQSB

UNIT – I:

Introduction to OR: Origin of OR and its definition. Concept of optimizing performance measure, Types of OR problems, Deterministic vs. Stochastic optimization, Phases of OR problem approach – problem formulation, building mathematical model, deriving solutions, validating model, controlling and implementing solution.

UNIT – II:

Linear Programming: Linear programming–Examples from industrial cases, formulation & definitions, Matrix form.Implicit assumptions of LPP.
Some basic concepts and results of linear algebra – Vectors, Matrices, Linear Independence/Dependence of vectors, Rank, Basis, System of linear eqns., Hyperplane, Convex set, Convex polyhedron, Extreme points, Basic feasible solutions.
Geometric method: 2-variable case, Special cases – infeasibility, unboundedness, redundancy &degeneracy, Sensitivity analysis.
Simplex Algorithm – slack, surplus & artificial variables, computational details, big-M method, identification and resolution of special cases through simplex iterations.
Duality – formulation, results, fundamental theorem of duality, dual-simplex and primal-dual algorithms.

UNIT – III:

Transportation and Assignment problems: TP - Examples, Definitions – decision variables, supply & demand constraints, formulation, Balanced & unbalanced situations, Solution methods – NWCR, minimum cost and VAM, test for optimality(MODI method), degeneracy and its resolution.
AP - Examples, Definitions – decision variables, constraints, formulation, Balanced &unbalanced situations, Solution method – Hungarian, test for optimality (MODI method), degeneracy & its resolution.

UNIT – IV:

PERT – CPM: Project definition, Project scheduling techniques – Gantt chart, PERT & CPM, Determination of critical paths, Estimation of Project time and its variance in PERT using statistical principles, Concept of project crashing/time-cost trade-off.

UNIT – V:

Inventory Control: Functions of inventory and its disadvantages, ABC analysis, Concept of inventory costs, Basics of inventory policy (order, lead time, types), Fixed order-quantity models – EOQ, POQ & Quantity discount models. EOQ models for discrete units, sensitivity analysis and Robustness, Special cases of EOQ models for safety stock with known/unknown stock out situations, models under prescribed policy, Probabilistic situations.

UNIT – VI:

Queuing Theory: Definitions – queue (waiting line), waiting costs, characteristics (arrival, queue, service discipline) of queuing system, queue types (channel vs. phase).

Kendall's notation, Little's law, steady state behaviour, Poisson's Process & queue, Models with examples - M/M/1 and its performance measures; M/M/m and its performance measures; brief description about some special models.

Simulation Methodology:

Definition and steps of simulation, random number, random number generator, Discrete Event System Simulation – clock, event list, Application in Scheduling, Queuing systems and Inventory systems.

TEXT BOOKS:

1. Operations Research: An Introduction, H.A. Taha
2. Principles of OR with Application to Managerial Decisions, H.M. Wagner
3. Introduction to Operations Research, F.S. Hiller and G.J. Lieberman

REFERENCES:

1. Linear Programming, K.G. Murthy
2. Elements of Queuing Theory, Thomas L. Saaty
3. Operations Research and Management Science, Hand Book: Edited By A. Ravi Ravindran
4. Management Guide to PERT/CPM. Wiest & Levy
5. Modern Inventory Management, J.W. Prichard and R.H. Eagle

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B.Tech. IV Semester - CSBS	**L**	**T/P/D**	**C**
	0	**2**	**1**

(19PC2CB04) OPERATING SYSTEMS (UNIX) LABORATORY

COURSE OBJECTIVES:
- To implement various CPU Scheduling Algorithms
- To implement Process Creation and Inter Process Communication.
- To implement Deadlock Avoidance and Deadlock Detection Algorithms
- To implement Page Replacement Algorithms
- To implement File Organization and File Allocation Strategies

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Compare the performance of various CPU Scheduling Algorithms
CO-2: Implement Deadlock avoidance and Detection Algorithms
CO-3: Analyze the performance of the various Page Replacement Algorithms
CO-4: Implement File Organization and File Allocation Strategies

WEEK 1:
Write programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir

WEEK 2:
Write C programs to simulate UNIX commands like cp, ls, grep, etc.

WEEK 3:
Shell Programming

WEEK 4:
Write C programs to implement the various CPU Scheduling Algorithms

WEEK 5:
Implementation of Semaphores

WEEK 6:
Implementation of Shared memory and IPC

WEEK 7:
Bankers Algorithm for Deadlock Avoidance

WEEK 8:
Implementation of Deadlock Detection Algorithm

WEEK 9:
Write C program to implement Threading & Synchronization Applications

WEEK 10:
Implementation of the following Memory Allocation Methods for fixed partition
a) First Fit b) Worst Fit c) Best Fit

WEEK 11:
Implementation of Paging Technique of Memory Management

WEEK 12:
Implementation of the following Page Replacement Algorithms
a) FIFO b) LRU c) LFU

WEEK 13:
Implementation of the various File Organization Techniques

WEEK 14:
Implementation of the following File Allocation Strategies
a) Sequential b) Indexed c) Linked

TEXT BOOKS:
1. Operating System Concepts Essentials, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne

REFERENCES:
1. Operating Systems: Internals and Design Principles, William Stallings
2. Operating System: A Design-oriented Approach, Charles Patrick Crowley
3. Operating Systems: A Modern Perspective, Gary J. Nutt
4. Design of the Unix Operating Systems, Maurice J. Bach
5. Understanding the Linux Kernel, Daniel Pierre Bovet, Marco Cesati

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	0	**2**	**1**

(19PC2CB05) DATATBASE MANGEMENT SYSTEM CONCEPT LABORATORY

COURSE OBJECTIVES:
- To provide the fundamental concepts of database creation
- To implement the concepts of Data manipulation
- To develop procedures for querying multiple tables
- To understand the concepts of PL / SQL

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Implement SQL functions using the DUAL table
CO-2: Apply Integrity constraints for creating consistent RDBMS environment
CO-3: Create, maintain and manipulate the Data through SQL commands
CO-4: Develop Triggers, query through PL /SQL structures

WEEK 1:
Implement the following using DUAL table:
a. Character functions.
b. Numeric functions.
c. Date functions.
d. Conversion functions.

WEEK 2:
Practice DDL and DML commands on a basic table without integrity constraints.

WEEK 3:
Practice DDL and DML commands on a Relational Database, specifying the Integrity constraints. (Primary Key, Foreign Key, CHECK, NOT NULL)

WEEK 4:
Apply the concepts of Joins, SET operations and SQL functions on any two relational schemas.

WEEK 5-7
Apply the concepts of Joins, SET operations and SQL functions on the following schema:
a) Employee:

Name	**Datatype**	**width**	**Constraint**	**Description**
Empno	Integer	4	Primary Key	Employee Number
Ename	Varchar	20		Employee Name
Job	Char	12		Designation
Mgr	Integer	4		Manager Number
Hiredate	Date			
Sal	Number	(8,2)		Salary
Comm	Number	(6,2)		Commission

Deptno	Integer	2	Foreign Key	Department Number

b) Dept:

Name	Datatype	width	Constraint	Description
Deptno	Integer	2	Primary Key	Department Number
Dname	Varchar	12		Department Name
Loc	Char	10		Location

c) Salgrade:

Name	Datatype	width	Constraint	Description
Grade	Integer	1		Grade
Hisal	Integer	4		Upper scale of salary
Losal	Integer	5		Lower scale of salary

WEEK 8:
Sessional Examination-I

WEEK 9 – 12:
End to end implementation of a schema for a specific system along with the illustrations of querying.
A system is described by specifying the functional and non-functional requirements. Based on this description, the major entities are identified and modelled. Further the relationships are modelled to form the initial schema. The schema is further refined by removing redundancies through normalization. Also based on the query requirements, the schema is remodelled to facilitate querying. Finally an illustration of various queries to extract required information from the system is shown using SQL / MYSQL.

The five major workflows to be implemented are:

1. System Specification
2. Design of Initial Schema
3. Schema refinement using functional dependencies and normalization
4. Schema refinement using query requirements
5. Illustration of querying the system using SQL / MYSQL.

WEEK 13:
Implementation of PL / SQL concepts

WEEK 14:
Creating and executing Cursors.

WEEK 15:
Creation and application of TRIGGERS on a Relational schema.

WEEK 16:
Sessional Examination-II

TEXT BOOKS:
1. Database System Concepts, Abraham Silberschatz, Henry F. Korth and S. Sudarshan

REFERENCES:
1. Principles of Database and Knowledge – Base Systems, Vol 1 by J. D. Ullman
2. Fundamentals of Database Systems, R. Elmasri and S. Navathe
3. Foundations of Databases, Serge Abiteboul, Richard Hull, Victor Vianu

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	0	**2**	**1**

(19PC2CB06) SOFTWARE DESIGN WITH UML LABORATORY

COURSE OBJECTIVES:

- To learn good design, good modeling practices, document them and be able to discuss the pros and cons of your designs and models
- To draw the UML diagrams for the given specification
- To map the design properly to code
- To improve the design by applying appropriate design patterns

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Capture the requirements specification for an intended software system develop structural models with the tool

CO-2: Develop static and behavioural models using UML as per the requirements gathered

CO-3: Select the set of appropriate diagrams to develop a system with UML

CO-4: Design UML diagrams for any complex problem

WEEK 1,2,3

1. All diagrams for Online course reservation system:

WEEK 4,5,6

4. All diagrams for Exam Registration

WEEK 7,8,9

5. All diagrams for ATM simulation

WEEK 10,11,12

6. Simulate railway registration system

WEEK 13

Lab Internals

WEEK 13,14,15

6. All diagrams for Online shopping

TEXT BOOKS:

1. Object-Oriented Software Engineering: using UML, Patterns, and Java, Bernd Bruegge and Allen H. Dutoit

REFERENCES:

1. Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Richard Helm, Ralph Johnson, and John M. Vlissides

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(19ES2ME10) OPERATIONS RESEARCH LABORATORY

COURSE OBJECTIVES:

- To understand the concept of graphical analysis of LPP
- To identify a transportation problem and implement various transportation models
- To derive the solution of an assignment problem and integer programming problems using various methods
- To understand Classification of Queuing Models (Finite and Infinite Models) and the simulation models

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Give solution of any LPP by using simplex algorithm

CO-2: Implement feasible, basic, non-degenerate solutions of a transportation problem

CO-3: Implement assignment problem that will be balanced and also solve integer programming problem

CO-4: Implement queuing theory techniques and simulation models

WEEK 1, 2, 3

Experiment 1. To solve Linear Programming Problem using Graphical Method with

I. Unbounded solution
II. Infeasible solution
III. Alternative or multiple solutions.

WEEK 4 ,5, 6

Experiment 2. Solution of LPP with simplex methods.

WEEK 7, 8 ,9

Experiment 3. Solving transportation problems.

WEEK 10,11,12

Experiment 4. solving assignment problems.

WEEK 13,14,15,16

Experiment 5. Solving queuing and simulation models

TEXT BOOKS:

1. Operations Research: An Introduction, H.A. Taha
2. Principles of OR with Application to Managerial Decisions, H.M. Wagner
3. Introduction to Operations Research, F.S. Hiller and G.J. Lieberman

REFERENCES:

1. Linear Programming, K.G. Murthy
2. Elements of Queuing Theory, Thomas L. Saaty
3. Operations Research and Management Science, Hand Book: Edited By A. Ravi Ravindran
4. Management Guide to PERT/CPM, Wiest & Levy
5. Modern Inventory Management, J.W. Prichard and R.H. Eagle

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. IV Semester - CSBS	**L**	**T/P/D**	**C**
	1	**2**	**2**

(19HS2EN04) BUSINESS COMMUNICATION AND VALUE SCIENCE -III

COURSE PRE-REQUISITE(S):
1. Basic Knowledge of English (verbal and written)
2. Completion of all units from Semesters 1, 2 and 3

COURSE OBJECTIVES:
- To enable the students to create clear, accurate, and succinct content to write business letters, resume, SOP, Proposals and Technical Reports for academics as well as for workplace
- To introduce students to Self-analysis techniques like SWOT & TOWS
- To introduce students to key concepts of Pluralism, cultural spaces and Cross-cultural communication
- To understand the importance of science for Nation building

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Identify the best practices of technical writing and Understand, apply &analyze the tools of technical writing
CO-2: Apply &analyze the basic principles of SWOT & life positions
CO-3: Identify & respect pluralism in cultural spaces- Analyze cross cultural communication and apply the concepts of Global, glocal and translocational; and Recognize the roles and relations of different genders
CO-4: Apply the science of Nation building

UNIT – I:
Basic principles of SWOT and Life Positions.
i. SWOT and Life Positions
ii. Apply SWOT in real life scenarios, Create SWOT
iii. SWOT Vs. TOWS-The Balancing Act
iv. Importance of Motivation in real life
v. Leverage motivation in real-life scenarios.

UNIT – II:
Pluralism in cultural spaces
i. Awareness and respect for pluralism in cultural spaces
ii. Rhythms of India (Cultures in India)
iii. Defibe and Differentiate -Global, glocal, translocational
iv. Cross-cultural communication- Culture shock
v. Gender awareness

UNIT – III:
Role of science in nation building
i. Role of scientists and mathematicians from ancient India.
ii. Role of science post- independence
iii. Inventions –Inventors-Institutes-Information technology
iv. Introduction to technical writing
v. Basic rules of technical writing

UNIT – IV:

Artificial intelligence –Voice of the future

i. Artificial intelligence in Everyday Life
ii. Communicating with machines
iii. Applying technical writing in profession
iv. Scenario-based technical writing
v. Best practices of Technical writing

UNIT – V:

Technical Writing

i) Summarizing & Synthesising
ii) Abstract Writing
iii) Report Writing
iv) Product Description
v) Description of a mechanism

UNIT – VI:

Project Work

- Visit rural area/ underprivileged parts of city to address some of the local issues; if relevant, suggest a practical technology solution to the issues.

TEXTBOOKS:

There are no prescribed texts for Semester 4 – there will be handouts and reference links.

REFERENCES:

1. Effective Technical Communication (2005), Ashraf, Rizvi M, New Delhi: Tata Mc Graw Hill Publishing Company Limited, 2nd Edition
2. Technical Communication: A Reader-Centered Approach (2003), Anderson, Paul V. Reports In Paul V. Anderson's 9th Edition, Boston: Heinle
3. Technical Communication: A Practical Approach, (2012) William S. Pfeiffer, 8th Edition, Pearson
4. Technical Communication (2001), Burnett, Rebecca, 6th Edition, Cengage Learning

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B.Tech. IV Semester	**L**	**T/P/D**	**C**
	0	**2**	**0**

(19MN6HS05) ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

COURSE OBJECTIVE:

- To give exposure to the repositories of our indigenous knowledge and wisdom
- To familiarize on how this knowledge and wisdom has evolved over centuries
- To map on how knowledge and wisdom still continue to serve social functions
- To understand how knowledge and wisdom help in cultural functions

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand basic principles, thought process, reasoning and inference of Indian Traditional Knowledge Systems

CO-2: Recognize wisdom of Sanskrit literature and its importance in modern society with rapid technological advancements

CO-3: Be familiar with scientific worldview and basic principles of Yoga and holistic health care system

CO-4: Understand that sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature

UNIT – I:

(Basic Structure of Indian Knowledge System-Part 1): The historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), Traditional Knowledge (TK) Vs western knowledge traditional knowledge vis-à-vis formal knowledge. Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT – II:

(Basic Structure of Indian Knowledge System-Part 2): The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act).

UNIT – III:

(Modern Science and Indian Knowledge System-Part 1): Mathematics in India, Early Historical Period, The Classical Period, The Classical Period, post-Āryabhaṭa, Features of Indian Mathematics.

UNIT – IV:

(Modern Science and Indian Knowledge System-Part 2): Early Chemical Techniques, Atomism in Vaiśeṣika, Chemistry in Early Literature, Indian Philosophy Sāṁkhya, Yoga, Vaiśeṣika, Nyāya, Mīmāṁsā, Vedānta, Sāṁkhya.

UNIT – V:

(Yoga and Holistic Health care- Part 1): Ayurveda for Life, Health and Well-being Definition of Ayurveda,

UNIT – VI:

(Yoga and Holistic Health care- Part 2): The Principles of Ayurvedic Healing, Treating diseases to restore health, Astanga Ayurveda.

REFERENCES:

1. Cultural Heritage of India-course material, by Sivaramakrishnan (Ed.), Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2. Holistic Science and Vedant, by Swami Jitatmanand, Bharatiya Vidya Bhavan
3. "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino
4. Science of Consciousness Psychotherapy and Yoga Practices, by RN Jha, Vidyanidhi Prakasham, Delhi, 2016

E-Resources:

1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. http://nptel.ac.in/courses/121106003/

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	2	**1**	**3**

(19PC1CB09) DESIGN AND ANALYSIS OF ALGORITHMS

COURSE OBJECTIVES:

- To analyze the asymptotic performance of algorithms
- To demonstrate a relationship between major algorithms and data structures
- To understand different algorithm design strategies
- To apply important algorithmic design paradigms and methods of analysis

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Analyze the performance of algorithms

CO-2: Understand how the choice of data structures and the algorithm design methods impact the performance of an algorithm

CO-3: Develop efficient algorithms for computational tasks

CO-4: Computing complexity measures of algorithms

UNIT – I:

Introduction: Characteristics of Algorithm. Analysis of Algorithm: Asymptotic analysis of Complexity Bounds – Best, Average and Worst-Case behavior; Performance Measurements of Algorithm, Time and Space Trade-Offs, Analysis of Recursive Algorithms through Recurrence Relations: Substitution Method, Recursion Tree Method and Masters' Theorem.

UNIT – II:

Fundamental Algorithmic Strategies: Brute-Force, Heuristics, Greedy, Shortest path algorithms, Minimum Spanning Tree, Dynamic Programming.

UNIT – III:

Branch and Bound and Backtracking methodologies: Illustrations of these techniques for Problem-Solving, Bin Packing, Knapsack, Travelling Salesman Problem.

UNIT – IV:

Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Transitive closure, Topological sorting, Network Flow Algorithm.

UNIT – V:

Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.

UNIT – VI:

Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE, Introduction to Quantum Algorithms.

TEXT BOOKS:

1. Fundamental of Computer Algorithms, E. Horowitz and S. Sahni
2. The Design and Analysis of Computer Algorithms, A. Aho, J. Hopcroft and J. Ullman

REFERENCES:

1. Introduction to Algorithms, T. H. Cormen, C. E. Leiserson and R. L. Rivest
2. Computer Algorithms: Introduction to Design and Analysis, S. Baase
3. The Art of Computer Programming, Vol. 1, Vol. 2 and Vol. 3, D. E. Knuth
4. Quantum Computation and Quantum Information, Michael A. Nielsen and Isaac L. Chuang

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	2	**1**	**3**

(19PC1CB10) COMPUTER NETWORKS

COURSE OBJECTIVES:

- To develop an understanding of modern network architectures from a design and performance perspective
- To introduce the student to the major concepts, principles involved in Data Link Layer and Network Layer
- To provide an opportunity to learn how to maintain QoS in Network & maintaining of Congestion Control
- To get an idea of Application Layer functionalities and importance of Security in the Network

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand modern network architectures from a design and performance perspective
CO-2: Learn major concepts, principals involved in Data Link Layer and Network Layer
CO-3: Analyze how to maintain QoS in Network and maintaining of Congestion Control
CO-4: Get an idea of Application Layer functionalities and importance of Security in the Network

UNIT – I:

Introduction: Computer networks and distributed systems, Classifications of computer networks, Preliminaries of layered network structures.
Data communication Components: Representation of data and its flow, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media.

UNIT – II:

LAN: Wired LAN, Wireless LAN, Virtual LAN.
Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

UNIT – III:

Data Link Layer and Medium Access Sub Layer: Fundamentals of Error Detection and Error Correction, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go-back–N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols - Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA

UNIT – IV:

Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

UNIT – V:

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service (QoS), QoS improving techniques - Leaky Bucket and Token Bucket algorithms.

UNIT – VI:

Application Layer: DNS, DDNS, TELNET, EMAIL, FTP, WWW, HTTP, SNMP, Bluetooth, Firewalls.

Network Security: Electronic mail, directory services and network management, Basic concepts of Cryptography.

