R V R & J C COLLEGE OF ENGINEERING, CHOWDAVARAM, GUNTUR-19

(Autonomous)

(w.e.f. the academic year 2019-2020)

B.Tech., Computer Science and Business Systems

Semester I (First year)

S.No.	CODE.NO	SUBJECT	SCHEME OF INSTRUCTION PERIODS PER WEEK			Scheme of examination			Category Code
			L	T	P	INT	EXT	CREDITS	
1	CB 111	Discrete Mathematics	3	1	-	40	60	4	BS
2	CB 112	Introductory Topics in Statistics, Probability & Calculus	3	-	-	40	60	3	BS
3	CB 113	Fundamentals of Computer Science	3	-	-	40	60	3	ES
4	CB 114	Principles of Electrical Engineering	2	-	-	40	60	2	ES
5	CB 115	Fundamentals of Physics	2	-	-	40	60	2	BS
6	CB 151	Fundamentals of Computer Science Lab	-	-	4	40	60	2	ES
7	CB 152	Principles of Electrical Engineering Lab	-	-	2	40	60	1	ES
8	CB 153	Fundamentals of Physics Lab	-	-	2	40	60	1	BS
9	CB 154	Business Communication & Value Science – I Lab	-	-	4	40	60	2	HS
Total			**13**	**1**	**12**	**360**	**540**	**20**	

Three Weeks Induction Programme is Mandatory before starting Semester I [First Year]

Semester II (First year)

S.No.	CODE.NO	SUBJECT	SCHEME OF INSTRUCTION PERIODS PER WEEK			Scheme of examination			Category Code
			L	T	P	INT	EXT	CREDITS	
1	CB 121	Linear Algebra	3	-	-	40	60	3	BS
2	CB 122	Statistical Methods	3	-	-	40	60	3	BS
3	CB 123	Data Structures &Algorithms	3	-	-	40	60	3	PC
4	CB 124	Principles of Electronics Engineering	3	-	-	40	60	3	ES
5	CB 125	Fundamentals of Economics	3	-	-	40	60	3	HS
6	MC 001	Constitution of India	2	-	-	100	-	-	MC
7	CBV04	Programming with Python (Self Learning Module)	-	-	2	100	-	-	VC
8	CB 161	Statistical Methods Lab	-	-	2	40	60	1	BS
9	CB 162	Data Structures & Algorithms Lab	-	-	2	40	60	1	PC
10	CB 163	Principles of Electronics Engineering Lab	-	-	2	40	60	1	ES
11	CB 164	Business Communication & Value Science – II Lab	-	-	4	40	60	2	HS
Total			**17**	**-**	**12**	**560**	**540**	**20**	

Semester III (Second year)

S.No.	CODE.NO	SUBJECT	SCHEME OF INSTRUCTION PERIODS PERWEEK			Scheme of examination			Category Code
			L	T	P	INT	EXT	CREDITS	
1	CB 211	Computational Statistics	4	-	-	40	60	3	BS
2	CB 212	Computer Organization & Architecture	4	-	-	40	60	3	PC
3	CB 213	Object Oriented Programming	3	1	-	40	60	3	PC
4	CB 214	Formal Languages & Automata Theory	4	-	-	40	60	3	PC
5	CB 215	Software Engineering	3	1	-	40	60	3	PC
6	MC 002	Environmental Science	2	-	-	100	-	-	MC
7	CB 251	Computational Statistics Lab	-	-	4	40	60	2	BS
8	CB 252	Computer Organization and Architecture Lab	-	-	2	40	60	1	PC
9	CB 253	Object Oriented Programming Lab	-	-	4	40	60	2	PC
10	CB 254	Software Engineering Lab	-	-	4	40	60	2	PC
Total			**20**	**2**	**12**	**420**	**480**	**22**	

Semester IV (Second year)