TEXT BOOKS:

1. Computer Networks, A. Tannenbaum
2. Data and Computer Communication, William Stallings
3. Data communications and networking, Forouzan, 4th Edition, Mc Graw Hill Education

REFERENCES:

1. Network Security, Kaufman, R. Perlman and M. Speciner
2. UNIX Network Programming, Vol. 1,2 & 3, W. Richard Stevens

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19HS1MG05) FUNDAMENTALS OF MANAGEMENT

COURSE OBJECTIVES:

- To understand the theories, functions, and practices of management and to provide them with practical exposure to cases of success/failure in business
- To expose with a systematic and critical understanding of organizational theory, structures, and design
- To comprehend the conceptual knowledge relating to Organizational Behavior and to provide a basic understanding of the behavior of individuals and groups in the organizations
- To apply business ethics and corporate social responsibility for business success and growth

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply theories to improve the practice of management
CO-2: Describe and assess the basic design elements of organizational structure and design
CO-3: analyze the behavior of individuals and groups in organizations in terms of the key factors that influence organizational behavior
CO-4: Evaluate ethical issues that face organizations in the fields finance, sales, and marketing

UNIT – I:
Management Theories: Concept and Foundations of Management, Evolution of Management Thoughts [Pre-Scientific Management Era (before 1880), Classical management Era (1880-1930), Neo-classical Management Era (1930-1950), Modern Management era (1950-on word). Contribution of Management Thinkers: Taylor, Fayol, Elton Mayo etc.

UNIT – II:
Functions of Management- Planning, Organizing, Staffing, Directing, Controlling

UNIT – III:
Organizational Design: Classical, Neoclassical and Contingency approaches to organizational design; Organizational theory and design, Organizational structure (Simple Structure, Functional Structure, Divisional Structure, Matrix Structure)

UNIT – IV:
Organization Behavior: Introduction, Personality, Perception, Learning and Reinforcement, Motivation, Group Dynamics, Power & Influence, Work Stress and Stress Management, Decision Making, Problems in Decision Making, Decision Making, Organizational Culture, Managing Cultural Diversity

UNIT – V:
Leadership: Concept, Nature, Importance, Attributes of a leader, developing leaders across the organization, Leadership Grid

UNIT – VI:
Managerial Ethics: Ethics and Business, Ethics of Marketing & advertising, Ethics of Finance & Accounting, Decision – making frameworks, Business and Social

Responsibility, International Standards, Corporate Governance, Corporate Citizenship, Corporate Social Responsibility

TEXT BOOKS:

1. Understanding the Theory and Design of Organizations by Richard L. Daft, 11e, Cengage, 2020
2. Management by James Arthur, Finch Stoner, R. Edward Freeman, and Daniel R Gilbert 6th Ed; Publisher: Pearson Education/Prentice Hall
3. Organizational Behaviour by Stephen P. Robbins, Prentice Hall, 2013

REFERENCES:

1. Organizational Behaviour by Fred Luthans, Mc Graw-Hill, 2013
2. Organizational Behavior by Stephen P. Robbins, Timothy A. Judge, Neharika ohra, 16e, Pearson Education, 2016
3. Business Ethics: Ethical Decision Making & Cases, by O. C. Ferrell, John Fraedrich, Linda Ferrell, 12th edition, Cengage,2017

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19PC1CB11) DESIGN THINKING

COURSE OBJECTIVES:

- To create awareness of design thinking among students of engineering
- To teach a systematic approach for identifying and applying design thinking process
- To enable the use of doodling and storytelling as a means of presenting ideas and prototypes
- To motivate students to create value proposition statements for identified problems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Identify design thinking phases from an engineering perspective
CO-2: Validate problem statements through user empathization with societal and environmental consciousness
CO-3: Devise visual design and documentation to communicate more effectively
CO-4: Develop prototypes to catering to the needs of users

UNIT – I:
Design Thinking Overview and Motivation: Design Thinking for business – Stories, Examples and Case Studies; Design Thinking for Students; Introduction to Design Thinking – Stanford's 5-step model;
*Activities to understand Design Thinking and its applications

UNIT – II:
Doing Design: Empathize Phase: Empathy; Importance of Empathy; Empathy Tools; Introduction to Immersion Activity; Persona, Importance of Persona Creation; Data collection and Inferences
*Activities for Empathize Phase

UNIT – III:
Doing Design: Define Phase: Problem Statements – Introduction, Definition, Validation; Need Analysis: Types of Users, Types of Needs; Addressable Needs and Touchpoints; Structuring Need Statements;
*Activities for Define Phase

UNIT – IV:
Doing Design: Ideate Phase
Ideation tools: Six Thinking Hats; Ideate to generate solutions; Doodling and Storytelling to present ideas;
*Activities for Ideate Phase

UNIT – V:
Doing Design: Prototype Phase
Introduction to Prototype; Methods of Prototyping; Value proposition for the solution;
*Activities for Prototype Phase

UNIT – VI:

Doing Design: Test Phase

Importance of testing; Feedback Collection; Documentation of Feedback; Inference from Feedback; Looping of Design Thinking; Agile and Design Thinking to deliver customer satisfaction;

*Activities for Test Phase

TEXT BOOKS:

1. There are no prescribed texts for Semester 5 – there will be handouts and reference links shared

REFERENCES:

1. Nir Eval, Hooked. How to Build Habit-Forming Products, Penguin Publishing Group
2. Rod Judkins, The Art of Creative Thinking, Hodder & Stoughton
3. Dan Senor and Saul Singer, Start-up Nation. The Story of Israel's Economic Miracle, Grand Central Publishing
4. Simon Sinek, Start with Why. How Great Leaders Inspire Everyone to Take Action, Penguin Books Limited

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19PE1CB01) CONVERSATIONAL SYSTEMS

COURSE OBJECTIVES -

- To enable attendees to acquire knowledge on chatbots and its terminologies
- To work with ML Concepts and different algorithms to build custom ML Model
- To better understand on Conversational experiences and provide better customer experiences

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Review, critically analyse and synthesize conversational systems and natural language processing
CO-2: Apply appropriate methodologies for developing and evaluating conversational systems
CO-3: Carry out testing of an implemented conversational system
CO-4: Explain the purpose of virtual assistant agents effect on the development, deployment, and evaluation of conversational Systems

UNIT – I:
Fundamentals of Conversational Systems:
Introduction: Overview, Case studies, Explanation about different modes of engagement for a human being, History and impact of AI.
Underlying Technologies: Natural Language Processing, Artificial Intelligence and Machine Learning, NLG, Speech-To-Text, Text-To-Speech, Computer Vision etc. **Introduction to Top players in Market** – Google, MS, Amazon &Market trends. **Messaging Platforms** (Facebook, WhatsApp) and Smart speakers – Alexa, Google Home and other new channels.
Ethical and Legal Considerations in AI Overview

UNIT – II:
Foundational Blocks for Programming: Basic Python programming concepts, Node Basics.
Natural Language Processing: Introduction: Brief history, Basic Concepts, Phases of NLP, Application of chatbots etc.
General chatbot architecture, Basic concepts in chatbots: Intents, Entities, Utterances, Variables and Slots, Fulfillment. Lexical Knowledge Networks (WordNet, Verbnet, PropBank, etc). Lexical Analysis, Part-of-Speech Tagging, Parsing/Syntactic analysis, Semantic Analysis, Word Sense Disambiguation. Information Extraction, Sentiment Analysis), Affective NLG

UNIT – III:
Building a chatbot/Conversational AI system: Fundamentals of Conversational Systems (NLU, DM and NLG), Chatbot framework & Architecture, Conversational Flow & Design, Intent Classification (ML and DL based techniques), Dialogue Management

Strategies, Natural Language Generation, UX design, APIs and SDKs, Usage of Conversational Design Tools.

Introduction to popular chatbot frameworks – Google Dialog flow, Microsoft Bot Framework, Amazon Lex, RASA Channels: Facebook Messenger, Google Home, Alexa, WhatsApp, Custom Apps. Overview of CE Testing techniques, A/B Testing, Introduction to Testing Frameworks - Botium /Mocha ,Chai. Security & Compliance – Data Management, Storage, GDPR, PCI.

UNIT – IV:

Role of ML/AI in Conversational Technologies –Brief Understanding on how Conversational Systems uses ML technologies in ASR, NLP, Advanced Dialog management, Language Translation, Emotion/Sentiment Analysis, Information extraction, etc. to effectively converse

UNIT – V:

Contact Centers: Introduction to Contact centers – Impact & Terminologies. Case studies & Trends, How does a Virtual Agent/Assistant fit in here?

UNIT – VI:

Overview on Conversational Analytics:

Conversation Analytics: The need of it, Introduction to Conversational Metrics.

Future – Where are we headed? Summary, Robots and Sensory Applications overview, XR Technologies in Conversational Systems, XR-Commerce, What to expect next? – Future technologies and market innovations overview.

TEXT BOOKS:

1. Designing Voice User Interfaces: Principles of Conversational Experiences 1st Edition by Cathy Pearl, O'Reilly
2. Conversational Interfaces: Principles of Successful Bots, Chatbots & Messaging Apps By Mariya Yao

REFERENCES:

1. Bot Business 101: How to start, run & grow your Bot / AI business By Ekim Kaya
2. Designing Bots: Creating Conversational Experiences By Amir Shevat O'Reilly
3. Designing Conversational Interfaces By Alper Çuğun

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19PE1CB02) CLOUD, MICROSERVICES AND APPLICATIONS

COURSE OBJECTIVES

The course intends to introduce students to the fundamentals of developing application on Cloud, specifically public clouds such as AWS, AZURE and Google Students would be able to appreciate

- Design applications for Cloud
- Develop applications using various services
- Deploy applications on Cloud by using cloud native services
- Introduction to Devops, Security and Monitoring Tools

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the main concepts, Cloud service/Deployment Models Application of Cloud Computing
CO-2: Describe the Monolithic & Distributed Architecture, Microservice fundamental and design approach
CO-3: Analyze the API Fundamental, API management, API tools & fundamentals of Devops
CO-4: Design and developing solution steps using containers & containerization of application

UNIT – I:
Cloud Fundamentals: Cloud Service Components, Cloud service/Deployment Models. Application of Cloud Computing Cloud Components Guiding Principle with respect to utilization/Security/Pricing. and the applications of Cloud. Public Cloud Platforms overview and their usage.

UNIT – II:
Application architectures-Monolithic & Distributed Architecture, Microservice fundamental and design approach, Spring Boot fundamentals and Design of Microservices, Cloud Native applications-12 Factors App.

UNIT – III:
Application integration process/Application Process, API Fundamental, API management, API tools. Developer Portal. Applications of APIFICATION.

UNIT – IV:
Devops fundamentals: Tools and Applications Containerization Process and application.

UNIT – V:
Python- Refresher, Use cases for cloud application development.

UNIT – VI:
Design and developing solution steps using containers & containerization of application and deployment using Kubernetes, Cloud Security and Monitoring Tools.

TEXT BOOKS:

1. Cloud Computing: Principles and Paradigms by RajkumarBuyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011
2. Cloud Computing Virtualization Specialist Complete Certification Kit - Study Guide Book, Ivanka Menken Gerard Blokdijk, 2009
3. Cloud Security: A Comprehensive Guide to Secure Cloud Computing By Ronald L. Krutz, Russell Dean Vines

REFERENCES:

1. Cloud Computing: A Practical Aprroach, Anthony T.Velte, TobeJ.Velte, Robert Elsenpeter, Publication Person Education, 2009
2. Storage Virtualization: Technologies for Simplifying Data Storage and Management, Tom Clark,Addison-Wesley, 2005
3. Cloud Computing Technologies and Strategies of the Ubiquitous Data Center, Curtis Franklin Jr.Brian J.S. Chee, 2010
4. Introduction to Cloud Computing: Business & Technology, Timothy Chou,2009

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19PE1CB03) MACHINE LEARNING

COURSE OBJECTIVES:

- To introduce students to the basic concepts and techniques of Machine Learning
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability-based and Generalized learning techniques
- To understand ensemble models of machine learning algorithms

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Distinguish between, supervised, unsupervised and semi-supervised learning

CO-2: Apply the appropriate machine learning strategy for any given problem

CO-3: Ability to get the skill to apply machine learning techniques to address the real time problems in different areas

CO-4: Modify existing machine learning algorithms to improve classification efficiency

UNIT – I:

Introduction to Machine Learning (ML); Relationship between ML and human learning; A quick survey of major models of how machines learn; Example applications of ML.

UNIT – II:

Classification: Supervised Learning; The problem of classification; Feature Engineering; Training and testing classifier models; Cross-validation; Model evaluation (precision, recall, F1-mesure, accuracy, area under curve); Statistical decision theory including discriminant functions and decision surfaces; Naive Bayes classification; Bayesian networks; Decision Tree and Random Forests; k-Nearest neighbor classification; Support Vector Machines; Artificial neural networks including backpropagation; Applications of classifications; Ensembles of classifiers including bagging and boosting.

UNIT – III:

Hidden Markov Models (HMM) with forward-backward and Vierbi algorithms; Sequence classification using HMM; Conditional random fields; Applications of sequence classification such as part-of-speech tagging.

UNIT – IV:

Regression: Multi-variable regression; Model evaluation; Least squares regression; Regularization; LASSO; Applications of regression

UNIT – V:

Association rule mining algorithms including apriori, Expectation-Maximization (EM) algorithm for unsupervised learning

UNIT – VI:

Clustering: Average linkage; Ward's algorithm; Minimum spanning tree clustering; K- nearest neighbors clustering; BIRCH; CURE; DBSCAN, Anomaly and outlier detection methods

TEXT BOOKS:

1. Machine Learning, Tom M. Mitchell, vMcGraw-Hill
2. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007

REFERENCES:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis
2. Machine Learning: The art and science of algorithms that make sense of data, Peter Flash, Cambridge. University press
3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009

PUBLICATIONS:

1. R.O. Duda, P.E. Hart, D.G. Stork, Pattern Classification, 2/e, Wiley, 2001
2. C. Bishop, Pattern Recognition and Machine Learning, Springer, 2007
3. E. Alpaydin, Introduction to Machine Learning, 3/e, Prentice-Hall, 2014
4. A.Rostamizadeh, A. Talwalkar, M. Mohri, Foundations of Machine Learning, MIT Press
5. A. Webb, Statistical Pattern Recognition, 3/e, Wiley, 2011

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B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19OE1CB01) BUSINESS STRATEGY

COURSE OBJECTIVES:

- To explain the basic concepts, principles, and practices of Strategic Management
- To identify the internal and external environment of
- To describe the various growth strategies available for the corporates
- To understand the stages in strategy implementation and evaluation

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply the fundamental concepts and principles of strategic management to analyse business situations
CO-2: analyze interrelationships among business functions such as: R&D, production, marketing, finance, HR and information technology
CO-3: Evaluate the inter-relationships of business to individuals, other organizations, government, and society
CO-4: analyze complex, unstructured qualitative and quantitative problems, using appropriate tools

UNIT – I:
Introduction to Strategic Management: Importance of Strategic Management, Vision and Objectives, Schools of thought in Strategic Management, Strategy Content, Process and Practice, Fit Concept and Configuration Perspective in Strategic Management

UNIT – II:
Internal Environment of Firm- Recognizing a Firm's Intellectual Assets: Core Competence as the Root of Competitive Advantage, Sources of Sustained Competitive Advantage, Business Processes and Capabilities-based Approach to Strategy

UNIT – III:
External Environments of Firm- Competitive Strategy: Five Forces of Industry Attractiveness that Shape Strategy, The concept of Strategic Groups, and Industry Life Cycle, Generic Strategies and the Value Chain

UNIT – IV:
Corporate Strategy and Growth Strategies: The Motive for Diversification, Related and Unrelated Diversification, Business Portfolio Analysis, Expansion, Integration and Diversification, Strategic Alliances, Joint Ventures and Mergers & Acquisitions

UNIT – V:
Strategy Implementation: Structure and Systems: The 7S Framework, Corporate Governance

UNIT – VI:
Strategy Evaluation and Control: An overview, Strategic Control, Operational Control and Techniques

TEXT BOOKS:

1. Contemporary Strategic Management by Robert M. Grant, 7th Edition, Blackwell, 2012
2. Competitive Strategy by Michael E. Porter, The Free Press, 1980
3. Competitive Advantage by Michael E. Porter, The Free Press, 1985

REFERENCES:

1. Good Strategy Bad Strategy: The Difference and Why It Matters by Richard Rumelt, Profile Books Ltd, 2013
2. Strategic Management by Francis Cherunilam, 4th Edition, HPH, 2016
3. Strategic Management and Business Policy by Azhar Kazmi, McGraw Hill Education, 2018

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19OE1CB02) SCRIPTING LANGUAGES

COURSE OBJECTIVES:

- To appreciate the nature of scripting and the role of scripting languages
- To effectively apply knowledge of scripting to new situations and learn from the experience
- To analyze requirements of software systems for the purpose of determining the suitability of implementation of PERL and Ruby
- To design and implement software solutions that accommodate specified requirements and constraints, based on analysis or modeling or requirements specification

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Distinguish between typical Scripting Languages & system and application programming languages
CO-2: Apply the syntax and semantics of languages such as PERL and Ruby for effective scripting
CO-3: Develop a Web applications to help in businesses and decision making
CO-4: Design and implement the appropriate software solutions using Scripting Languages such as e-commerce, content management, custom database solutions, and prototyping

UNIT – I:
Introduction to Scripting Language: Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages.

UNIT – II:
Fundamentals of Perl: PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT – III:
Advanced Perl: Finer points of looping, pack and unpack, filesystem, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT – IV:
Facets of Ruby: Ruby new, Classes, Objects and Variables, Containers, Blocks and Iterators, Standard Types, Methods, Expressions, Exceptions, Catch, And Through, Modules, Basic Input and Output.

UNIT – V:
Ruby in its Setting: Ruby and Its World, Interactive Ruby Shell, Documenting Ruby, Package Management with RUBYGEMS, Ruby and web. Ruby Tk.

UNIT – VI:

Ruby Crystallized: The Ruby Language, Duck Typing, Classes and Objects, Locking Ruby in the Safe, Reflection, Object Space and Distributed Ruby

TEXT BOOKS:

1. The World of Scripting Languages, David Barren, Wiley Publications
2. "Programming Ruby" The Pramatic Progammers guide by Dabve Thomas 2nd Edition

REFERENCES:

1. Perl by Example, E. Quigley, Pearson Education
2. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD
3. Ruby Progamming language by David Flanagan and Yukihiro Matsumoto O'Reilly

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(19OE1CB03) MOBILE APPLICATION DEVELOPMENT

COURSE OBJECTIVES:
- To understand system requirements for mobile applications
- To generate suitable design using specific mobile development frameworks
- To implement the design using specific mobile development frameworks
- To deploy the mobile applications in marketplace for distribution

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Describe the requirements for mobile applications
CO-2: Develop design for mobile applications for specific requirements
CO-3: Implement the design using Android SDK, Objective C and iOS
CO-4: Deploy mobile applications in Android and iPhone marketplace for distribution

UNIT – I:
Introduction: Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications.

UNIT – II:
Basic Design: Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications

UNIT – III:
User Interfaces: User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

UNIT – IV:
Advanced Design: Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

UNIT – V:
Android: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

UNIT – VI:
IOS: Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace.

TEXT BOOKS:

1. Professional android Development, Reto Meier, Wiley-India Edition, 2012
2. Professional Android 2 Application Development, Reto Meier, Wiley India Pvt Ltd
3. Charlie Collins, Michael Galpin and Matthias Kappler, Android in Practice, DreamTech, 2012

REFERENCES:

1. Beginning iOS 6 Development: Exploring the iOS SDK, David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, Apress, 2013
2. Jeff McWherter and Scott Gowell, Professional Mobile Application Development, Wrox, 2012
3. Beginning Android, Mark L Murphy, Wiley India Pvt Ltd
4. Pro Android, Sayed Y Hashimi and Satya Komatineni, Wiley India Pvt Ltd
5. Teach Yourself Android Application Development In 24 Hours, Edition:I, Publication: SAMS

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(19PE2CB01) CONVERSATIONAL SYSTEMS LABORATORY
(Professional Elective-I Lab)

COURSE OBJECTIVES:

- To introduce basic concepts of NLP libraries
- To enable attendees to acquire knowledge on chatbots and its terminologies
- To work with ML Concepts and different algorithms to build custom ML Model
- To better understand on Conversational experiences and provide better customer experiences related to real time

COURSE OUTCOMES: After completion of the course, the student should be able to
CO – 1: Understand and apply various libraries required for building conversational system
CO – 2: Implement a conversational system using appropriate software and tools
CO – 3: Apply appropriate methodologies for testing conversational systems
CO – 4: Build real time case studies for conversational systems

Week 1 & 2:
Programs on NODE BASICS in python

Week 3 &4:
NLP using Python - Make use of any of the NLP libraries like NLTK, spaCy, StanfordNLP

Week 5 & 6:
Case study to build a Text Chat Bot

Week 7 & 8:
Case study to build a Voice Chat Bot

Week 9 & 10:
Case study to build a learning Chat Bot

Week 11 & 12:
Case study to build virtual assistant

Week 13 & 14:
Case Study to build a ML Model using LSTM/any RNN and integrate with chatbot

TEXT BOOKS:

1. Designing Voice User Interfaces: Principles of Conversational Experiences 1st Edition by Cathy Pearl, O'Reilly
2. Bot Business 101: How to start, run & grow your Bot / AI business By Ekim Kaya
3. Designing Bots: Creating Conversational Experiences By Amir Shevat O'Reilly
4. Conversational Interfaces: Principles of Successful Bots, Chatbots & Messaging Apps By Mariya Yao
5. Designing Conversational Interfaces By Alper Çuğun

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(19PE2CB02) CLOUD, MICROSERVICES AND APPLICATIONS LABORATORY
(Professional Elective-1 Lab)

COURSE OBJECTIVES:

- To develop web applications in cloud
- To learn the design and development process involved in creating a cloud based application
- To learn to implement and use parallel programming using Hadoop
- To Manipulate large data sets in a parallel environment

COURSE OUTCOMES: After completion of the course, the student should be able to

CO – 1: Configure various virtualization tools such as Virtual Box, VMware workstation

CO – 2: Design and deploy a web application in a PaaS environment

CO – 3: Learn how to simulate a cloud environment to implement new schedulers

CO – 4: Install and use a generic cloud environment that can be used as a private cloud. Manipulate large data sets in a parallel environment

WEEK 1 & 2:

Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.

WEEK 3:

Install a C compiler in the virtual machine created using virtual box and execute Simple Programs

WEEK 4:

Install Google App Engine. Create hello world app and other simple web applications using python/java.

WEEK 5:

Use GAE launcher to launch the web applications.

WEEK 6 & 7:

Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.

WEEK 8 & 9:

Find a procedure to transfer the files from one virtual machine to another virtual machine.

WEEK 10 & 11:
Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)

WEEK 12 & 13:
Install Hadoop single node cluster and run simple applications like wordcount.

WEEK 14:
Internal Exam

TEXT BOOKS:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011
2. Cloud Computing Virtualization Specialist Complete Certification Kit - Study Guide Book, Ivanka Menken Gerard Blokdijk, 2009
3. Cloud Security: A Comprehensive Guide to Secure Cloud Computing By Ronald L. Krutz, Russell Dean Vines

REFERENCES:

1. Cloud Computing: A Practical Aprroach, Anthony T.Velte, TobeJ.Velte, Robert Elsenpeter, Publication Person Education, 2009
2. Storage Virtualization: Technologies for Simplifying Data Storage and Management, Tom Clark,Addison-Wesley, 2005
3. Cloud Computing Technologies and Strategies of the Ubiquitous Data Center, Curtis Franklin Jr.Brian J.S. Chee, 2010
4. Introduction to Cloud Computing: Business & Technology, Timothy Chou,2009

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(19PE2CB03) MACHINE LEARNING LABORATORY
(Professional Elective-1 Lab)

COURSE OBJECTIVES:

- To introduce students to the basic concepts and techniques of Machine Learning
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability-based and Generalized learning techniques
- To understand ensemble models of machine learning algorithms

COURSE OUTCOMES: After completion of the course, the student should be able to:
CO-1: Distinguish between, supervised, unsupervised and semi-supervised learning
CO-2: Apply the appropriate machine learning strategy for any given problem
CO-3: Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
CO-4: Modify existing machine learning algorithms to improve classification efficiency

WEEK 1:
Introduction to WEKA

WEEK 2:
Introduction to Python and Python Libraries- NumPy, Pandas, Matplotlib, Scikit

WEEK 3:
Perform Data exploration and pre-processing in Python
Perform Feature Engineering and Feature Selection Methods.

WEEK 4:
Implement regularized Linear regression
Implement regularized logistic regression

WEEK 5:
Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample

WEEK 6:
Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets

WEEK 7:
Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task.

WEEK 8:
Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.

WEEK 9:
Build model using SVM with different kernels
Implement Perceptron Learning Algorithm.
Build models using different Ensemble techniques

WEEK 10:
Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library lasses/API in the program.

WEEK 11:
Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Python ML library classes can be used for this problem.

WEEK 13:
Build model to perform Clustering using K-means after applying PCA and determining the value of K using Elbow method.
Build a model to perform hierarchical Clustering.

WEEK 14:
Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs
Mini projects in the Lab:
(1) Implementation of one clustering algorithm
(1) Implementation of one association rule mining algorithm
(2) Implementation of one anomaly detection algorithms
(3) Implementation of EM algorithm for some specific problem

TEXT BOOKS:

1. Machine Learning, Tom M. Mitchell, vMcGraw-Hill
2. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007

REFERENCES:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis
2. Machine Learning: The art and science of algorithms that make sense of data, Peter Flash, Cambridge, University press
3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009

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(19PC2CB07) DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY

COURSE OBJECTIVES:

- To analyse the asymptotic performance of algorithms
- To demonstrate a relationship between major algorithms and data structures
- To apply important algorithmic design paradigms and methods of analysis
- To implement problems using different algorithm design paradigms

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Ability to analyze the performance of algorithms
CO-2: Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs
CO-3: Implement efficient algorithms for a specified application
CO-4: Strengthen the ability to identify and apply the suitable algorithm for the given real-world problem

WEEK 1:
Implement and analyze time complexity in best & worst case for Binary Search, Quick Sort

WEEK 2:
Implement and analyze time complexity in best & worst case for
Merge Sort, Stassen Matrix Multiplication

WEEK 3:
Implement and analyze time complexity of Greedy Application Problems.

WEEK 4:
Implement and analyze time complexity of Dynamic Programming Application Problems.

WEEK 5:
Implement and analyze time complexity of Greedy Application Problems, Prims & Kruskal's Algorithms

WEEK 6:
Implement and analyze time complexity of Backtracking Application Problems.

WEEK 7:
Implement and analyze time complexity of Branch & Bound Application Problems.

WEEK 8:
Implement and analyze time complexity of BFS and DFS and their applications.

WEEK 9:
Implement and analyze time complexity of Dijkstra and Floyd Warshall Algorithms.

WEEK 10:
Implement and analyze time complexity of Topological sorting, Network Flow Problems.

WEEK 11&12:
Implement sample problem on P, NP, NP complete and NP hard

WEEK 13&14:
Implement and analyze time complexity of Randomized Quick Sort.

TEXT BOOKS:

1. Fundamental of Computer Algorithms, E. Horowitz and S. Sahni
2. The Design and Analysis of Computer Algorithms, A. Aho, J. Hopcroft and J. Ullman

REFERENCES:

1. Introduction to Algorithms, T. H. Cormen, C. E. Leiserson and R. L. Rivest
2. Computer Algorithms: Introduction to Design and Analysis, S. Baase
3. The Art of Computer Programming, Vol. 1, Vol. 2 and Vol. 3, D. E. Knuth

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(19PC2CB08) COMPUTER NETWORKS LABORATORY

COURSE OBJECTIVES:

- To learn and use network commands
- To learn and understand various error correction and detection mechanisms, socket programming
- To implement and analyze various network protocols
- To learn and use simulation tools

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Implement error correction and error detection mechanisms
CO-2: Acquire the required skill to design simple computer networks
CO-3: Implement socket programming
CO-4: Use simulation tools to analyze the performance of various network protocols

WEEK 1:
Basic Networking commands

WEEK 2:
Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16

WEEK 3:
Implement the data link layer framing methods such as character stuffing and bit stuffing.

WEEK 4:
Establishing a network between computers.

WEEK 5:
Configuring FTP Server for file sharing.

WEEK 6:
Implement Dijkstra's algorithm to compute the Shortest path through a graph.

WEEK 7:
Study of Socket Programming and Client – Server model

WEEK 8:
Write a HTTP web client program to download a web page using TCP sockets.

WEEK 9:
Implementation of Subnetting

WEEK 10:
Study of Network Simulators

WEEK 11:
Applications using TCP and UDP Sockets like a. DNS b. SNMP c. File Transfer

WEEK 12:
Write a program to implement RPC (Remote Procedure Call)

WEEK 13:
Study of TCP/UDP performance using Simulation tool.

WEEK 14:
Simulation of Distance Vector/ Link State Routing algorithm.

WEEK 15:
Lab internal

TEXT BOOKS:
1. Computer Networks, A. Tannenbaum
2. Data and Computer Communication, William Stallings

REFERENCES:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. Data Communications and Networking – Behrouz A. Forouzan, 4thEdition TMH, 2006

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(19PW4CB01) INTERNSHIP

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Gain exposure to the current technological developments relevant to the subject area of training
CO-2: Apply the technical knowledge in real industrial situations
CO-3: Promote academic, professional and/or personal development
CO-4: Demonstrate effective communication skills through oral presentation
CO-5: Engage in effective written communication through internship report

COURSE OUTLINE:

- A student shall take up 01 credit summer internship in an industry/research organization/institution during the summer vacation after fourth semester (II year II semester) of the B.Tech. programme.
- Internship shall be carried out for a minimum period of 02 weeks and maximum of 04 weeks.
- Evaluation of the Internship shall be done by a review committee consisting of the Head of the Department, faculty supervisor and a senior faculty member of the department. A student shall submit a detailed report regarding the internship and present it before the review committee for evaluation.

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	2	**1**	**3**

(19PC1CB12) COMPILER DESIGN

COURSE OBJECTIVES

- To illustrate different phases of compilation and its uses
- To describe various steps and techniques involved in parsing
- To learn compiler optimization methods to improve the intermediate code
- To generate code for the optimized code

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the major phases of compilation
CO-2: Construct the parse tree for checking the grammatical errors
CO-3: Construct the intermediate code representations and apply the code optimization techniques on intermediate code for its improvement
CO-4: Construct the target code on improved intermediate code

UNIT – I:
Introduction: Phases of compilation and overview. Lexical Analysis (scanner): Regular languages, finite automata, regular expressions, relating regular expressions and finite automata, scanner generator (lex, flex).

UNIT – II:
Syntax Analysis (Parser): Context-free languages and grammars, push-down automata, LL(1) grammars and top-down parsing, operator grammars, LR(O), SLR(1), LR(1), LALR(1) grammars and bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator (yacc, bison)

UNIT – III:
Semantic Analysis: Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree.

UNIT – IV:
Symbol Table: Basic structure, symbol attributes and management.
Run-time environment: Procedure activation, parameter passing, value return, memory allocation, scope.
Intermediate Code Generation: Translation of different language features, different types of intermediate forms.

UNIT – V:
Code Improvement (optimization): control-flow, data-flow dependence etc.; local optimization, global optimization, loop optimization, peep-hole optimization etc.
Architecture dependent code improvement: instruction scheduling (for pipeline), loop optimization (for cache memory) etc. Register allocation and target code generation.

UNIT – VI:
Advanced topics: Type systems, data abstraction, compilation of Object-Oriented features and non-imperative programming languages.

TEXT BOOKS:

1. Compilers: Principles, Techniques and Tools, V. Aho, R. Sethi and J. Ullman
2. Lex & Yacc, Levine R. John, Tony Mason and Doug Brown

REFERENCES:

1. The Design and Evolution of C++, Bjarne Stroustrup
2. Modern Compiler Design- Dick Grune, Henry E. Bal, Cariel T. H. Jacobs, Wiley dreamtech

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(19PC1CB13) ARTIFICIAL INTELLIGENCE

COURSE OBJECTIVES:

- To understand the major areas and challenges of AI
- To introduce basic AI algorithms to solve problems for a given case study
- To describe various knowledge representation techniques
- To understand the concepts of planning techniques

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Provide a strong foundation of fundamental concepts in Artificial Intelligence

CO-2: Implement different search strategies and solve problems by applying a suitable search method

CO-3: Design, implement and apply various knowledge representation techniques for a suitable case study

CO-4: Explore various concepts of reasoning, learning, and planning techniques for real time applications

UNIT – I:

Introduction, Overview of Artificial intelligence: Problems of AI, AI technique, Tic - Tac - Toe problem. Intelligent Agents, Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents.

UNIT – II:

Problem Solving, Problems, Problem Space & search: Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.

UNIT – III:

Search techniques: Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Heuristic search strategies Greedy best-first search, A* search, AO* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search.

UNIT – IV:

Constraint satisfaction problems: Local search for constraint satisfaction problems. Adversarial search, Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.

UNIT – V:

Knowledge & reasoning: Knowledge representation issues, representation & mapping, approaches to knowledge representation. Using predicate logic, representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction. Representing knowledge using rules, Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge.

UNIT – VI:

Probabilistic reasoning: Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Planning Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques.

Expert Systems: Representing and using domain knowledge, expert system shells, and knowledge acquisition.

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach
2. Artificial Intelligence, Russel, Pearson

REFERENCES:

1. Artificial Intelligence, Ritch & Knight, TMH
2. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI
3. Logic &Prolog Programming, Saroj Kaushik, New Age International
4. Expert Systems, Giarranto, VIKAS

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(19PC1CB14) INFORMATION SECURITY

COURSE OBJECTIVES

- To understanding of security parameters and access control mechanisms
- To introduce the student to the security polices & principals
- To provide an opportunity to learn system design and logic based system principles
- To get an idea of Operating system and Database security

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Develop of security parameters and access control mechanisms
CO-2: Learn major concepts, principals involved security Policy
CO-3: Analyze system design and logic based system principles
CO-4: Illustrate Operating system and Database security

UNIT – I:
Overview of Security Parameters: Confidentiality, integrity and availability; Security violation and threats; Security policy and procedure; Assumptions and Trust; Security Assurance, Implementation and Operational Issues; Security Life Cycle.

UNIT – II:
Access Control Models: Discretionary, mandatory, roll-based and task-based models, unified models, access control algebra, temporal and spatio-temporal models.

UNIT – III:
Security Policies: Confidentiality policies, integrity policies, hybrid policies, non-interference and policy composition, international standards.

UNIT – IV:
Systems Design: Design principles, representing identity, control of access and information flow, confinement problem. Assurance: Building systems with assurance, formal methods, evaluating systems.

UNIT – V:
Logic-based System: Malicious logic, vulnerability analysis, auditing, intrusion detection. Applications: Network security, operating system security, user security, program security. Special Topics: Data privacy, introduction to digital forensics, enterprise security specification.

UNIT – VI:
Operating Systems Security: Security Architecture, Analysis of Security in Linux/Windows.
Database Security: Security Architecture, Enterprise security, Database auditing.

TEXT BOOKS:

1. Security Engineering, Ross Anderson
2. Computer Security: Art and Science, M. Bishop, Pearson Education
3. Information Security: Principles and Practice, M. Stamp

REFERENCES:

1. Security in Computing, C.P. Pfleeger, S.L. Pfleeger, J. Margulies
2. Secure Programming HOWTO, David Wheeler
3. Browser Security Handbook, Michael Zalewski
4. Handbook of Database Security, M. Gertz, S. Jajodia

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(19PE1CB04) MODERN DAY ROBOTICS AND ITS INDUSTRIAL APPLICATIONS

COURSE OBJECTIVES:

- To acquire Knowledge about the modern-day robotics
- To understand the computer vision in robotics
- To learn the basic knowledge of Artificial Intelligence
- To acquire Knowledge on cloud computing, big data, data science and python

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand basic concepts and technological advancements in AI and robotics
CO-2: Develop skills of using advanced software for solving practical problems in robotics pertaining to various industries
CO-3: Understand and apply several statistical analysis techniques and business analytics for cognitive robotics
CO-4: Understand and apply the programming of robots using python and R languages

UNIT – I:
Introduction to Modern Day Robotics and their Industrial Applications: Industry 4.0 Concept: Background and Overview-Industry 4.0 technologies: implementation patterns in manufacturing companies-Evolution of Industrial Robots and their Applications-Advancements in Robotics and Its Future Uses-Types of robotics in various fields for applications

UNIT – II:
Technologies essential for Cognitive Robotics: Computer systems and Technologies relevant to modern day robotics-Robotic Process Automation: Overview of RPA and its applications-RPA, AI, and Cognitive Technologies for Leaders-Introduction to Robotics: Analysis, Control, Applications

UNIT – III:
Introduction to computer vision and application of Vision Systems in Robotics: Concepts of computer vision and the how vision systems are becoming essential part of Robotics-Computer Vision: Models, Learning, and Inference -Mastering Computer Vision with TensorFlow 2.x: Build advanced computer vision applications using machine learning and deep learning techniques- Machine Vision Applications-
Application areas for vision systems-Robot inspection case study-Autonomous driving using 3D imaging case study.

UNIT – IV:
AI in the context of Cognitive Robotics and Role of AI in Robotics: Foundation for Advanced Robotics and AI- A Concept for a Practical Robot Design Process- Demo to train A Robot Using AI - Deep learning core applications-Deep learning business applications
Data Science and Big Data in the context of Cognitive Robotics: Cognitive Technologies: The Next Step Up for Data and Analytics in robotics-Cognitive Deep Learning Technology for Big Data Cognitive Assistant Robots for Reducing Variability in Industrial Human-Robot Activities

Artificial Intelligence and Robotics - The Review of Reliability Factors Related to Industrial Robots -Failure analysis of mature robots in automated production- Data Analytics for Predictive Maintenance of Industrial Robots - Failure Is an Option: How the Severity of Robot Errors Affects Human-Robot Interaction

UNIT – V:

Concepts of Cloud computing, cloud platforms and it applications in Robotics: Learning Cloud Computing: Core Concepts - Cloud Computing: Private Cloud Platforms -Robot as a Service in Cloud Computing -Cloud Computing Technology and Its Application in Robot Control - A Comprehensive Survey of Recent Trends in Cloud

Robotics Architectures and Applications - Google's cloud robotics and high computing needs of industrial automation and systems-The role of cloud and opensource software in the future of robotics-The Power of Cloud Robotics by Robotics Industry Association

UNIT – VI:

Basics of Robotic operating System: ROS for beginners an overview- Introduction to the Robot Operating System (ROS) Middleware - Secure communication for the Robot Operating System - An Introduction to Robot Operating System: The Ultimate Robot Application Framework by Adnan

Quality of Service and Cybersecurity Communication Protocols -Analysis for the Robot Operating System

Robotics systems communication- Threat modelling using ROS

Towards cloud robotic system: A case study of online co-localization for fair resource competence-A Case Study on Model-Based Development of Robotic Systems using Monti Arc with Embedded Automata

Introduction to Python and R Programming in the context of Robotics: Introduction to Python - Python Functions for Data Science-Basic ROS Learning Python for robotics-An introduction to R -The R in Robotics rosR: A New Language Extension for the Robot Operating System-

TEXT BOOKS:

1. Introduction to Robotics: Analysis, Control, Applications, Saeed Benjamin Niku, 2nd Edition, Wiley Publishers, 2011
2. Computer Vision: Models, Learning, and Inference, Simon J. D. Prince, Cambridge University Press, 2012
3. Artificial Intelligence for Robotics: Build Intelligent Robots that Perform Human Tasks Using AI Techniques, Francis X. Govers, Packt publishing, 2018

REFERENCES:

1. Mastering Computer Vision with TensorFlow 2.x: Build Advanced Computer Vision Applications Using Machine Learning and Deep Learning Techniques, Krishnendu Kar, Packt publishing, 2020
2. Introduction to Deep Learning Business Applications for Developers from Conversational Bots in Customer Service to Medical Image processing, Armando Vieira, Bernardete Ribeiro, Apress,2018

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19PE1CB05) MODERN WEB APPLICATIONS

COURSE OBJECTIVES:

- To enable students to develop modern web application by leveraging latest technologies
- To build strong foundation in students making them job ready as per industry requirements
- To enable them to learn new technologies by applying foundation paradigms
- To building strong expertise to develop end to end application - web frontend and backend development

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Build static and dynamic web pages with HTML, XML, JSON
CO-2: Create Dynamic web pages using CSS and Java Script
CO-3: Understand the concepts, analyse and build interactive web applications
CO-4: Apply various frameworks of web technologies to optimize the applications

UNIT – I:
Introduction: Concept of website, its need and purpose, Types of websites: Static and dynamic website, Introduction to HTML, XML, JSON, Web Browsers, − Web Servers, Uniform Resource Locator, Tools and Web Programming Languages. Web Standards, Tiered Architecture: Client Server Model, Three Tier Model, Service Oriented Architectures, REST services

UNIT – II:
Hypertext Mark Up Language: Languages used for website development, HTML5: basic tags, formatting tags, Adding images, Lists, Embedding multimedia in Web pages, Inserting tables, Internal and External Linking, Frames, Forms

UNIT – III:
Cascading Style Sheets (CSS3): Basics of Cascading Style sheets, Advantages of CSS, External Style sheet, Internal style sheet, Inline style sheet, CSS Syntax, color, background, Font, images

UNIT – IV:
Java Script: Features of JavaScript, extension of JavaScript, Syntax of JavaScript: data types, operators, variables, tag, Document Object Model (DOM) with JavaScript, Selection Statement using if and Switch, Iterative statement: for, for/in, while, do while, break and continue

UNIT – V:
Front End Framework: Introduction to jQuery - Syntax, Selectors, Events, Traversing, AJAX; Introduction to Bootstrap – Basics, Grids, Themes; Angular JS – Expressions, Modules, Data Binding, Scopes, Directives & Events, Controllers, Filters, Services, Validation

UNIT – VI:
Back End Technologies: Introduction to RESTful services, Resources, Messages (Request, Response), Addressing, Methods – (GET, POST, PUT, DELETE)

TEXT BOOKS:

1. Internet and World Wide Web: How to Program, Deitel P. J., Deitel H. M. and Deitel A. 5th Edition, Pearson Prentice Hall, 2012
2. HTML & CSS: Design and Build Websites, Jon Duckett, John Wiley & Sons

REFERENCES:

1. Programming the World Wide Web, Sebesta R. W, 8th edition, Pearson, 2014
2. Web Engineering: a practitioner's approach, Pressman R. and Lowe D,1st Edition, Mc GrawHill, 2008
3. Web Engineering: The Discipline of systematic Development of Web Applications, Kappel G., et al, 1st Edition, John Wiley & Sons, 2006
4. Web Engineering: Principles and Techniques, Suh W,Idea Group Inc, 2005
5. PHP for the Web: Visual Quick Start Guide, Ullman L, 5th Edition, Peachpit Press, 2016

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19PE1CB06) DATA MINING AND ANALYTICS

COURSE OBJECTIVES:

- To introduce the basic concepts and techniques Data Mining
- To apply pre-processing statistical methods for any given raw data
- To develop skills of using recent data mining software for solving practical problems
- To understand and apply several statistical analysis techniques: regression, ANOVA, data reduction

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Assess raw input data and process it to provide suitable input for a range of data mining algorithms.
CO-2: Discover and measure interesting patterns from different kinds of databases
CO-3: Evaluate and select appropriate data-mining algorithms and apply, interpret and report the output appropriately
CO-4: Perform statistical analysis on variety of data

UNIT – I:
Introduction to Data Mining: What is data mining? Related technologies - Machine Learning, DBMS, OLAP, Statistics, Stages of the Data Mining Process, Data Mining Techniques, Knowledge Representation Methods, Applications

UNIT – II:
Data preprocessing: Data cleaning, Data transformation, Data reduction, Discretization and generating concept hierarchies, Installing Weka 3 Data Mining System, Experiments with Weka - filters, discretization
Data Mining Knowledge Representation: Task relevant data, Background knowledge, Representing input data and output knowledge, Visualization techniques
Attribute-Oriented Analysis: Attribute generalization, Attribute relevance, Class comparison, Statistical measures

UNIT – III:
Data mining algorithms: Association rules: Motivation and terminology, Example: mining weather data, Basic idea: item sets, Generating item sets and rules efficiently, Correlation analysis
Data Mining Algorithms - Classification: Basic learning/mining tasks, Inferring rudimentary rules: 1R, algorithm, Decision trees, covering rules
Data Mining Algorithms – Prediction: The prediction task, Statistical (Bayesian) classification, Bayesian networks, Instance-based methods (nearest neighbor), linear models

UNIT – IV:
Descriptive analytics: Data Modeling, Trend Analysis, Simple Linear Regression Analysis
Forecasting models: Heuristic methods, predictive modeling and pattern discovery,
Logistic Regression: Logit transform, ML estimation, Tests of hypotheses, Wald test, LR test, score test, test for overall regression, multiple logistic regression, forward, backward method, interpretation of parameters, relation with categorical data analysis. Interpreting Regression Models, Implementing Predictive Models
Generalized Linear model: link functions such as Poisson, binomial, inverse binomial, inverse Gaussian, Gamma.