S.No.	CODE.NO	SUBJECT	SCHEME OF INSTRUCTION PERIODS PER WEEK			Scheme of examination			Category Code
			L	T	P	INT	EXT	CREDITS	
1	CB 221	Operations Research	3	1	--	40	60	3	ES
2	CB 222	Introduction to Innovation, IP Management & Entrepreneurship	3	1	--	40	60	3	HS
3	CB 223	Operating Systems	3	1	--	40	60	3	PC
4	CB 224	Database Management Systems	3	1	--	40	60	3	PC
5	CB 225	Software Design with UML	3	1	--	40	60	3	PC
6	MC003	Essence of Indian Traditional Knowledge	2	--	--	100	--	--	MC
7	CB 261	Operations Research lab	--	--	2	40	60	1	ES
8	CB 262	Business Communication & Value Science III lab	--	--	4	40	60	2	HS
9	CB 263	Operating Systems lab	--	--	2	40	60	1	PC
10	CB 264	Database Management Systems lab	--	--	2	40	60	1	PC
11	CB 265	Software Design with UML lab	--	--	4	40	60	2	PC
Total			**19**	**5**	**10**	**500**	**600**	**22**	

Semester V (Third Year)

S.No.	CODE.NO	SUBJECT	SCHEME OF INSTRUCTION PERIODS PER WEEK			Scheme of examination			Category Code
			L	T	P	INT	EXT	CREDITS	
1	CB 311	Design and Analysis of Algorithms	3	1	--	40	60	3	PC
2	CB 312	Compiler Design	3	1	--	40	60	3	PC
3	CB 313	Fundamentals of Management	3	1	--	40	60	3	HS
4	CB 314	Business Strategy	3	1	--	40	60	3	HS
5	CB 315	*Elective I	3	1	--	40	60	3	PE
6	MC 004	Design Thinking & Product innovation	2	--	--	100	--	--	MC
7	CB 351	Design and Analysis of Algorithms Lab	--	--	2	40	60	1	PC
8	CB 352	Compiler Deign Lab	--	--	4	40	60	2	PC
9	CB 353	* Elective I Lab	--	--	2	40	60	1	PE
10	CB 354	Mini Project	--	--	2	40	60	1	PC
Total			**17**	**5**	**10**			**20**	

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(Autonomous)

(w.e.f. the academic year 2019-2020)

B.Tech.,Computer Science and Business Systems

CB 111 Discrete Mathematics

Semester I (First year)	**L**	**T**	**P**	**C**
	3	**1**	**-**	**4**

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in discrete mathematics. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more a level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes: The students will learn:

CO1: Understand the basic principles of sets, recurrence relations and basic counting
CO2: Demonstrate an understanding of algebraic structure and evaluate Boolean functions and simplify expressions
CO3: Develop the given problem as graph networks and solve with techniques of graph theory
CO4: Write an argument using logical notation and determine if the argument is or is not valid.

UNIT-I [Text Book -1,3] (12)

Combinatorics: Set, relation, function, Basic counting: balls and bins problems, pigeonhole principle, principle of mathematical induction, proof techniques, generating functions, recurrence relations

UNIT-II [Text Book -1,2] (12)

Abstract and Boolean algebras: Group, subgroup, Lagrange's theorem, definition and elementary properties of ring and field, Introduction of Boolean algebra, truth table, basic logic gate, basic postulates of Boolean algebra, principle of duality, canonical form, Karnaugh map.

UNIT-III [Text Book -5] (12)

Logic: Propositional calculus - propositions and connectives, syntax; Semantics – truth assignments and truth tables, validity and satisfiability, tautology; Adequate set of connectives; Equivalence and normal forms; Compactness and resolution; Formal reducibility - natural deduction system and axiom system; Soundness and completeness.

UNIT-IV [Text Book -4] (12)

Graph Theory: Graphs and digraphs, complement, isomorphism, connectedness and reachability, adjacency matrix, Eulerian paths and circuits in graphs and digraphs, Hamiltonian

paths and circuits in graphs and tournaments, trees; Planar graphs, Euler's formula, dual of a planer graph, independence number and clique number, chromatic number, statement of Four- color theorem.

Text Books:

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

Reference Books:

1. *Introduction to linear algebra.* Gilbert Strang.
2. *Introductory Combinatorics,* R. A. Brualdi, North-Holland, New York.
3. *Graph Theory with Applications to Engineering and Computer Science,* N. Deo, Prentice Hall, Englewood Cliffs.
4. *Introduction to Mathematical Logic,*(Second Edition), E. Mendelsohn, Van-Nostrand, London.