Non-Linear Regression (NLS): Linearization transforms, their uses & limitations, examination of non-linearity, initial estimates, iterative procedures for NLS, grid search, Newton-Raphson, steepest descent, Marquardt's methods. Introduction to semiparametric regression models, additive regression models. Introduction to nonparametric regression methods

UNIT – V:

Time Series Analysis: Auto - Covariance, Auto-correlation and their properties. Exploratory time series analysis, Test for trend and seasonality, Exponential and moving average smoothing, Holt – Winter smoothing, forecasting based on smoothing

Linear time series models: Autoregressive, Moving Average, Autoregressive Moving Average and Autoregressive Integrated Moving Average models; Estimation of ARMA models such as Yule-Walker estimation for AR Processes, Maximum likelihood and least squares estimation for ARMA Processes, Forecasting using ARIMA models

UNIT – VI:

Prescriptive Analytics: Mathematical optimization, Networks modeling-Multi-objective optimization-Stochastic modeling, Decision and Risk analysis, Decision trees.

TEXT BOOKS:

1. Data Mining: Concepts and Techniques, Jiawei Han and Micheline Kamber, Morgan Kaufmann Publishers, 3rd Edition, 2010
2. Data Mining and Knowledge Discovery Handbook, Lior Rokach and Oded Maimon, Springer, 2nd Edition, 2010
3. Time Series Analysis, Forecasting and Control, Box, G.E.P and Jenkins G.M, Holden-Day, 1970

REFERENCES:

1. Applied Regression Analysis, Draper, N. R. and Smith, H, (John Wiley) 3rd Edition, 1998
2. Applied Logistic Regression, Hosmer, D. W. and Lemeshow, S, Wiley, 1989

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19OE1CB04) FINANCIAL AND COST ACCOUNTING

COURSE OBJECTIVES:

- To apply the basic accounting concepts & conventions and to analyse financial position of business enterprise
- To enumerate with the preparation of books of accounts and application of important accounting standards
- To acquaint with the different types of costing and cost management
- To explain about company accounts and audit reports

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Create an awareness about the importance and usefulness of the accounting concepts and their managerial implications
CO-2: prepare and develop an understanding of the financial statements and the underlying principles and learn to interpret financial statements
CO-3: Create an awareness about cost accounting, different types of costing and cost management
CO-4: Analyse and interpret the company accounts and audit reports

UNIT – I:
Accounting Concept: Introduction, Techniques and Conventions, Financial Statements- Understanding & Interpreting Financial Statements

UNIT – II:
Accounting Process: Book Keeping and Record Maintenance, Fundamental Principles and Double Entry, Journal, Ledger, Trial Balance, Balance Sheet, Final Accounts, Cash Book and Subsidiary Books, Rectification of Errors

UNIT – III:
Financial Statements: Form and Contents of Financial Statements, Analyzing and Interpreting Financial Statements, Accounting Standards.
Class Discussion: Corporate Accounting Fraud- A Case Study of Satyam

UNIT – IV:
Cash Flow and Fund Flow Techniques: Introduction, How to prepare, Difference between them

UNIT – V:
Costing Systems: Elements of Cost, Cost Behavior, Cost Allocation, OH Allocation, Unit Costing, Process Costing, Job Costing, Absorption Costing, Marginal Costing, Cost Volume Profit Analysis, Budgets, ABC Analysis
Class Discussion: Application of costing concepts in the Service Sector

UNIT – VI:
Company Accounts and Annual Reports: Audit Reports and Statutory Requirements, Directors Report, Notes to Accounts, Pitfalls

TEXT BOOKS:

1. Accounting: Texts and Cases by Robert N Anthony, David Hawkins, Kenneth Marchant, 13e, McGraw-Hill, 2019

2. Financial Management: Text, Problems and Cases by M Y Khan and P K Jain, 8th Edition, McGraw Hill Education, 2018
3. Cost Accounting by M Y Khan and P K Jain, 2nd Edition, McGraw Hill Education, 2014

REFERENCES:

1. https://www.collegetutor.net/notes/Financial_Management_I_M_Pandey_Book_pdf
2. https://www.pdfdrive.com/cost-accounting-e34374053.html
3. https://www.tcs.com/content/dam/tcs/investor-relations/financial-statements/2019-20/ar/annual-report-2019-2020.pdf

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19OE1CB05) AUGMENTED REALITY AND VIRTUAL REALITY

COURSE OBJECTIVES:

- To understanding of the concepts of Virtual Reality (VR)
- To studying geometric modelling concepts
- To building VR applications
- To perception on future needs

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand geometric modelling and Virtual environment
CO-2: Study about Virtual Hardware and Software
CO-3: Develop Virtual Reality applications
CO-4: Exploring AR and VR Business Cases

UNIT – I:

Introduction to Virtual Reality (VR): Virtual Reality and Virtual Environment: Introduction, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR

UNIT – II:

Geometric Modelling: Introduction, From 2D to 3D, 3D space curves, 3D boundary representation. Generic VR system: Introduction, Virtual environment, Computer environment, VR technology.

UNIT – III:

Introduction to Augmented Reality (AR), Definition and Scope A brief history of AR, Examples, Related Fields, MR continuum, Virtual Reality, Ubiquitous Computing

UNIT – IV:

Tracking, Coordinate Systems, Characteristics of Tracking technology, Stationary Tracking systems, Mobile Sensors.

UNIT – V:

Computer Vision for AR, Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection.

UNIT – VI:

The future-Driving forces of Business Cases, AR developer's Wish List, Tracking AR Outdoors, Interface with Smart Objects

TEXT BOOKS:

1. Virtual Reality Systems, John Vince, Pearson Education Asia, 2007
2. Augmented Reality, Principles and Practices, Dieter Schmalstieg, Tobias Hollerer, Pearson 2017
3. Augmented and Virtual Reality, Anand R., Khanna Publishing House, Delhi

REFERENCES:

1. Visualizations of Virtual Reality, Adams, Tata McGraw Hill, 2000

2. Virtual Reality Technology, Wiley Inter Science, Grigore C. Burdea, Philippe Coiffet, 2nd Edition, 2006
3. Understanding Virtual Reality: Interface, William R. Sherman, Alan B. Craig,
4. Application and Design, Morgan Kaufmann, 2008

WEBLINKS:

1. www.vresources.org
2. www.vresources.org
3. www.w3.org/MarkUp/VRM

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(19OE1CB06) DISTRIBUTED SYSTEMS

COURSE OBJECTIVES:

- To understand foundations of Distributed Systems
- To learn the characteristics of peer-to-peer and distributed shared memory systems
- To learn issues related to clock Synchronization and the need for global state in distributed systems
- To learn distributed mutual exclusion and deadlock detection algorithms and to design a distributed file system to share data and storage resources using a common file system

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply knowledge of distributed systems techniques and methodologies
CO-2: Understand the use of process migration and load balancing approaches
CO-3: Understand Inter process communication and scheduling in distributed systems
CO-4: Understand Distributed File Systems and Distributed Shared Memory

UNIT – I:
Introduction: Introduction to distributed systems Architecture for Distributed System, Goals of Distributed system, Hardware and Software concepts, Distributed Computing Model, Advantages& Disadvantage distributed system, Examples of Distributed Systems, Trends in Distributed Systems, Challenges.

UNIT – II:
Process & Resource Management: Process Management: Process Migration: Features, Mechanism - Threads: Models, Issues, Implementation. Resource Management: Introduction- Features of Scheduling Algorithms –Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.

UNIT – III:
Memory Management in Distributed System: Basic Concept of Distributed Share Memory (DSM), DSM Architecture & its Types, Design & Implementations issues In DSM System, Structure of Share Memory Space, Consistency Model, and Thrashing.

UNIT – IV:
Inter Process Communication in Distributed System: Data Representation & Marshaling, Group Communication, Client Server Communication, RPC-Implementing RPC Mechanism, Stub Generation, RPC Messages, Synchronization: - Clock Synchronization, Mutual Exclusion, Election Algorithms, Bully & Ring Algorithms.

UNIT – V:
Distributed Scheduling and Deadlock Distributed Scheduling- Introduction - Clocks, events and process states, Logical time and logical clocks - Global states – Coordination and Agreement – Introduction - Distributed mutual exclusion. Deadlock-Issues in deadlock detection & Resolutions, Deadlock Handling Strategy, Distributed Deadlock Algorithms.

UNIT – VI:

File Management in Distributed System: Desirable features of good Distributed File System, Introduction File service architecture – Andrew File system, File Accessing Model, File Sharing semantics, File Catching Scheme, File Application Naming: - Features, System Oriented Names, Object Locating Mechanism, Human Oriented Name.

TEXT BOOKS:

1. Distributed Systems: Principles and Paradigms, Tanenbaum A.S., Van Steen M., Pearson Education, 2007
2. Distributed Systems Concepts and Design, George Coulouris, Jean Dollimore and Tim Kindberg, 5th Edition, Pearson Education, 2012

REFERENCES:

1. Distributed Operating Systems: Concepts and Design,Pradeep K Sinha, Prentice Hall of India, 2007
2. Distributed Computing, Principles and Applications, Liu M.L., Pearson Education, 2004
3. Advance Concept in Operating System, Singhal & Shivratari, McGraw Hill
4. Distributed Computing, Attiya & Welch, Wiley Pub

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	0	**2**	**1**

(19PE2CB04) MODERN DAY ROBOTICS AND ITS INDUSTRIAL APPLICATIONS LABORATORY

COURSE OBJECTIVES:

- To give a novice understanding of robotics using R and Python
- To expose students to the different types of robot designing and how to analyze the process
- Understand the role of each virtual components in robot system
- Acquire knowledge in R, Python to designing the robot for different applications

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Explore basic, standard control techniques like mobile robot, path planning, etc
CO-2: Learn the robot design, control and analysis
CO-3: Design, develop and commissioning of robotic models for desired applications
CO-4: Understand the different types of robot design and analyzing methods

LIST OF EXPERIMENTS

1. Design of mobile robot
2. Design of 3 link robot model.
3. Design of obstacle avoiding robot
4. Design and Implementation of robot vision for shape identification.
5. Design of line following robot
6. Robot programming and simulation for pick and place.
7. Robot programming and simulation for machining (cutting, welding).
8. Robot programming and simulation for any industrial process (Packaging, Assembly)
9. Robot programming and simulation for multi process.
10. Robot Programming for path planning

TEXT BOOKS:

1. Introduction to Robotics: Analysis, Control, Applications, Saeed Benjamin Niku, Wiley Publishers, 2nd Edition,2011
2. Computer Vision: Models, Learning, and Inference, Simon J. D. Prince, Cambridge University Press, 2012

REFERENCES:

1. Artificial Intelligence for Robotics: Build Intelligent Robots that Perform Human Tasks Using AI Techniques, Francis X. Govers, Packt publishing, 2018
2. Mastering Computer Vision with TensorFlow 2.x: Build Advanced Computer Vision Applications Using Machine Learning and Deep Learning Techniques, Krishnendu Kar, Packt publishing, 2020
3. Introduction to Deep Learning Business Applications for Developers from Conversational Bots in Customer Service to Medical Image processing, Armando Vieira, Bernardete Ribeiro, Apress, 2018

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	0	**2**	**1**

(19PE2CB05) MODERN WEB APPLICATIONS LABORATORY

COURSE OBJECTIVES:

- To learn various fundamental concepts for developing websites and web based applications
- To know about technology for data transportation among incompatible systems and applications
- To learn about java script, XML
- To design and deploy web application using AJAX

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Build static and dynamic web pages with HTML, java script and Cascading Styles sheets
CO-2: Analyse and Create XML documents and XML Schema
CO-3: Write static and dynamic web pages
CO-4: Understand the concepts, analyse and build interactive web applications using AJAX

Week 1,2 ,3, 4:
Front end to be developed covering all the technologies (HTML5, CSS3, jQuery, AngularJS)

Week 5,6,7,8:
Backend connectivity to be established through RESTful services and must have database connectivity. Sample Application should cover Create, Read, Update, Delete scenarios of data.

Week 9,10:
Develop sample web pages using AJAX

Week 11,12:
Student can choose any backend technologies and database for developing REST services required for the application development. RESTful services should be developed using technologies already familiar. E.g. Java OR C# OR Python etc.

Week 13,14:
Develop web application using all technologies covered in syllabus

TEXT BOOKS:

1. Web Programming, building internet applications, Chris Bates 2nd Edition, WILEY Dreamtech
2. HTML & CSS: Design and Build Websites, Jon Duckett, John Wiley & Sons

REFERENCES:

1. Programming the World Wide Web, Sebesta R. W,8th Edition, Pearson, 2014
2. Pressman R. and Lowe D. (2008) Web Engineering: a practitioner's approach, 1st Edition, Mc GrawHill
3. Web Engineering: The Discipline of systematic, Kappel G., et al, 2006
4. Development of Web Applications, First Edition, John Wiley & Sons
5. PHP for the Web: Visual Quick Start Guide, Ullman L 2016, 5th Edition, Peachpit Press

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	0	**2**	**1**

(19PE2CB06) DATA MINING AND ANALYTICS LABORATORY

COURSE OBJECTIVES:

- To demonstrate the basic concepts and techniques of Data Mining using WEKA machine learning toolkit
- To performing data preprocessing tasks for data mining in WEKA
- To applying various classification algorithms on data sets using the WEKA machine learning toolkit
- To exploring clustering and Association rule techniques using the WEKA

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Evaluate and implement a wide range of emerging and newly adopted methodologies and technologies to facilitate the knowledge discovery
CO-2: Assess raw input data and process it to provide suitable input for a range of data mining algorithms
CO-3: Acquire skills to effectively apply data mining techniques to solve real business problems
CO-4: Design and implement data-mining applications using sample, realistic data sets and modern tools

WEEK 1& 2:
Title: Introduction to the Weka machine learning toolkit
Aim: To learn to use the Weak machine learning toolkit

1. What options are available on main panel?
2. What is the purpose of the the following in Weka:
   i. The Explorer
   ii. The Knowledge Flow interface
   iii. The Experimenter
   iv. The command-line interface
3. Describe the arfffile format.
4. Press the Explorer button on the main panel and load the weather dataset and answer the following questions
   a. How many instances are there in the dataset?
   b. State the names of the attributes along with their types and values.
   c. What is the class attribute?
   d. In the histogram on the bottom-right, which attributes are plotted on the X,Yaxes?
   e. How do you change the attributes plotted on the X,Y-axes?
   f. How will you determine how many instances of each class are present in the Data
   g. What happens with the Visualize All button is pressed?
   h. How will you view the instances in the dataset? How will you save the changes?

WEEK 3&4:

Task-2:

Load the weather dataset and perform the following tasks:

1. Use the unsupervised filter Remove With Values to remove all instances where the attribute 'humidity' has the value 'high'?
2. Undo the effect of the filter.
3. Answer the following questions:
    a. What is meant by filtering in Weka?
    b. Which panel is used for filtering a dataset?
    c. What are the two main types of filters in Weka?
    d. What is the difference between the two types of filters? What is the difference between and attribute filter and an instance filter?
4. Load the iris dataset and perform the following tasks:
    a. Press the Visualize tab to view the Visualizer panel.
    b. What is the purpose of the Visualizer?
    c. Select one panel in the Visualizer and experiment with the buttons on the panel.

WEEK 5 & 6:

Task-3 (a):

Title: Classification using the Weka toolkit

Aim: To perform classification on data sets using the Weka machine learning toolkit

Requirements

Load the 'weather.nominal.arff' dataset into Weka and run Id3 classification algorithm.

Answer the following questions

1. List the attributes of the given relation along with the type details
2. Create a table of the weather.nominal.arff data
3. Study the classifier output and answer the following questions
    a. Draw the decision tree generated by the classifier
    b. Compute the entropy values for each of the attributes
    c. What is the relationship between the attribute entropy values and the nodes of The Decision tree?
4. Draw the confusion matrix? What information does the confusion matrix provide?
5. Describe the following quantities:

1. TP Rate 2. FP Rate
3. Precision 4. Recall

WEEK 7 & 8:

Task-3 (b):

Perform the following preprocessing tasks and apply classification:

1. Load the 'sick.arff' dataset.
2. Apply the supervised discretization filter.
3. What is the effect of this filter on the attributes?
4. How many distinct ranges have been created for each attribute?
5. Apply the unsupervised discretization filter. Do this twice:
    - In this step, set 'bins'=5
    - In this step, set 'bins'=10
    - What is the effect of the unsupervised filter filter on the datset?
6. Run the the Naive Bayes classifier after apply the following filters
    - Unsupervised discretized with 'bins'=5
    - Unsupervised discretized with 'bins'=10
    - Unsupervised discretized with 'bins''=20.
7. Compare the accuracy of the following cases

- Naive Bayes without discretization filters
- Naive Bayes with a supervised discretization filter
- Naive Bayes with an unsupervised discretization filter with different values for the 'bins' attributes.

WEEK 9 & 10:
Task 4:
Title : Performing clustering using the data mining toolkit
Aim : To learn to use clustering techniques
Requirements Perform the following tasks:
1. Load the 'bank.arff' data set in Weka.
2. Run the Simple K-Means clustering algorithm on the dataset
   a. How many clusters are created?
   b. What are the number of instances and percentage figures in each cluster?
   c. What is the number of iterations that were required?
   d. What is the sum of squared errors? What does it represent?
   e. Tabulate the characteristics of the centroid of each cluster.
3. Visualize the results of this clustering (let the X-axis represent the cluster name, and the Y-axis represent the instance number)
   a. Is there a significant variation in age between clusters?
   b. Which clusters are predominated by males and which clusters are predominated by females?
   c. What can be said about the values of the region attribute in each cluster?
   d. What can be said about the variation of income between clusters?
   e. Which clusters are dominated by married people and which clusters are dominated by unmarried people?
   f. How do the clusters differ with respect to the number of children?
   g. Which cluster has the highest number of people with cars?
   h. Which clusters are predominated by people with savings accounts?
   i. What can be said about the variation of current accounts between clusters?
   j. Which clusters comprise mostly of people who buy the PEP product and which ones are comprised of people who do not buy the PEP product?
4. Run the Simple K Means algorithm for values of K (no. of clusters) ranging from 1 to12. Tabulate the sum of squared errors for each run. What do you observe about the trend of the sum of squared errors?
5. For the run with K=12, answer the following questions:
   a. Is there a significant variation in age between clusters?
   b. Which clusters are predominated by males and which clusters are predominated by females?
   c. How do the clusters differ with respect to the number of children?
   d. Which clusters comprise of people who buy the PEP product and which ones are comprised of people who do not buy the PEP product?
   e. Do you see any differences in your ability to evaluate the characteristics of clusters generated for K=6 versus K=12? Why does this difference arise?

WEEK 11 & 12:
Task 5:
Title: Using Weka to determine Association rules
Aim: To learn to use Association algorithms on datasets Requirements
Perform the following tasks:
1. Load the bank-data.csv file.
2. Apply the Apriori association rule algorithm. What is the result?
3. Apply the supervised discretization filter to the age and income attributes.
4. Run the Apriori rule algorithm
5. List the rules that were generated.

WEEK 13 & 14:
Revision and Internal lab

TEXT BOOKS:

1. Data Mining: Concepts and Techniques, Jiawei Han and Micheline Kamber, Morgan Kaufmann Publishers, 3rd Edition, 2010
2. Data Mining and Knowledge Discovery Handbook, Lior Rokach and Oded Maimon, Springer, 2nd Edition, 2010
3. Time Series Analysis, Forecasting and Control, Box, G.E.P and Jenkins G.M. Holden-Day, 1970

REFERENCES:

1. Applied Regression Analysis,Draper, N. R. and Smith, H, (John Wiley) 3rd Edition, 1998
2. Applied Logistic Regression, Hosmer, D. W. and Lemeshow, S, Wiley, 1989

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	0	**2**	**1**

(19PC2CB09) COMIPER DESIGN AND INFORMATION SECURITY LABORATORY

COURSE OBJECTIVES:

- To understand and implement the principles, techniques and tools used in compiler construction process
- To understand the knowledge of Lex & Yaac
- To learn and understand various security polices, user roles and responsibilities
- To examine Analysis of security in Unix/Linux

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the practical approach of how a compiler works
CO-2: Apply the knowledge of Lex & Yacc tools to develop various phases involved in compilation process
CO-3: Acquire the required skill to design and implement security polices, user roles and responsibilities
CO-4: Illustrate security in Unix/Linux

WEEK 1:
Design a Lexical analyzer for a mini language.

WEEK 2:
Introduction to lex tools.

WEEK 3:
Calculate first and follow for the given grammar using C language.
Design Predictive parser for the given grammar.

WEEK 4:
Introduction to YACC.

WEEK 5:
Design Predictive parser for the given language
Design LALR bottom up parser for the above language.

WEEK 6:
Convert the BNF rules into Yacc form and Write code to generate abstract syntax tree.

WEEK 7:
Write program to generate machine code from the abstract syntax tree generated by the parser

WEEK 8:
Study of Network Security fundamentals - Ethical Hacking, Social Engineering practices.

WEEK 9:
Study of System threat attacks - Denial of Services.

WEEK 10:
Study of Sniffing and Spoofing attacks

WEEK 11:
Study of Techniques uses for Web Based Password Capturing, Administration of users, password policies, privileges and roles

WEEK 12:
Study of Different attacks causes by Virus and Trojans

WEEK 13:
Analysis of security in Unix/Linux.

WEEK 14:
Study of security Polices

WEEK 15:
Lab internal

TEXT BOOKS:

1. Principles of compiler design -A.V. Aho .J.D.Ullman; Pearson Education
2. Security Engineering, Ross Anderson
3. Engineering a Compiler-Cooper & Linda, Elsevier

REFERENCES:

1. Information Security: Principles and Practice, M. Stamp
2. lex&yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
3. Modern Compiler Design- Dick Grune, Henry E. Bal, Cariel T. H. Jacobs, Wiley dreamtech
4. Atual Kahate, Cryptography and Network Security, TMH
5. William Stalling, Cryptography and Network security, Pearson

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B.Tech. VI Semester	**L**	**T/P/D**	**C**
	0	**2**	**1**

(19PC2CB10) ARTIFICIAL INTELLIGENCE LABORATORY

COURSE OBJECTIVES:

- To understand the basic concepts in AI
- To apply basic principles of various AI search techniques
- To explore various knowledge representation techniques in AI
- To explore on expert systems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Implement practical approach to solve and apply various search strategies
CO-2: Demonstrate the adversial search techniques
CO-3: Design the use cases for knowledge representation techniques and predicate logic
CO-4: Demonstrate expert systems by using domain knowledge

WEEK 1:
Write a program to solve any problem using depth first search.

WEEK 2:
Write a program to solve any problem using best first search algorithm.

WEEK 3:
Write a program to implement depth limit search.

WEEK 4:
Write a program to solve 4-Queen's problem.

WEEK 5:
Write a program to solve travelling salesman problem.

WEEK 6:
Write a program to implement A*algorithm.

WEEK 7:
Write a program to implement heuristic approach.

WEEK 8:
Write a program to implement tic_tac_toe with min_max algorithm.

WEEK 9:
Solve the logic programming for the mathematical expression using necessary libraries
Hint: pip install kanren, sympy

WEEK 10:
Demonstrate knowledge representation for the following using open source tools:
a. Ram likes mango.
b. Seema is a girl.
c. Bill likes Cindy.

d. Rose is red.
e. John owns gold

WEEK 11:
Simulate use cases in predicate logic by using open source tools.

WEEK 12:
Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

WEEK 13:
Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.

WEEK 14:
Write a program to implement Bayesian network.

TEXT BOOKS:
1. Artificial Intelligence-A modern approach, Staurt Russel and peter Norvig, 1998, PHI
2. Artificial Intelligence, Elaine Rich & Kevin Knight, TMH Publication

REFERENCES:
1. Introduction to AI & Expert Systems, Dan W. Patterson, PHI Publication

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(19HS2EN06) BUSINESS COMMUNICATION AND VALUE SCIENCE-IV

COURSE PRE-REQUISITES: Basic Knowledge of English (verbal and written)

COURSE OBJECTIVES:

- To understand the importance of Diversity in work place
- To recognize the importance of Emotional Intelligence, Multiple Intelligences and Learner Styles
- To develop communicative writing and apply public speaking in real life scenarios
- To recognize the importance of Corporate Social Responsibility, Corporate Etiquette, Stress Management, Time Management and Conflict Management

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Use tools of structured written communication and hone public speaking skills
CO-2: Apply emotional intelligence and knowledge of multiple intelligences and learning styles in real life scenarios
CO-3: Understand the importance of diversity in workplace and corporate social responsibility
CO-4: Identify and practice best time management, stress management practices
CO-5: Recognize and cultivate the attributes needed to function and grow in a corporate environment

UNIT – I:
Communicative Writing

i) Principles of Communicative Writing
ii) Formal and Business letters
iii) Writing proposals
iv) Using charts and graphs in communicative writing
v) Applying communicative writing in real life scenarios

UNIT – II:
Emotional Intelligence

i) Emotional intelligence
ii) Manifestations of Emotional intelligence
iii) Importance of emotional intelligence in personal and professional lives
iv) Ways to Build Emotional intelligence
v) Applying emotional intelligence in real life scenarios- Activity

UNIT – III:
Public Speaking

i) Need for public speaking
ii) Public speaking – best practices
iii) Applying public speaking in real life scenarios
iv) Selling your start-up ideas (activity)
v) Business Storytelling and Doodling methods

UNIT – IV:
Corporate Social Responsibility (CSR)

i) Importance of corporate social responsibility (CSR)

ii) The Need to conduct CSR activities
iii) Stories of corporate social responsibility

Diversity, Multiple Intelligences & Learner styles
iv) Multiple intelligences
v) Learning styles
vi) Applying multiple intelligences and Learning styles in communication

UNIT – V:
Employability Skills-1
i) Attributes required for work and life
ii) Strategic thinking and planning
iii) Decision making
iv) Best practices to share and receive feedback
v) Attributes needed to function and grow in a corporate environment- Image Management

UNIT -VI:
Life Skills-1
i) Stress management
ii) Time Management
iii) Corporate etiquette
vii) Business idioms and Corporate Terms
viii) Conflict Resolution and Conflict Management

TEXT BOOKS:
1. There are no prescribed texts for Semester 6 – there will be handouts and reference links shared

REFERENCES:
1. Emotional Intelligence: Why it Can Matter More Than IQ by Daniel Goleman
2. Putting Emotional Intelligence To Work by Ryback David
3. How to Develop Self Confidence and Improve Public Speaking - Time - Tested Methods of Persuasion by Dale Carnegie
4. TED Talks: The official TED guide to public speaking: Tips and tricks for giving unforgettable speeches and presentations

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(19MN6HS03) GENDER SENSITIZATION

COURSE DESCRIPTION:
This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality. This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features a number of exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

ACTIVITIES:
Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments.

COURSE OBJECTIVES:
- To sensitize students on issues of gender in contemporary India
- To provide a critical perspective on the socialization of men and women
- To expose the students to debates on the politics and economics of work
- To enable students to reflect critically on gender violence
- To expose students to more egalitarian interactions between men and women

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand important issues related to gender in contemporary India
CO-2: Attain a finer grasp of how gender discrimination works in our society and how to counter it
CO-3: Acquire insight into the gendered division of labour and its relation to politics and economics
CO-4: Respond to put an end to gender violence
CO-5: Equipped to work with the other gender treating them as equals

MODULE 1: Introduction to Gender
- Definition of Gender
- Basic Gender Concepts and Terminology
- Exploring Attitudes towards Gender
- Social Construction of Gender

MODULE 2: Gender Roles and Relations
- Types of Gender Roles
- Gender Roles and Relationships Matrix
- Gender-based Division and Valuation of Labour

MODULE 3: Gender Development Issues

- Identifying Gender Issues
- Gender Sensitive Language
- Gender, Governance and Sustainable Development
- Gender and Human Rights
- Gender and Mainstreaming

MODULE 4: Gender-based Violence

- The concept of violence
- Types of Gender-based violence
- The relationship between gender, development and violence
- Gender-based violence from a human rights perspective

MODULE 5: Gender and Culture

- Gender and Film
- Gender and Electronic Media
- Gender and Advertisement
- Gender and Popular Literature

MODULE 6: Gender and Studies

- Knowledge: Through the Lens of Gender Point of View, Gender and the Structure of Knowledge
- Whose History: Questions for Historians and Others, Reclaiming a Past, Writing Other Histories

TEXT BOOK:

1. Towards a World of Equals: A Bilingual Textbook on Gender, A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu, Telugu Akademi, Telangana Government, 2015.

REFERENCES:

1. Sen, Amartya. More than One Million Women are Missing. New York Review of Books 37.20 (20 December 1990). Print. 'We Were Making History...' Life Stories of Women in the Telangana People's Struggle. New Delhi: Kali for Women, 1989.
2. Tripti Lahiri. By the Numbers: Where Indian Women Work. Women's Studies Journal (14 November 2012) Available online at: http://blogs.wsj.com/India real time/2012/11/14/by-the-numbers-where-India-women-work/>
3. Abdulali Sohaila I Fought For My Life ...and Won. Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/
4. K. Kapadia. The Violence of Development: the Politics of Identity, Gender and Social Inequalities in India. London: Zed Books, 2002
5. T. Banuri and M. Mahmood, Just Development: Beyond Adjustment with a Human Face, Karachi: Oxford University Press, 1997

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B.Tech. VII Semester	**L**	**T/P/D**	**C**
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(19PC1CB15) USABILITY DESIGN OF SOFTWARE APPLICATIONS

COURSE OBJECTIVES:

- To create a learning system through which management students can enhance their innovation and creative thinking skills
- To acquaint themselves with the special challenges of starting new ventures
- To use IPR as an effective tool to protect their innovations and intangible assets from exploitation
- To gain expertise in redesigning an existing Application or website for better user experience

COURSE OUTCOMES: After completion of the course, the student shall be able to

CO-1: Explain fundamentals of User Centered Design and User Experience their relevance and contribution to businesses

CO-2: Relate the facets of User Experience (UX) Design, particularly as applied to the digital artefacts

CO-3: Appraise user research, solution conceptualization and validation as interwoven activities in the design and development lifecycle

CO-4: Analyse and identify the methods to offer a better UI experience for the applications

UNIT – I:

Introduction to User Centred Design: Basics of User Centered Design. Aspects of User Centred Design : Product Appreciation Assignment – Evaluating the product from user centred design aspects such as functionality, ease of use, ergonomics, aesthetics.

UNIT – II:

Heuristic Evaluation: 10 Heuristic Principles, Examples Heuristic Evaluation: Group Assignment initiation (Website and App) Evaluation for key tasks of the app or website for heuristic principles, severity, recommendations.

UNIT – III:

Project Design Lifecycle: Redesign project through the design lifecycle – Discovery - Define – Design - Implement (Design Prototype) - Usability Testing

UNIT – IV:

UX Research: Understanding users, their goals, context of use, and environment of use. Research Techniques: Contextual Enquiry, User Interviews, Competitive Analysis for UX

UNIT – V:

Personas and Scenarios: Scenarios and Persona Technique –Overview of Design Thinking Technique - Discovery and brainstorming

UNIT – IV:

Development and Prototyping: Concept Development - Task flow detailing for the Project – Prototyping Techniques - Paper, Electronic, and Prototyping Tools.

TEXT BOOKS:

1. Interaction Design: Beyond Human-Computer Interaction, Jenny Preece, Helen Sharp and Yvonne Rogers 4th Edition,
2. A Practitioner's Guide to User Research, Elizabeth Goodman, Mike Kuniavsky, Andrea Moed, Observing the User Experience, 2nd Edition

REFERENCES:

1. About Face, Alan Cooper and Robert Reimann, 4th Edition,
2. The Elements of User Experience: User-Centered Design for the Web and Beyond, Jesse James Garrett, 2nd Edition
3. Understanding Design Thinking, Lean, and Agile, Jonny Schneider

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	3	**0**	**3**

(19HS1MG06) FINANCIAL MANAGEMENT

COURSE OBJECTIVES:

- To understand the fundamentals of Financial Management and Time Value of Money
- To explain the Valuation of securities and calculation of portfolio of risk and return
- To understand fundamentals of Leverages and how resources are used efficiently, effectively and economically
- To understand cash management and accounts receivables in business firms

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Analyze the concepts of financial management, and importance of Time value of Money, valuation of Securities

CO-2: Apply concepts of Risk and Return such as cost of capital, risk and return, and Financial Leverage

CO-3: Evaluate investment proposals through Capital Budgeting and working capital management

CO-4: Apply the concepts of Cash management of Accounts receivables

UNIT – I:

Introduction: Introduction to Financial Management - Goals of the firm - Financial Environments.

Time Value of Money: Simple and Compound Interest Rates, Amortization, Computing more that once a year, Annuity Factor.

UNIT – II:

Valuation of Securities: Bond Valuation Preferred Stock Valuation, Common Stock Valuation, Concept of Yield and YTM. Risk & Return: Defining Risk and Return, Using Probability Distributions to Measure Risk, Attitudes Toward Risk, Risk and Return in a Portfolio Context, Diversification, The Capital Asset Pricing Model (CAPM)

UNIT – III:

Operating & Financial Leverage: Operating Leverage, Financial Leverage, Total Leverage, Indifference Analysis in leverage study; Cost of Capital: Concept, Computation of Specific Cost of Capital for Equity - Preference – Debt, Weighted Average Cost of Capital – Factors affecting Cost of Capital.

UNIT – IV:

Capital Budgeting: The Capital Budgeting Concept & Process - An Overview, Generating Investment Project Proposals, Estimating Project, After Tax Incremental Operating Cash Flows, Capital Budgeting Techniques, Project Evaluation and Selection - Alternative Methods

UNIT – V:

Working Capital Management: Overview, Working Capital Issues, Financing Current Assets (Short Term and Long Term- Mix), Combining Liability Structures and Current Asset Decisions, Estimation of Working Capital.

UNIT – VI:

Cash Management: Motives for Holding cash, Speeding Up Cash Receipts, Slowing Down Cash Payouts, Electronic Commerce, Outsourcing, Cash Balances to maintain, Factoring; Accounts Receivable Management: Credit & Collection Policies, Analyzing the Credit Applicant, Credit References, Selecting optimum Credit period.

TEXT BOOKS:

1. Financial Management, Prasanna Chandra, Theory & Practice, Tata McGraw Hill
2. Financial Management, M. Y. Khan, P. K. Jain, 8th Edition, McGraw Hill 2018

REFERENCES:

1. Financial Management, Srivastava, Misra, OUP
2. Fundamentals of Financial Management, Van Horne and Wachowicz, Prentice Hall/ Pearson Education
3. Investment Analysis and Management, Charles P. Jones, 9th Edition, 2004

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(19PE1CB07) COGNITIVE SCIENCE AND ANALYTICS

COURSE OBJECTIVES:

- To identify core concepts of data and cognitive analytics for intelligent applications
- To explore language semantics and information processing models
- To focus on engineering principles of cognitive science
- To understand the need of Cognitive engineering for business applications

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Apply basic concepts of data analytics in the field of AI and cognitive engineering

CO-2: Explore the fundamentals of evolution of cognitive science for language semantics, data interpretation and memory processing

CO-3: Demonstrate the concepts of cognitive analytics to develop information processing system for business specifications

CO-4: Analyse deep understanding of learning patterns and cognitive engagement of virtual devices connected in digital environment

UNIT – I:

Foundational Areas of Analytics:

Introduction to Analytics: Definition, Description & Evolution of Analytics, History of Analytics, and Applicability of Analytics with development of Technology and Computer, How Analytics entered mainstream

Concepts of Analytics: Various overlapping concepts and fields of Analytics such as Data Mining, Machine Learning, Artificial Intelligence and Simulation

Emerging Areas in Analytics: Understanding of emerging research areas of Analytics: Mathematical programming, Evolutionary computation, Simulation, Machine learning/data mining, Logic-based models, and, Combinations of categories

Value Chain of Analytics: Descriptive Analytics Covering Exploratory Data Analysis & Basic of Statistics, Diagnostics Analytics: BI/Analysis, Trend, Pattern, Simultaneous **Relationship, Predictive Analytics:** Cause-Effect Relationship and Futuristic prediction in terms of probabilities, Continuous & Categorical Predictions, Simulation, Optimization, Multi-faceted Intelligent Technology driven Analytics combining Machine Intelligence with Human Brain Processing Abilities

UNIT – II:

Foundational Areas of Cognitive Science:

Introduction & Evolution of Cognitive Science: Introduction to the study of cognitive sciences, Brief history of cognitive science development and Methodological concerns in philosophy.

Understand Brain and Sensory Motor Information: Fundamentals of Neuro Science, Processing of sensory information in the brain, and Brain Imaging Elements.

Language & Linguistic Knowledge: Background and details of Syntax & Semantics, Understanding of Generative Linguistic.
Memory & Processing: Theory of Information Processing, Fundamentals of Short term Memory.

UNIT – III:
Data Theory & Taxonomy of Data:
Data as a whole: Understanding of Data as a whole for distinguishing and relating various types of data and Categorization of Data: Structured, Unstructured Data, Quantitative & Qualitative Data.
Views of Data: Understanding Data as an interdisciplinary framework for learning methodologies: covering statistics, neural networks, and fuzzy logic
Measurement & Scaling Concepts: Measurement of variables and commonly used **Statistical Tools:** Number of procedures for measurement of the variables,
Categorization procedures, Scale construction procedures and Techniques of data processing for qualitative as well as quantitative data;
Various types of Scales: Nominal, Ordinal, Interval & Ratio Scales

UNIT – IV:
Multivariate Data Analytics & Cognitive Analytics:
Overview: High level overview of Categorization of Techniques: Inter-dependence Relationship Techniques and Dependence Relationship Techniques
Overview of Commonly Used Inter-dependence Techniques: Factor Analysis, Principal Component Analysis (PCA), Cluster Analysis
Overview of Commonly Used Dependence Techniques: Regression, Logistic Regression
Analytics Value Chain &Application of Analytics across Value Chain:
a. Basic statistical concepts such as Descriptive & Diagnostics statistics, concept of random variables, discrete and continuous random variables, confidence interval, hypothesis testing, analysis of variance and correlation.
b. Predictive analytics techniques such as multiple linear regression, logistic regression, decision tree learning Clustering and forecasting techniques.
c. **Prescriptive analytics Concepts:** linear programming, integer programming, goal programming & stochastic models
d. **Cognitive analytics Concepts:** Text Analytics, Learning Analytics, Data Mining, Cognitive Systems, Cognitive Computing, Learning Data Science, Machine Learning, Big data Analytics and Business analytics

UNIT – V:
Artificial Intelligence & Machine Learning:
Fundamentals of Artificial Intelligence: Various areas of AI:
a. **Knowledge:** Text Analytics, Topic Modelling, Natural Language Processing (NLP), Natural Language Generation (NLG), Natural Language Understanding (NLU), Named-entity recognition (NER)
b. **Perception:** Image Analytics, Video Analytics & Audio Analytics
c. **Memory:** Cognitive Engagement: BOTs, Virtual & Digital Assistants, Augmented Reality, Virtual Reality, Mixed Reality

d. **Learning:** Intelligent Automation

Spectrum of AI

a. **Reactive Machine:** Low memory, works on Known rules, such as Object Detection/Games/Recommendations specific to known Rules

b. **Limited Memory:** Memory used to learn and improve continuously such as Most ML Models, Automated Vehicles

c. **Theory of Mind:** Machine Understands and responds such as BoTs/Virtual/Digital Assistants

d. **Self-Aware:** Human like intelligence such as Super Robots in Space etc.

UNIT – VI:

Approach & Methodology:

World Standard Methodology: CRISP-DM Methodology, SEMMA Methodology

Real Life Work around Multi-Variate Analytics: A few Selected Commonly used Techniques: Predictive & Classification Models, Regression, Clustering

Real Life Work around Artificial Intelligence, Machine Learning and Deep Learning: A few Selected Commonly used Techniques & Algorithms: ANN (Artificial Neural Network), CNN (Convolutional Neural Network), RNN (Recurrent Neural Network);

RN Architecture: LSTM, Bidirectional LSTM, Gated Recurrent Unit (GRU), CTRNN (Continuous Time RNN) CNN Architectures: VGG16, Alexnet, InceptionNet, RestNet, Googlenet

Object Detection Models: R-CNN, Fast R-CNN, Faster R-CNN, cascade R-CNN. Mask RCNN, Single Shot MultiBox Detector (SSD) ,You Only Look Once (YOLO), Single-Shot Refinement Neural Network for Object Detection (RefineDet), Retina-Net

Autoencoders: Denoising Autoencoder, GAN

Transformers: Attention based Encoder and Decoder: Eg- BERT(Bidirectional Encoder Representations from Transformers), Generative Pretrained Transformers GPT-3, GPT-2, BERT, XLNet, and RoBERTa

TEXT BOOKS:

1. Emerging Trends and Applications in Cognitive Computing, Pradeep Kumar Mallick, Samarjeet Borah, IGI Global Publishers, 2019
2. Cognitive Science: An Introduction to the Science of the Mind, Jose Luis Bermudez, Cambridge University Press, New York, 2020
3. Evolution of Analytics, Hall P., Phan W., & Whitson K., O'Reilly Media, 2016

REFERENCES:

1. Cognitive Computing and Big Data Analytics, Judith S. Hurwitz, Marcia Kaufman, Adrian Bowles
2. Learning From Data: Concepts, Theory, and Methods, Cherkassky V, & Mulier F. M. John Wiley & Sons, 2007
3. Business Analytics: The Science of Data-Driven Decision Making, Kumar U. D., Wiley, 2017
4. Practical Deep Learning for Cloud, Mobile, and Edge: Real-World AI & Computer-Vision Projects Using Python, Keras & Tensor Flow, 1st Edition
5. Multivariate Data Analysis, Hair J. F., Anderson R. E., Tatham R. L., & Black W. C. Englewood Cliff, New Jersey, USA, 5(3), 207-2019, 1998

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B.Tech. VII Semester	**L**	**T/P/D**	**C**
	2	**1**	**3**

(19PE1CB08) INTRODUCTION TO IOT

COURSE OBJECTIVES:

- To understand about the fundamentals of Internet of Things and its building blocks along with their characteristics
- To understand the recent application domains of IoT in everyday life
- To understand the protocols and standards designed for IoT and the current research on it
- To understand the other associated technologies like cloud and fog computing in the domain of IoT

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Describe basic concepts of Internet-of-Things , use cases and architecture

CO-2: Relate sensor and industrial systems

CO-3: Analyze Networking and communication for IoT

CO-4: Discuss IoT data processing and storage

UNIT – I:

Introduction to IoT and Use Cases: Understanding basic concepts of IoT, Consumer IoT vs Industrial Internet, Fundamental building blocks, Use Cases of IoT in various industry domains,

UNIT – II:

Architecture: IoT reference architectures, Industrial Internet Reference Architecture, Edge Computing, IoT Gateways, Data Ingestion and Data Processing Pipelines, Data Stream Processing

UNIT – III:

Sensors and Industrial Systems: Introduction to sensors and transducers, integrating sensors to sensor processing boards, introduction to industrial data acquisition systems, industrial control systems and their functions

UNIT – IV:

Networking for IoT: Recap of OSI 7 layer architecture and mapping to IoT architecture, Introduction to proximity networking technologies (ZigBee, Bluetooth, Serial Communication), Industrial network protocols (Modbus, CANbus),

UNIT – V:

Communication for IoT: Communicating with cloud applications (web services, REST, TCP/IP and UDP/IP sockets, MQTT, WebSockets, protocols. Message encoding (JSON, Protocol Buffers)

UNIT – VI:

IoT Data Processing and Storage: Time Series Data and their characteristics, time series databases, basic time series analytics, data summarization and sketching, dealing with noisy and missing data, anomaly and outlier detection,

TEXT BOOKS:

1. The Internet of Things, Samuel Greengard, MIT Press Essential Knowledge Series,
2. The Internet of Things: Enabling Technologies, Platforms, and Use Cases, Pethuru Raj and Anupama C. Raman, CRC Press

REFERENCES:

1. Visualizing Data-Exploring and Explaining Data with the Processing Environment, Ben Fry, O'Reilly Media
2. Raspberry Pi Computer Architecture Essentials, Andrew K. Dennis
3. Getting Started with Arduino, M. Banzi, O Reilly Media

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(19PE1CB09) CRYPTOLOGY

COURSE OBJECTIVES:

- To explain the basic and emerging concepts of cryptography algorithms
- To illustrate and defend against unauthorized access using Authentication process
- To illustrate and defend the security attacks on information systems using secure algorithms
- To evaluate the key concepts of cryptanalysis and quantum cryptography

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Illustrate the need of security to introduce strong cryptosystems and analyse the cryptographic algorithms for information security.

CO-2: Design the authentication schemes for membership authorization.

CO-3: Evaluate the requirements for secure communication and challenges related to the secure applications

CO-4: Provide solutions for security related issues using Post quantum cryptography

UNIT – I:

Introduction to Cryptography: Elementary number theory, Pseudo-random bit generation, Elementary cryptosystems.

Basic Security Services: confidentiality, integrity, availability, non-repudiation, privacy.

UNIT – II:

Basic Symmetric Key Cryptosystems:

Stream Cipher: Basic Ideas, Hardware and Software Implementations, Examples with some prominent ciphers: A5/1, Grain family, RC4, Salsa and ChaCha, HC128, SNOW family, ZUC.

UNIT – III:

Basic Symmetric Key Cryptosystems:

Block Ciphers: DES, AES, Modes of Operation; Hash Functions; Authentication.

UNIT – IV:

Public Key Cryptosystems: RSA, ECC; Digital signatures

UNIT – V:

Security Applications (Selected Topics): Electronic commerce (anonymous cash, micro-payments), Key management, Zero-knowledge protocols, Cryptology in Contact Tracing Applications, Issues related to Quantum Cryptanalysis

UNIT – VI:

Introductory Topics in Post-Quantum Cryptography: Post-Quantum Cryptography, lattice-based cryptography-NTRU Encryption, code-based cryptography-McEliece Cryptosystem, hash-based cryptography

TEXT BOOKS:

1. Cryptography, Theory and Practice, D. R. Stinson, CRC Press
2. Handbook of Applied Cryptography, A. J. Menezes, P. C. van Oorschot and S. A. Vanstone, CRC Press
3. A Course in Number Theory And Cryptography, N. Koblitz, GTM, Springer

REFERENCES:

1. Cryptography and Network Security. W. Stallings, Prentice Hall
2. Security Engineering, R. Anderson, Wiley
3. RC4 Stream Cipher and Its Variants, G. Paul and S. Maitra, CRC Press, Taylor & Francis Group, Chapman & Hall Book, 2012
4. Design & Cryptanalysis of ZUC - A Stream Cipher in Mobile Telephony, C. S. Mukherjee, D. Roy, S. Maitra, Springer, 2020
5. Contact Tracing in Post-Covid World - A Cryptologic Approach, P. Chakraborty, S. Maitra, M. Nandi, S. Talnikar, Springer, 2020

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B.Tech. VII Semester	**L**	**T/P/D**	**C**
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(19PE1CB10) QUANTUM COMPUTATION AND QUANTUM INFORMATION

COURSE OBJECTIVES:

- To understand the fundamental concepts on quantum computing
- To learn how to do computation using basic and advanced quantum algorithms
- To understand random number generators for quantumness
- To understand communication using quantum key distribution and post-quantum cryptography

COURSE OUTCOMES: After completion of the course, students should be able to

CO -1: Identify the concepts related to basic quantum information processing

CO -2: Analyze the behavior of basic and advanced quantum algorithms

CO-3: Explain quantum true random number generators to ensure the strongest level of encryption

CO-4: Choose secure communication using quantum key distribution method and Post-Quantum Cryptography related algorithms

UNIT – I:

Introduction to Quantum Information: States, Operators, Measurements, Quantum Entanglement: Quantum Teleportation, Super-dense coding, CHSH Game, Quantum gates and circuits

UNIT – II:

Quantum Algorithms Basics: Deutsch-Jozsa, Simon, Grover, Shor, Implication of Grover's and Simon's algorithms towards classical symmetric key cryptosystems

UNIT – III:

Quantum Algorithms Advanced: Implication of Shor's algorithm towards factorization and Discrete Logarithm based classical public key cryptosystems

UNIT – IV:

Quantum True Random Number Generators (QTRNG): Detailed design and issues of quantumness, Commercial products and applications

UNIT – V:

Quantum Key Distribution (QKD): BB84, Ekert, Semi-Quantum QKD protocols and their variations, Issues of Device Independence, Commercial products

UNIT – VI:

Introductory Topics in Post-Quantum Cryptography: Is cryptography dead? A taste of post-quantum cryptography .Challenges in post-quantum cryptography. Quantum-resistant public-key cryptographic algorithms(any two) Refer to https://csrc.nist.gov/projects/post-quantum-cryptography. May discuss any two ciphers from this list.

TEXT BOOKS:

1. Quantum Computation and Quantum Information, M. A. Nielsen and I. L. Chuang, Cambridge University Press
2. Presskil Lecture notes: Available online: http://www.theory.caltech.edu/~preskill/ph229/

REFERENCES:

1. An Introduction to Quantum Computing, P. Kaye, R. Laflamme, and M. Mosca, Oxford University Press, New York
2. Quantum Computer Science, N. David Mermin, Cambridge University Press
3. Quantum Algorithms for Cryptographically Significant Boolean Functions - An IBMQ Experience, SAPV Tharrmashastha, D. Bera, A. Maitra and S. Maitra, Springer 2020
4. Handbook of Applied Cryptography, A. J. Menezes, P. C. van Oorschot, and S. A. Vanstone, CRC Press

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester	**L**	**T/P/D**	**C**
	2	**1**	**3**

(19PE1CB11) ADVANCED SOCIAL, TEXT AND MEDIA ANALYTICS

COURSE OBJECTIVES:

- To provide an overview of common text mining and social media data analytic activities
- To understand the complexities of processing text and network data from different data sources
- Understand and apply social media analytics tools.
- To enable students to solve complex real-world problems for sentiment analysis and recommendation systems

COURSE OUTCOMES: After completion of the course, Student should be able to

CO-1: Understand Text Mining and carry out Pattern Discovery, Predictive Modeling

CO-2: Find state of the art web mining tools and libraries on realistic data sets as a basis for business decisions and applications

CO-3: Explore the use of social network analysis to understand the growing connectivity and complexity in the world around us on different scales – ranging from small groups to the World Wide Web

CO-4: Perform social network analysis to identify important social actors, subgroups (i.e., clusters),and network properties in social media sites such as Twitter, Facebook, and YouTube

UNIT – I:

Text Mining: Introduction, Core text mining operations, Preprocessing techniques, Categorization, Clustering, Information extraction, Probabilistic models for information extraction, Text mining applications

UNIT – II:

Methods & Approaches: Content Analysis; Natural Language Processing; Clustering &Topic Detection; Simple Predictive Modeling; Sentiment Analysis; Sentiment Prediction

UNIT – III:

Web Analytics: Web analytics tools, Clickstream analysis, A/B testing, online surveys; Web search and retrieval, Search engine optimization,

UNIT – IV:

Web crawling and Indexing, Ranking algorithms, Web traffic models

UNIT – V:

Social Media Analytics: Social network and web data and methods. Graphs and Matrices. Basic measures for individuals and networks. Information visualization;

UNIT – VI:

Making Connections: Link analysis. Random graphs and network evolution. Social contexts: Affiliation and identity; Social network analysis

Home Assignments:

1. Language Analysis: Students are expected to analyze the language of a category of text (e.g.,literary, academic, social media) of their selection. Based on the analysis, students are expected to provide a critical description of the texts involved and possibly distinguishing them from other texts and/or uncovering relationships or concepts communicated by the text authors.

2. Students are required Perform sentiment analysis using Twitter. Students will be required touse off the-shelf software and/or code of their own to detect sentiment/emotion in the data and write a description of the methods they use and the results.

TEXT BOOKS:

1. The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data, Ronen Feldman and James Sanger, Cambridge University Press, 2006
2. Analyzing Social Media Networks with NodeXL: Insights from a Connected World, Hansen, Derek, Ben Sheiderman, Marc Smith, 2011 Morgan Kaufmann, 304
3. Web Analytics 2.0: The Art of Online Accountability, Avinash Kaushik, 2009

REFERENCES:

1. Introduction to Social Network Method Hanneman, Robert and Mark Riddle, 2005
2. Social Network Analysis: Methods and Applications, Wasserman S. & Faust K. New York, Cambridge University Press, 1994
3. Theories of Communication Networks, Monge P. R. & Contractor N. S, New York, 2003
4. http://nosh.northwestern.edu/vita.html, Oxford University Press
5. Web Data Mining Exploring Hyperlinks, Contents, and Usage Data, Bing Liu, 2nd Edition, Springer, 2011

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B.Tech. VII Semester	**L**	**T/P/D**	**C**
	2	**1**	**3**

(19PE1CB12) MOBILE COMPUTING

COURSE OBJECTIVES:

- To learn about the basic concepts of wireless and mobile infrastructure
- To learn location management, handoff process, narrowband and wide brand spectrum
- To describe current technology trends for the implementation and deployment of Mobile ad hoc and wireless sensor networks
- To design the wireless networks based on the cognitive radios and gives an understanding of cognitive radio architecture and D2D communications in 5G cellular networks

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: To understand the concepts of wireless, mobile infrastructure and to create propagation and path loss models

CO-2: To understand location management, handoff process, narrowband and wideband spectrum.

CO-3: Analyze the functionality of wireless transmission protocols and enables the students to examine the important aspects of Mobile Ad hoc Networks and wireless sensor networks

CO-4: Design and understand the wireless networks based on the cognitive radios, and to explain the concepts behind D2D communications in 5G Cellular networks

UNIT – I:

Introduction: Overview of wireless and mobile infrastructure; Preliminary concepts on cellular architecture; Design objectives and performance issues; Radio resource management and interface; Propagation and path loss models; Channel interference and frequency reuse; Cell splitting; Channel assignment strategies; Overview of generations: - 1G to 5G.

UNIT – II:

Location Management: Introduction to location management (HLR and VLR); Mobility models characterizing individual node movement (Random walk, Fluid flow, Markovian, Activity based); Mobility models characterizing the movement of groups of nodes (Reference point-based group mobility model, Community based group mobility model); Static (Always vs. Never update, Reporting Cells, Location Areas) and Dynamic location management schemes (Time, Movement, Distance, Profile Based); Terminal Paging (Simultaneous paging, Sequential paging); Location management and Mobile IP;

Overview of Handoff Process; Factors affecting handoffs and performance evaluation metrics; Handoff strategies; Different types of handoffs (soft, hard, horizontal, vertical

UNIT – III:

Wireless Transmission Fundamentals: Introduction to narrow and wideband systems; Spread spectrum; Frequency hopping; Introduction to MIMO; MIMO Channel Capacity and diversity gain; Introduction to OFDM; MIMO-OFDM system; Multiple access control (FDMA, TDMA, CDMA, SDMA); Wireless local area network; Wireless personal area network (Bluetooth and zigbee).

UNIT – IV:

Mobile Adhoc Networks: Characteristics and applications; Coverage and connectivity problems; Routing in MANETs.

Wireless Sensor Networks: Concepts, basic architecture, design objectives and applications; Sensing and communication range; Coverage and connectivity; Sensor placement; Data relaying and aggregation; Energy consumption; Clustering of sensors; Energy efficient Routing (LEACH).

UNIT – V:

Cognitive Radio Networks: Fixed and dynamic spectrum access; Direct and indirect spectrum sensing; Spectrum sharing; Interoperability and co-existence issues; Applications of cognitive radio networks.

UNIT – VI:

D2D Communications in 5G Cellular Networks: Introduction to D2D communications; High level requirements for 5G architecture; Introduction to the radio resource management, power control and mode selection problems; Millimeter wave communication in 5G.

TEXT BOOKS:

1. Mobile Communications, Jochen Schiller, Pearson Education
2. Wireless Communications, Andrea Goldsmith, Cambridge University Press
3. Wireless Communications: Principles and Practice, Theodore Rappaport, Pearson Education

REFERENCES:

1. Wireless Communications, Ezio Biglieri, MIMO, Cambridge University Press
2. Handbook of Wireless Networking and Mobile Computing, Ivan Stojmenovic, Wiley
3. Dynamic Location Management in Heterogeneous Cellular Networks, James Cowling
4. MIT Thesis http://people.csail.mit.edu/cowling/hons/jcowling-dynamic-Nov04.pdf
5. Principles of Mobile Communication, Gordon L. Stber, Springer

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B.Tech. VII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19OE1CB07) HUMAN RESOURCE MANAGEMENT

COURSE OBJECTIVES:

- To understand the functions, systems, policies and applications of Human Resource Management in organizations
- To familiarize how HRM assess the constraints and opportunities associated with managing employees in different socio-economic and political context
- To explain the emerging horizons of HRM in Organizations
- To comprehend how HRM activities lead to performance and sustainability of the organization

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Analyse of the concept of human resource management and its relevance in organizations

CO-2: Identify necessary skill set for application of various HR functions

CO-3: Design the strategic HR activities with real time organisational environment

CO-4: Assess cross-cultural work dynamics and HR activities

UNIT – I:

Human Resource Management: Concept and Challenges, HR Philosophy, Policies, Procedures and Practices.

UNIT – II:

Human Resource System Design: HR Profession, and HR Department, Line Management Responsibility in HRM, Measuring HR, Human resources accounting and audit; Training.

UNIT – III:

Functional Areas of HRM: recruitment and staffing, benefits, compensation, employee relations, HR compliance, organizational design, training and development, human resource information systems (H.R.I.S.) and payroll.

UNIT – IV:

Human Resource Planning: Demand Forecasting, Action Plans– Retention, Training, Redeployment & Staffing, Succession Planning

UNIT – V:

Strategic Management of Human Resources: SHRM, relationship between HR strategy and overall corporate strategy, HR as a Factor of Competitive Advantage, Managing Diversity in the Workplace

UNIT – VI:

Human Resource Management in Service Sector- Special considerations for Service Sector including

- Managing the Customer – Employee Interaction
- Employee Empowerment and Customer Satisfaction
- Service Failure and Customer Recovery – the Role of Communication and Training
- Similarities and Differences in Nature of Work for the Frontline Workers and the Backend
- Support Services - Impact on HR Practices Stressing Mainly on Performance
- Flexible Working Practices – Implications for HR

TEXT BOOKS:

1. Human Resource Management, Dessler G., Varrkey B., 16th Edition, Pearson Education, India, 2020
2. International Human Resource Management, Peter J. Dowling, Marion Festing, Allen D. Engle, Cengage, 2017

REFERENCES:

1. Human Resource and Personal Management, K. Aswathappa, 8th Edition, Tata McGraw Hill, 2017
2. Human Resource Management, Joseph J. Martocchio, 15th Edition, Pearson Education Champaign, 2019
3. Human Resource Management, Mathis R. L., Jackson J. H., 15th Edition, Jakarta, SalembaEmpat

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B.Tech. VII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19OE1CB08) BLOCKCHAIN TECHNOLOGIES

COURSE OBJECTIVES:

- To study the concepts and foundation of Blockchain Technology
- To understand security mechanism and Consensus in Blockchain
- To design use cases and architecture Blockchain Technology
- To study benefits, limitations and identify application area of Blockchain Technology

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Gain a clear understanding of the concepts that underlie digital distributed ledger

CO-2: Understand key mechanisms like decentralization, transparency and trust, Immutability

CO-3: Understand and apply the concept of Hash Function and Related Hash algorithms for high secure and availability of systems

CO-4: Learn how to design and implement any application in Blockchain Technology

UNIT – I:

Introduction to Blockchain: Introduction to centralized decentralized and distributed system, Distributed database, History of Blockchain, Various technical definitions of Blockchain, Generic elements of a blockchain: Block, Transaction, Peer-to-peer network, Node, genesis block, Why It's Called "Blockchain", characteristics of Blockchain.

UNIT – II:

Concept of Blockchain Technology, Structure of Blockchain, Component of block, Applications of blockchain technology, Tiers of blockchain technology Bolckchain 0, Bolckchain 1, Bolckchain 2, Bolckchain 3, Generation, Smart Contract.

UNIT – III:

Consensus mechanism, various consensus algorithm, Cryptography and Technical Foundations, Confidentiality, Integrity, Authentication, CAP theorem and blockchain, Public and private keys, RSA, Discrete logarithm problem, Message Digest (MD), Hashing, Hash Function, Secure Hash Algorithms (SHAs), Design of Secure Hash Algorithms (SHA), SHA-256, Design of SHA3, Elliptic Curve Digital signature algorithm.

UNIT – IV:

Types of Blockchain: Public blockchains, Private blockchains, Semi-private blockchains, Tokenization of assets, Tokenized blockchains, Tokenless blockchains, ledger, Permissioned ledger Distributed ledger Shared ledger application area of various types of blockchain.

UNIT – V:

Financial markets and trading, Trading, Exchanges, Trade life cycle, Order anticipators, Market manipulation, Crypto Currency: Bitcoin, Bitcoin definition, Keys and addresses, Public keys in Bitcoin, Private, keys in Bitcoin, Bitcoin currency units

UNIT – VI:

Implementation Platforms: Hyperledger as a protocol, Reference architecture, Hyperledger Fabric, Transaction Flow, Hyperledger Fabric Details, Fabric Membership, Fabric Membership, comparison between various platform.

TEXT BOOKS:

1. Mastering Blockchain, Imaran Bashir
2. Blockchain Technology, Chandramouli Subramanian, Universities Press

REFERENCE:

1. Blockchain For Dummies®, IBM Limited Edition, John Wiley & Sons, Inc

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B.Tech. VII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19OE1CB09) ADVANCED OPERATING SYSTEMS

COURSE OBJECTIVES:

- To understand main components of Real time Operating system and their working
- To study the operations performed by OS as a resource manager
- To understand the scheduling policies of DOS
- To implement the working principles of OS

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Explain what a real-time operating system (RTOS) is, how real-time operating systems are useful for measurement and control applications

CO-2: Understand distributed operating system design issues, features and principles of working

CO-3: Analyze functions of Network operating systems

CO-4: Understand kernel Issues and development principles

UNIT – I:

Real-time Operating Systems: Introduction to Real-Time Operating Systems, Definitions, Role of an OS in Real Time Systems, Important Terminology and Concepts Example

UNIT – II:

Real-Time Applications: How Real-Time OSs Differ from General-Purpose OSs, Design issues, principles and case study.

UNIT – III:

Distributed Operating System: Introduction to Distributed Systems, Definitions, Goals, Advantages of Distributed Systems over Centralized Systems, Advantages of Distributed Systems over Independent PCs, Disadvantages of Distributed Systems Design issues, features and principles of working, case study.

UNIT – IV:

Network Operating System: Introduction to Network operating system, Definitions, Different types of network operating systems, Function of Network operating systems, Design issues, working principles and characteristic features, case study.

UNIT – V:

Kernel Development: Introduction, Overview, Issues and development principles, case study.

UNIT – VI:

Protection, privacy, access control and security issues, solutions.

TEXT BOOKS:

1. Applied Operating System Concepts, A. Silberschatz, Wiley, 2000
2. Operating System Principles, Lubemir F. Bic and Alan C. Shaw, Pearson Education, 2003
3. Distributed Operating Systems, Andrew S. Tanenbaum, PHI

REFERENCES:

1. Operating Systems: Internal and Design Principles, Stallings, 6th Edition, PE
2. Modern Operating Systems, Andrew S. Tanenbaum, 3rd Edition, PE
3. Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne, 7th Edition, John Wiley
4. UNIX User Guide, Ritchie & Yates

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B.Tech. VII Semester	**L**	**T/P/D**	**C**
	0	**2**	**1**

(19PE2CB07) QUANTUM COMPUTATION AND QUANTUM INFORMATION LABORATORY

COURSE OBJECTIVES:

- To understand the fundamental concepts on quantum computing
- To learn how to do computation using basic and advanced quantum algorithms
- To understand random number generators for quantumness
- To understand communication using quantum key distribution and post-quantum cryptograhy

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Relate quantum instruction set architecture for performing quantum computations

CO-2: Identify and implement logics using quantum circuits

CO-3: Design and implement quantum algorithms

CO-4: Relate outcomes by implementing optimized quantum algorithms

LIST OF PROGRAMS:

Week 1,2: Introduction of quantum Instruction Set Architecture for quantum computations (quil)

Week 3,4: Use of quantum instruction language such as pyQuil for performing any quantum computations

Week 5: Programs using bits and qubits

Week 6,7,8: Implementation of quantum algorithms - Deutsch–Jozsa problem, Simon's algorithm and Shor's algorithm

Week 9: Implement classical logics using quantum circuits

Week 10: Program to implement Quantum counting

Week 11,12: Programs for Quantum optimization algorithms

Week 13: Program for quantum walk to solve problems include search and sampling without errors

Week 14: Implementation of Quantum algorithm for solving linear systems of equations

TEXT BOOKS:

1. Quantum Computation and Quantum Information, M. A. Nielsen and I. L. Chuang, Cambridge University Press
2. Presskil Lecture notes: Available online: http://www.theory.caltech.edu/~preskill/ph229/

REFERENCES:

1. An Introduction to Quantum Computing, P. Kaye, R. Laflamme, and M. Mosca, Oxford University Press, New York
2. Quantum Computer Science, N. David Mermin, Cambridge University Press
3. Quantum Cryptography, D. Unruh, Available online: https://courses.cs.ut.ee/all/MTAT.07.024/2017_fall/uploads/

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B.Tech. VII Semester	**L**	**T/P/D**	**C**
	0	**2**	**1**

(19PE2CB08) ADVANCED SOCIAL, TEXT AND MEDIA ANALYTICS LABORATORY

COURSE OBJECTIVES:

- To learn how to obtain, monitor, and evaluate social media data from major online platforms like Twitter and facebook
- To understand problems in analysing the free-form text using classification and clustering techniques
- To learn the advantages/disadvantages of using social media data

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Utilize various Application Programming Interface (API) services to collect data from different social media sources such as YouTube, Twitter

CO-2: Explore how to process the collected data - using methods involving correlation, regression, and classification to derive insights about the sources and people who generated that data

CO-3: Analyse unstructured data - primarily textual comments - for sentiments expressed in them

CO-4: Use different tools for collecting, analysing, and exploring social media data for research and development purposes

LIST OF PROGRAMS:

Week 1, 2: Implement page ranking algorithm

Week 3, 6: Implement text classification and clustering algorithms

Implement topic modelling using LDA

Week 7: Extracting Data from Twitter Using Python

Extracting Data from YouTube Using Python

Week 8: Statistical Analysis with Twitter Data

Week 9,10: Analysing Social Media Data Using Python

Week 11,12: Sentiment Analysis with Twitter

Week13,14: Implement web crawling

TEXT BOOKS:

1. The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data, Ronen Feldman and James Sanger, Cambridge University Press, 2006
2. Analyzing Social Media Networks with NodeXL: Insights from a Connected World, Hansen, Derek, Ben Sheiderman, Marc Smith, Morgan Kaufmann, 2011
3. Web Analytics 2.0: The Art of Online Accountability, Avinash Kaushik, 2009

REFERENCES:

1. Introduction to Social Network Method, Hanneman, Robert and Mark Riddle, 2005
2. Social network analysis: Methods and Applications, Wasserman S. & Faust K. New York: Cambridge University Press, 1994

3. Theories of Communication Networks, Monge, P. R. & Contractor, N. S, Oxford University Press. http://nosh.northwestern.edu/vita.html, 2003
4. Web Data Mining – Exploring Hyperlinks, Contents, and Usage Data, Bing Liu, 2nd Edition, Springer, 2011

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B.Tech. VII Semester	**L**	**T/P/D**	**C**
	0	**2**	**1**

(19PE2CB09) MOBILE COMPUTING LABORATORY

COURSE OBJECTIVES:

- To learn about various wireless & cellular communication networks and various telephone and satellite networks
- To build knowledge on various Adhoc and sensor networks routing protocol and energy efficient protocol
- To build skills in working with Cognitive radio networks and recent telecommunication networks
- To design and development of various network protocol using simulation tools

COURSE OUTCOMES: After completion of course, the student should be able to

CO-1: Design various wireless network protocols using simulation tools

CO-2: Develop various wireless network protocols using simulation tools

CO-3: Apply testing on various wireless network protocols using simulation tools

CO-4: Describe and document various wireless network protocols using simulation tools

LIST OF EXPERIMENTS:

Development and implementation of different network protocols using network simulators such as NS-3 and OMNET++.

Week 1,2: Implement MAC Protocol

Week 3,4: Implement Routing Protocol

Week 5,6: Implement Transport Protocol

Week 7,8,9: Implement Congestion Control Protocol

Week 10,11,12: Implement Application Protocol

Week 13,14: Implement Security Protocol

TEXT BOOKS:

1. Mobile Communications. Jochen Schiller, Pearson Education
2. Wireless Communications. Andrea Goldsmith, Cambridge University Press

REFERENCES:

1. Wireless Communications: Principles and Practice, Theodore Rappaport, Pearson Education
2. Wireless Communications, Ezio Biglieri, MIMO, Cambridge University Press
3. Handbook of Wireless Networking and Mobile Computing, Ivan Stojmenovic, Wiley
4. Dynamic Location Management in Heterogeneous Cellular Networks, James Cowling

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B.Tech. VII Semester	**L**	**T/P/D**	**C**
	0	**2**	**1**

(19PC2CB11) USABILITY DESIGN OF SOFTWARE APPLICATIONS LABORATORY

COURSE OBJECTIVES:

- To create an application that emerged from a problem statement or real-world problems
- To adopt the design life cycle while analyzing, designing, and developing the application
- To identify scenarios and develop the prototype for each task flow
- To gain expertise in developing and testing the applications with proper usage of Niche technologies and testing techniques

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Identify or create a problem statement to solve real-world problems

CO-2: Analyse and Design the application by following the design life cycle

CO-3: Develop the application using Niche technologies for identified scenarios in Iterations

CO-4: Demonstrate the application through presentation after thorough testing using applicable testing techniques

LIST OF PROGRAMS:

Week 1,2: Identify a website or an App to redesign, with justification.

Week 3,4: Analysis of the mobile app or the website through the design life cycle.

Week 5,6: Identifying Personas and Scenarios for the App or the website.

Week 7,8: Concept development and task flow detailing.

Week 9,10: Prototype development with Iterations and justification

Week 11,12: Usability testing and demonstration

s/w: Rational Rose, HTML, CSS, JavaScript(jdk)

TEXT BOOKS:

1. Interaction Design: Beyond Human-Computer Interaction, Jenny Preece, Helen Sharp and Yvonne Rogers, 4th Edition
2. Observing the User Experience, A Practitioner's Guide to User Research, Elizabeth Goodman, Mike Kuniavsky, Andrea Moed, 2nd Edition

REFERENCES:

1. About Face, Alan Cooper and Robert Reimann, 4th Edition
2. The Elements of User Experience: User-Centered Design for the Web and Beyond, Jesse James Garrett, 2nd Edition
3. Understanding Design Thinking, Lean, and Agile, Jonny Schneider

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B.Tech. VII Semester	**L**	**T/P/D**	**C**
	0	**4**	**2**

(19PW4CB02) MINI-PROJECT

COURSE OUTCOMES: After completion of the course, students should be able to
CO-1: Understand the formulated industry / technical problem
CO-2: Analyze and / or devlop models for providing solution to Industry / Technical problems
CO-3: Interpret and arrive at conclusions from the project carried out
CO-4: Demonstrate effective communication skills through oral presentation
CO-5: Engage in effective written communication through project report

COURSE OUTLINE:

- A student shall undergo an industry oriented mini-project, in collaboration with an industry of their specialization, during the summer vacation after sixth semester (III year II semester) of the B.Tech. programme.
- Mini-project shall be carried out for a minimum period of 04 weeks and maximum of 06 weeks.
- Evaluation of the mini-project shall be done by a Project Review Committee (PRC) consisting of the Head of the Department, faculty supervisor and a senior faculty member of the department.
- The industry oriented mini-project shall be submitted in a report form and presented before the Project Review Committee (PRC) for evaluation.

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B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	2	**1**	**3**

(19PE1CB13) BEHAVIOURAL ECONOMICS

COURSE OBJECTIVES:

- To understand the concepts of behavioural economics
- To impart knowledge on current ideas and concepts regarding decision making in economics, particularly from a behavioural science perspective
- To explore key departures and the consequences of behaviour of firms, households and other economics entities
- To provide an overview of how behavioural principles have been applied to economic problems

COURSE OUTCOMES: After completion of this course, the student should be able to

CO-1: Identify and evaluate evidence for systematic departures of economic behaviour from the Predictions of the neoclassical model, and psychological explanations for these anomalies

CO-2: Incorporate psychologically motivated assumptions into economic models, and interpret the implications of these assumptions

CO-3: Analyze the principles of game theory and ability to interpret incentives of people in interpersonal interactions

CO-4: Apply Behavioural principles in economic problems

UNIT – I:

Introduction: The neoclassical/standard model and behavioral economics in contrast; historical background; behavioral economics and other social sciences; theory and evidence in the social sciences and in behavioral economics; applications – gains and losses, money illusion, charitable donation.

UNIT – II:

Basics of Choice Theory: Revisiting the neoclassical model; utility in economics and psychology; models of rationality; connections with evolutionary biology and cognitive neuroscience; policy analysis – consumption and addiction, environmental protection, retail therapy; applications – pricing, valuation, public goods, choice anomalies

UNIT – III:

Beliefs, Heuristics and Biases: Revisiting rationality; causal aspects of irrationality; different kinds of biases and beliefs; self-evaluation and self-projection; inconsistent and biased beliefs; probability estimation; trading applications – trade in counterfeit goods, financial trading behavior, trade in memorabilia

UNIT – IV:

Choice under Uncertainty: Background and expected utility theory; prospect theory and other theories; reference points; loss aversion; marginal utility; decision and probability weighting; applications – ownership and trade, income and consumption, performance in sports.

UNIT – V:

Intertemporal Choice: Geometric discounting; preferences over time; anomalies of inter-temporal decisions; hyperbolic discounting; instantaneous utility; alternative concepts – future projection, mental accounts, heterogeneous selves, procedural choice; policy analysis – mobile calls, credit cards, organization of government; applications – consumption and savings, clubs and membership, consumption planning

UNIT – VI:

Strategic Choice:

1. Review of game theory and Nash equilibrium – strategies, information, equilibrium in pure and mixed strategies, iterated games, bargaining, signaling, learning; applications – competitive sports, bargaining and negotiation, monopoly and market entry
2. Individual preferences; choice anomalies and inconsistencies; social preferences; altruism; fairness; reciprocity; trust; learning; communication; intention; demographic and cultural aspects; social norms; compliance and punishment; inequity aversion; policy analysis – norms and markets, labor markets, market clearing, public goods; applications – logic and knowledge, voluntary contribution, compensation design.

TEXT BOOKS :

1. An Introduction to Behavioral Economics, N. Wilkinson and M. Klaes, 3rd Edition, Palgaeve McMillan
2. Introduction to Behavioral Economics, David R. Just, Wiely

REFERENCE:

1. Behavioural Economics: A Very Short Introduction (Very Short Introductions) Illustrated Edition, Oxford Press

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B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	2	**1**	**3**

(19PE1CB14) COMPUTATIONAL FINANCE AND MODELING

COURSE OBJECTIVES:

- To understand existing financial models in a quantitative and mathematical way
- To understand the quantitative tools to solve complex problems in the areas of portfolio management, risk management and financial engineering
- To explain the approaches required to calculate the price of options
- To identify the methods required to analyse information from financial data and trading systems

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Analyze and interpret financial data, mathematical foundations of finance and financial modeling.

CO-2: Apply the skills and knowledge of financial markets and instruments, and application of tools and techniques of quantitative finance and option pricing models

CO-3: Evaluate and manage various types of financial risks, and design and test computational finance models

CO-4: Analyze the advance knowledge in designing, developing and testing of computational finance models

UNIT – I:

Numerical methods relevant to integration, differentiation and solving the partial differential equations of mathematical finance: examples of exact solutions including Black Scholes and its relatives, finite difference methods including algorithms and question of stability and convergence, treatment of near and far boundary conditions, the connection with binomial models, interest rate models, early exercise, and the corresponding free boundary problems, and a brief introduction to numerical methods for solving multi-factor models.

UNIT – II:

Black-Scholes Framework: Black-Scholes PDE: simple European calls and puts; put-call parity. The PDE for pricing commodity and currency options. Discontinuous payoffs - Binary and Digital options. The Greeks: theta, delta, gamma, vega & rho and their role in hedging. The mathematics of early exercise - American options: perpetual calls and puts; optimal exercise strategy and the smooth pasting condition. Volatility considerations - actual, historical, and implied volatility; local vol and volatility surfaces.

Simulation including random variable generation, variance reduction methods and statistical analysis of simulation output. Pseudo random numbers, Linear congruential generator, Mersenne twister RNG. The use of Monte Carlo simulation in solving applied problems on derivative pricing discussed in the current finance literature. The technical topics addressed include importance sampling, Monte Carlo integration, Simulation of Random walk and approximations to diffusion processes, martingale control variables, stratification, and the estimation of the "Greeks. "

UNIT – III:

Financial Products and Markets: Introduction to the financial markets and the products which are traded in them: Equities, indices, foreign exchange, and commodities. Options contracts and strategies for speculation and hedging.

UNIT – IV:

Application areas include the pricing of American options, pricing interest rate dependent claims, and credit risk. The use of importance sampling for Monte Carlo simulation of VaR for portfolios of options.

UNIT – V:

Statistical Analysis of Financial Returns: Fat-tailed and skewed distributions, outliers, stylized facts of volatility, implied volatility surface, and volatility estimation using high frequency data.

UNIT –VI:

Copulas, Hedging in incomplete markets, American Options, Exotic options, Electronic trading, Jump Diffusion Processes, High-dimensional covariance matrices, Extreme value theory, Statistical Arbitrage.

TEXT BOOKS:

1. Tools for Computational Finance, R. Seydel, 2nd Edition, Springer-Verlag, New York, 2004
2. Monte Carlo Methods in Financial Engineering, P. Glasserman, Springer-Verlag, New York,2004
3. Statistics and Data Analysis for Financial Engineering, D. Ruppert

REFERENCES:

1. Numerical Recipes in C: The Art of Scientific Computing, W. Press, S. Teukolsky, W. Vetterling and B. Flannery, Cambridge University Press, Cambridge, 1997, UK Available on-line at: http://www.nr.com/
2. Option Valuation under Stochastic Volatility, A. Lewis:, Finance Press, Newport Beach, California, 2000
3. Efficient Methods for Valuing Interest Rate Derivatives, A. Pelsser:, Springer-Verlag, New York, 2000
4. Analysis of Financial Time Series, R. S. Tsay
5. Statistics of Financial Markets: An Introduction, J. Franke, W. K. Härdle and C. M. Hafner

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B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	2	**1**	**3**

(19PE1CB15) PSYCHOLOGY

COURSE OBJECTIVES:

- To understand the content areas of industrial psychology and the application of psychological theory to organizational issues
- To describe about employment law, job analysis, recruitment and selection, training, performance appraisal and discipline, employee motivation, and workplace safety
- To explain how the science of human behaviour is used to select, develop, and manage employees
- To understand and learn how organizations can create a supportive work environment

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Analyse the major content areas of Industrial Psychology (i.e., job analysis, recruitment, selection, employment law, training, performance management, and health/well-being issues in the workplace)

CO-2: Select the tests and measurements, collect accurate information and make sound data-based decisions

CO-3: Analyse the behaviour of individuals and groups in organizations in terms of the key factors that influence organizational behavior

CO-4: Evaluate the appropriateness of various leadership styles, organizational development strategies and motivational strategies used in a variety of organizational settings

UNIT – I:

Introduction: What is I/O Psychology? Research Methods, Statistics, and Evidence-based Practice, Introduction & Legal Context of Industrial Psychology, Job Analysis & Competency Modeling, Job Evaluation & Compensation, Job Design & Employee Well-Being, Recruitment.

UNIT – II:

Evaluating the Quality of Performance Measures: Identifying Criteria & Validating Tests and Measures, Screening Methods, Intensive Methods

UNIT – III:

Employee Performance and Evaluation: Performance Goals and Feedback, Performance Coaching and Evaluation, Evaluating Employee Performance

UNIT – IV:

Organizational Fairness and Diversity Management: Employee Motivation, Satisfaction and Commitment, Fairness and Diversity

UNIT – V:

Organizational Behaviour: The Organization of Work Behaviour, Teams in Organizations, Stress Management: Demands of Life and Work

UNIT – VI:

Leadership and Organizational Development: Leadership, Organizational Climate, Culture, and Development

TEXT BOOKS:

1. Work in the 21st Century, Landy F. J. and Conte J. M., 4th Edition, Oxford Blackwell Publishing, 2013
2. Organizational Behavior, Stephen Robbins, Prentice Hall, 2013

REFERENCES:

1. Industrial-Organizational Psychology, Miner B. J., McGraw Hill Inc., 1992
2. Human Resource Management: Text & Cases, K. Ashwathappa, 8th Edition, McGraw Hill Education, 2017
3. Industrial/Organizational Psychology: An Applied Approach, Aamodt M., 8th Edition, Wadsworth Publishing Co., 2015
4. Organizational Behavior, Fred Luthans, McGraw Hill,2013

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B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	2	**1**	**3**

(19PE1CB16) ENTERPRISE SYSTEMS

COURSE OBJECTIVES:

- To introduce the essential concepts of ERP involved in business processes
- To impart skills in the design and implementation of ERP architecture
- To impart skills in the implementation of ERP architecture
- To familiarize with various tools and technologies for developing ERP for large project

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Identify the design involved in simple web applications using MVC architecture, related tools and techniques

CO-2: Evaluate SOA, ERP models, design and implement CRM, SRM models

CO-3: Analyze interactive network and applications

CO-4: Develop model for ERP for large projects understanding both hardware and software requirements

UNIT – I:

Model - View - Control (MVC) Architecture: Overview of MVC -MVC method of software development in a 3-tier environment -Control (MVC) development in a 3-tier environment.

UNIT – II:

Tools and Technologies: Microsoft .NET framework, PHP, Ruby on Rails, JavaScript, Ajax and Overview of SAP and Oracle Applications

UNIT – III:

ERP Architecture and Generic Modules: Service Oriented Architecture (SOA) - Principles of loose coupling – encapsulation - Inter-operability - Enterprise Resource Planning (ERP) systems and their architecture - Generic ERP Modules: Finance, HR, Materials Management, Investment - Examples of Domain Specific Modules

UNIT – IV:

ERP Technologies: Business Process Reengineering - Decision Support System - On-Line Analytical Processing -Electronic Data Exchange - Customer Relationship Management (CRM) - Supplier Relationship Management (SRM)

UNIT – V:

ERP Networking & Security: Overview of MPLS - Virtual Private Networks (VPN) – Firewalls - Network monitoring and enforcement of policies - ERP Security Issues – Authentication – Authorisation - Access control – Roles - single-sign-on -Directory servers - Audit trails - Digital signatures – Encryption - review of IPSec - SSL

UNIT – VI:

Software Architectures for Enterprise Systems:

Software: Acquisition Process – Tendering - conditions of contract - Commercial off the shelf software (COTS) Implementations - Bespoke Implementations - Total cost of ownership - Issues on using Open source software or free software and Licensed software

Hardware Architectures for Enterprise Systems: Hardware: Servers –Storage area networks - Storage units - Back-up strategies - Local Area Network (LAN) technologies and products - Data Centres - Hardware Acquisition - Disaster Recovery

TEXT BOOKS:

1. Enterprise Resource Planning, Alexis Leon, 4th Edition, Tata McGraw Hill, 2020
2. Enterprise Resource Planning and Supply Chain Management, Kurbel K. E., Springer, 2016

REFERENCES:

1. Enterprise Resource Planning - Fundamentals of Design and Implementation, Ganesh K., Sanjay M., Anbuudayasankar S. P., Sivakumar P., Springer, 2014
2. Enterprise Systems for Management, Luvai F. Motiwalla and Jeff Thompson, 2nd Edition, Pearson, ISBN-13: 978-0-13-214576-3, 2011
3. Enterprise Systems for Management, Motiwalla, L. F., & Thompson J., eBook, 2nd Edition, Boston, MA, Pearson, 2012

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B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	2	**1**	**3**

(19PE1CB17) ADVANCE FINANCE

COURSE OBJECTIVES:

- To understand about the various financial sources and instruments, and the Corporate Dividend decisions
- To explain about Leasing and decisions involving Leasing, Organizational goals with optimum investment, and Corporate Restructuring
- To understand financial restructuring and working capital management in business firms
- To understand risk and return in the Derivatives, swaps

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Analyze the decisions involved in sources of finance and Dividend Decisions

CO-2: Interpretation of business information and application of financial theory in corporate investment decisions, and assess working capital management and leasing contracts

CO-3: Evaluate the corporate and financial restructuring

CO-4: Analyze the Derivative Markets and Swaps

UNIT – I:

Sources of Funds (including regulatory framework): Types of securities; Issuing the capital in market; Pricing of issue; Valuation of Stocks and bonds

UNIT – II:

Dividend Decisions: Traditional Approach, Dividend Relevance Model, Miller and Modigliani Model, Stability of Dividends, Forms of Dividends, Issue of bonus shares, Stock Split.

UNIT – III:

Evaluation of Lease Contracts

UNIT – IV:

Corporate Restructuring: Mergers and Acquisitions- Types of Mergers, Evaluation of Merger Proposal; Take-over; Amalgamation; Leverage buy-out; Management buy-out; Corporate Failure and Liquidation

UNIT – V:

Financial Restructuring; Share Split; Consolidation; Cancellation of Paid-up Capital; Other Mechanisms

UNIT – VI:

Working Capital Management and Introduction to derivatives: Working Capital Planning; Monitoring and Control of Working Capital; Working Capital Financing; Managing the Components of Working Capital-Cash Management-Receivable

Management- Inventory Management-Introduction to derivatives; Basics of Futures, Forwards, Options, Swaps; Interest rate Payoff Diagrams, Pricing of Futures, Put Call Parity, Option Pricing using Binomial Model and Black Scholes Model Use of Derivatives for Risk-Return Management- Credit Default Swaps

Home Assignment:

Case study materials book will be given to students. Students are required to meet in groups before coming to class and prepare on the case for the day. Instructor may ask the student groups to present their analysis and findings to the class.

Further, the topic for class discussion will be mentioned beforehand and students should be prepared to discuss these topics in class. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

1. Topic: Historical perspectives of markets like major boom and busts, bull and bear cycles, major market crashes, bubbles
2. Topic: Major scams in the market, e.g. Satyam case

TEXT BOOKS:

1. Principles of Corporate Finance, Brealey, Myers and Allen, 11th Edition, McGraw Hill, 2017
2. Investment analysis and portfolio Management, Prasanna Chandra, 4th Edition, TMH, 2013

REFERENCES:

1. Elements of Corporate Finance, S. M. Maheswari, Sultan Chand, 2016
2. Financial Management Text and Cases, IM Pandey, Vikas, 2012
3. Accounting for Management, S. N. Maheswari, S. K. Maheswari, 4th Edition, Vikas Publishing House, 2018

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B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	2	**1**	**3**

(19PE1CB18) IMAGE PROCESSING AND PATTERN RECOGNITION

COURSE OBJECTIVES:

- To impart fundamental knowledge in the area image processing
- To understand various filters and techniques available to process an image
- To provide knowledge of the concepts related to image analysis
- To learn the fundamentals of pattern recognition

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Understand the basics of image formation, transformations and filters

CO-2: Learn various techniques available for feature extraction and image segmentation

CO-3: Comprehend the techniques for image registration and morphological image processing

CO-4: Understand colour image processing techniques

UNIT – I:

Introduction: Image processing systems and its applications. Basic image file formats Image formation: Geometric and photometric models; Digitization - sampling, quantization; Image definition and its representation, neighbourhood metrics.

UNIT – II:

Intensity Transformations and Spatial Filtering: Enhancement, contrast stretching, histogram specification, local contrast enhancement; Smoothing, linear and order statistic filtering, sharpening, spatial convolution, Gaussian smoothing, DoG, LoG.

UNIT – III:

Image/Object Features Extraction: Textural features - gray level co-occurrence matrix; Moments; Connected component analysis; Convex hull; Distance transform, medial axis transform, skeletonization/thinning, shape properties.

UNIT – IV:

Segmentation: Pixel classification; Grey level thresholding, global/local thresholding; Optimum thresholding - Bayes analysis, Otsu method; Derivative based edge detection operators, edge detection/linking, Canny edge detector; Region growing, split/merge techniques, line detection, Hough transform.

UNIT – V:

Registration: Mono-modal/multimodal image registration; Global/local registration; Transform and similarity measures for registration; Intensity/pixel interpolation.

UNIT – VI:

Colour Image Processing: Fundamentals of different colour models - RGB, CMY, HSI, YCbCr, Lab; False colour; Pseudo colour; Enhancement; Segmentation.

Morphological Filtering Basics: Dilation and Erosion Operators, Top Hat Filters

TEXT BOOKS:

1. Digital Image Processing, R. C. Gonzalez and R. E. Woods, Prentice Hall
2. Image Processing, Analysis, and Machine Vision, Milan Sonka, Vaclav Hlavac, Roger Boyle, Brooks/Cole, 3rd Edition

REFERENCES:

1. Image Processing: The Fundamentals. Maria Petrou and Panagiota Bosdogianni, John Wiley & Sons Ltd.
2. Digital Image Processing, K. R. Castleman, Prentice Hall, Englewood Cliffs
3. Digital Image Processing, William K. Pratt, Wiley
4. Fundamentals of Digital Image Processing, Anil K. Jain, Pearson

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B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19OE1CB10) IT PROJECT MANAGEMENT

COURSE OBJECTIVES:

- To understand IT Project Management concepts, project overview and feasibility studies
- To apply Project Cost Control and Scheduling techniques like PERT and CPM.
- To describe Agile Project management, Principles and Methodologies
- To be familiar with Agile methodologies and techniques like Scrum, DevOps, etc

COURSE OUTCOMES: After completion of this course, the student should be able to

CO-1: Understand the techniques to effectively plan, manage, execute, and control projects within time and cost targets with a focus on Information Technology and Service Sector

CO-2: Apply the project cost control and scheduling techniques like PERT and CPM

CO-3: Explore and learn agile project management, principles and methodologies

CO-4: Aware of agile project management techniques such as Scrum and DevOps

UNIT – I:

Project Overview and Feasibility Studies- Identification, Market and Demand Analysis, Project Cost Estimate, Financial Appraisal

UNIT – II:

Project Scheduling: Project Scheduling, Introduction to PERT and CPM, Critical Path Calculation, Precedence Relationship, Difference between PERT and CPM, Float Calculation and its importance, Cost reduction by Crashing of activity.

Cost Control and Scheduling: Project Cost Control (PERT/Cost), Resource Scheduling & Resource Levelling.

UNIT – III:

Project Management Features: Risk Analysis, Project Control, Project Audit and Project Termination

UNIT – IV:

Agile Project Management: Introduction, Agile Principles, Agile methodologies, Relationship between Agile Scrum, Lean, DevOps and IT Service Management (ITIL).

UNIT – V:

Scrum: Various terminologies used in Scrum (Sprint, product backlog, sprint backlog, sprint review, retro perspective), various roles (Roles in Scrum), Best practices of Scrum.

UNIT – VI:

DevOps: Overview and its Components, Containerization Using Docker, Managing Source Code and Automating Builds, Automated Testing and Test Driven Development, Continuous Integration, Configuration Management, Continuous Deployment, Automated Monitoring.

Other Agile Methodologies: Introduction to XP, FDD, DSDM, Crystal

TEXT BOOKS:

1. Succeeding with Agile: Software Development Using Scrum, Mike Cohn
2. Project Management for IT Related Projects. ISEB Foundation, BCS Publications
3. Project Planning and Management with CPM and PERT, Kundan Singh and Mitthan Lal Kansal

REFERENCES:

1. Agile Project Management: 2 Books in 1: Beginner's Guide & Methodology, The Definitive Guide to Master Scrum, Kanban, XP, Crystal, FDD, DSDM
2. Scrum Guide- Scrum Masters, Ken Schwaber and Jeff Sutherland
3. DevOps For Beginners, Joseph Joyner
4. Agile Product Management with Scrum, Roman Pichler,
5. Agile Project Management with Scrum, Ken Schwaber, Microsoft Professional

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B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19OE1CB11) SERVICES SCIENCE AND SERVICE OPERATIONAL MANAGEMENT

COURSE OBJECTIVES:

- To understand concepts related to services, operations and goods
- To learn about different ways to design Services and assess them using Service qualities
- To understand various methods to operate and manage Service businesses
- To know how innovation can be approached from Services point of view

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Describe and distinguish concepts related to services, operations and goods

CO-2: Identify ways to design Services and evaluate them using Service qualities

CO-3: Relate how various methods can be used to operate and manage Service businesses

CO-4: Analyze about how innovation can be approached from Services point of view

UNIT – I:

Introduction: Introduction to the course, Introduction to service operations, Role of service in economy and society, Introduction to Indian service sector

Nature of Services and Service Encounters: Differences between services and operations, Service package, characteristics, various frameworks to design service operation system, Kind of service encounter, importance of encounters

Service-Dominant Logic: From Goods-Dominant logic to Service-Dominant logic, Value Co-creation

UNIT – II:

Service Strategy and Competitiveness: Development of Strategic Service Vision (SSV), Data Envelopment Analysis

New Service Development: NSD cycle, Service Blueprinting, Elements of service delivery system

UNIT – III:

Service Design: Customer Journey and Service Design, Design Thinking methods to aid Service Design

Locating Facilities and Designing Their Layout: models of facility locations (Huff's retail model), Role of service-scape in layout design

UNIT – IV:

Service Quality: SERVQUAL, Walk through Audit, Dimensions of Service quality & other quality tools

Service Guarantee & Service Recovery: How to provide Service guarantee? How to recover from Service failure?

UNIT – V:

Forecasting Demand for Services: A review of different types of forecasting methods for demand forecasting.

Managing Capacity and Demand: Strategies for matching capacity and demand, Psychology of waiting, Application of various tools used in managing waiting line in services.

UNIT – VI:

Managing Facilitating Goods: Review of inventory models, Role of inventory in services

Managing Service Supply Relationship: Understanding the supply chain/hub of service, Strategies for managing suppliers of service

Vehicle Routing Problem: Managing after sales service, Understanding services that involve transportation of people and vehicle, Techniques for optimizing vehicle routes

TEXT BOOKS:

1. Fitzsimmons & Fitzsimmons, Service Management: Operations, Strategy, Information Technology, 7th Edition, McGraw Hill
2. Services, marketing: Integrating Customer Focus Across the Firm, Wilson A., Zeithaml V. A., Bitner M. J., & Gremler D. D., McGraw Hill, 2012

REFERENCES:

1. Services Marketing, Lovelock, C, 7th Edition, Pearson Education India, 2011
2. Service Design for Business: A Practical Guide to Optimizing the Customer Experience, Reason, Ben, and Lovlie, Lavrans, Pan Macmillan India, 2016
3. Open Services Innovation: Rethinking Your Business to Grow and Compete In A New Era, Chesbrough, H. John Wiley & Sons, 2010

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B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	3	**0**	**3**

(19OE1CB12) MARKETING RESEARCH AND MARKETING MANAGEMENT

COURSE OBJECTIVES:

- To understand the need of study of Marketing and Marketing Research
- To explain the various concepts of Marketing research in Organisations
- To explain the various statistical tools and techniques for data analysis in Marketing Research
- To comprehend internet and B2B marketing

COURSE OUTCOMES: After completion of this course, the student should be able to

CO-1: Apply the basic marketing concepts in business organisations

CO-2: Interpret the dynamics of marketing and analyze how its various components interact with each other in the real world

CO-3: Leverage marketing research concepts, and identify statistical tools and techniques in marketing research for effective decision making

CO-4: Plan for internet marketing, and position and price B2B products and services

UNIT – I:

Marketing Concepts and Applications: Introduction to Marketing & Core Concepts, Marketing of Services, Importance of marketing in service sector.

Marketing Planning & Environment: Elements of Marketing Mix, Analyzing needs & trends in Environment - Macro, Economic, Political, Technical & Social

Understanding the Consumer: Determinants of consumer behavior, Factors influencing consumer behavior

Market Segmentation: Meaning & Concept, Basis of segmentation, selection of segments, Market Segmentation strategies, Target Marketing, Product Positioning

UNIT – II:

Product Management: Product Life cycle concept, New Product development & strategy, Stages in New Product development, Product decision and strategies, Branding & packaging

UNIT – III:

Pricing, Promotion and Distribution Strategy: Policies & Practices – Pricing Methods & Price determination Policies. Marketing Communication – The promotion mix, Advertising & Publicity, 5 M's of Advertising Management. Marketing Channels, Retailing, Marketing Communication.

UNIT – IV:

Marketing Research: Introduction, Type of Market Research, Scope, Objectives & Limitations Marketing Research Techniques, Survey Questionnaire design & drafting, Pricing Research, Media Research, Qualitative Research

Data Analysis: Use of various statistical tools – Descriptive & Inference Statistics, Statistical Hypothesis Testing, Multivariate Analysis - Discriminant Analysis, Cluster Analysis, Segmenting and Positioning, Factor Analysis

UNIT – V:

Internet Marketing: Introduction to Internet Marketing. Mapping fundamental concepts of Marketing (7Ps, STP); Strategy and Planning for Internet Marketing

UNIT – VI:

Business to Business Marketing: Fundamental of business markets. Organizational buying process. Business buyer needs. Market and sales potential. Product in business markets. Price in business markets. Place in business markets. Promotion in business markets. Relationship, networks and customer relationship management. Business to Business marketing strategy

HOME ASSIGNMENTS:

1. Written Analyses of Cases – Students are expected to report on their analysis and recommendations of what to do in specific business situations by applying concepts and principles learned in class (Case Studies to be shared by Faculty) e.g. "Marketing Myopia"
2. Field visit & live project covering steps involved in formulating Market Research Project
3. Measuring Internet Marketing Effectiveness: Metrics and Website Analytics

TEXT BOOKS:

1. Marketing Management, Philip Kotler & Keller Kevin, 4th Edition, Pearson Education, 2019
2. Marketing Research: An Applied Approach, Malhotra N. K., Nunan D., & Birks D. F., Pearson Education Limited, 2019

REFERENCES:

1. Marketing Management: A Relationship Approach, Hollensen S, Pearson Education, 2019
2. Marketing Management, Deepak R., Kanthiah Alias, and S. Jeyakumar, Educreation Publishing, 2019
3. Marketing Research: Text and Cases, Nargundkar R., McGraw-Hill Education, 2020
4. Marketing Management: A Cultural Perspective, Visconti L. M., Peñaloza L., & Toulouse N. (Eds.) Routledge, 2020

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B.Tech. VII Semester	**L**	**T/P/D**	**C**
	0	**8**	**4**

(19PW4CB03) MAJOR PROJECT PHASE-I

B.Tech. VIII Semester	**L**	**T/P/D**	**C**
	0	**12**	**6**

(19PW4CB04) MAJOR PROJECT PHASE-II

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Identify and formulate the problem (Industry/technical/societal)

CO-2: Analyze, design and develop a solution to industry/technical/societal problems

CO-3: Implement and execute the solution

CO-4: Demonstrate effective communication skills through oral presentation

CO-5: Engage in effective written communication through project report

COURSE OUTLINE:

- A student shall initiate major project in seventh semester (IV year I semester) and continue it in the eighth semester (IV year II semester).
- Major project shall be carried out in two phases i.e., Major Project Phase-I in the seventh semester and Major Project Phase-II in the eighth semester.
- Major project shall be evaluated for a total of 200 marks. Out of which, Major Project Phase-I shall be evaluated for 100 marks in seventh semester and Major Project Phase-II for 100 marks in eighth semester.
- Evaluation of Major Project Phase-I and Major Project Phase-II shall consist of both CIE and SEE in each semester.
- CIE shall be done by a Project Review Committee (PRC) consisting of Head of the Department, project supervisor and senior faculty member of the Department.
- CIE shall be done on the basis of two seminars conducted in each semester as per the academic calendar and as per the evaluation format provided by the DoA.
- A student shall submit project progress in prescribed report format during each of the project reviews.
- SEE shall be carried out in both Major Project Phase-I and Major Project Phase-II.
- SEE in Major Project Phase-I shall be conducted by a committee consisting of Head of the Department, the project supervisor and one senior faculty of the programme.
- SEE in Major Project Phase-II (project viva-voce) shall be conducted by a committee consisting of an external examiner, Head of the Department, the project supervisor and one senior faculty of the programme.