CO-PO Mapping

Course Name: Discrete Mathematics (CB111) 1st Year 1st Sem

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										2
CO2	2	3										1
CO3	3	2										1
CO4	3	3										2

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(w.e.f. the academic year 2019-2020)

B.Tech.,Computer Science and Business Systems

CB-112 INTRODUCTORY TOPICS IN STATISTICS, PROBABILITY & CALCULUS

Semester I (First year)	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

Course Objectives:

The student who successfully completes this course will have:

1. The knowledge in the application of basic statistics in various branches.
2. The skill to collect the data and analyse the data.
3. The ability to understand the basic principles of various probability distributions.
4. The basic concepts of differential and integral calculus and its application.

Course Outcomes:

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

1. Apply various models to design and conduct experiments, as well as to analyze and interpret the data.
2. Use the concept of probability and conditional probability to determine the outcomes.
3. Apply the knowledge of distribution theory to both software and hardware design problems
4. Get knowledge of differential and integral calculus and its application.

UNIT-I [Text Book -1] **(16 periods)**

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. 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-II [Text Book -2] **(10 periods)**

Probability: Concept of experiments, sample space, event. Definition of Combinatorial Probability. Conditional Probability, Bayes Theorem.

UNIT-III [Text Book -2] **(14 periods)**

Probability distributions: Discrete& continuous distributions, Binomial, Poisson and Geometric distributions, Uniform, Exponential, Normal, Chi-square, t, F distributions. Expected values and moments: mathematical expectation and its properties, Moments (including variance) and their properties, interpretation, Moment generating function.

UNIT-IV [Text Book -3] **(10 periods)**

Calculus: Basic concepts of Differential and integral calculus, application of double and triple integral.

Text Books:

1. Fundamentals of Statistics, Vol. I&II, A. Goon, M. Gupta and B. Dasgupta, World Press.

2. Introduction of Probability Models, S.M. Ross, Academic Press, N.Y.

3. Higher Engineering Mathematics, B. S. Grewal, Khanna Publication, Delhi.

Reference Books:

1. *A first course in Probability*, S.M. Ross,Prentice Hall.
2. *Probability and Statistics for Engineers*,(Fourth Edition), I.R. Miller, J.E. Freund and R. Johnson, PHI.
3. *Introduction to the Theory of Statistics*, A.M. Mood, F.A. Graybilland D.C. Boes,McGraw Hill Education.
4. *Advanced Engineering Mathematics*, (Seventh Edition), Peter V. O'Neil, Thomson Learning.
5. *Advanced Engineering Mathematics*, (Second Edition) M. D. Greenberg, Pearson Education.
6. *Applied Mathematics*, Vol. I & II, P. N. Wartikar andJ. N. Wartikar,VidyarthiPrakashan.

CO-PO Mapping

Course Name: Statistics, Probability and Calculus (CB-112)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										3
CO2	3	2										2
CO3	3	2										1
CO4	3	2										3

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(w.e.f. the academic year 2019-2020)

B.Tech.,Computer Science and Business Systems

CB 113 Fundamentals of Computer Science

Semester I (First year)	**L**	**T**	**P**	**C**
	3	**-**	**4**	**4**

Course Pre Requisites : Your **passion**, **enthusiasm and** Just a bit of logical skills should be enough.

Course Objectives:

- To impart adequate knowledge on the need of programming languages and problem solving techniques.
- To develop programming skills using the fundamentals and basics of C Language.
- To enable effective usage of arrays, structures, functions, pointers and to implement the memory management concepts.
- To teach the issues in file organization and the usage of file systems.

Course Outcomes:

CO1: The students will be able to enhance their analyzing and problem solving skills and use the same for writing programs in C.

CO2: To develop programs using the basic elements like control statements, Arrays and Strings.

CO3: To develop advanced applications using enumerated data types, function pointers and nested structures and ability to apply code reusability with user defined functions.

CO4: To learn the basics of file handling mechanism that is essential for understanding the concepts in database management systems and to understand the uses of preprocessors and various header file directives.

UNIT-I

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

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-II

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.

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, Initialisation, Recursion, Pre-processor, Standard Library Functions and return types.

UNIT-III

Pointers and Arrays: 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, Initialisation of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated.

Structures: Basic Structures, Structures and Functions, Array of structures, Pointer of structures, Self-referral structures, Table look up, typedef, unions, Bit-fields

UNIT-IV

Input and Output: Standard I/O, Formatted Output – printf, Formated 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.

Unix system Interface: File Descriptor, Low level I/O – read and write, open, create, close and unlink, Random access – lseek, Discussions on Listing Directory, Storage allocator.

Programming Method: Debugging, Macro, User Defined Header, User Defined Library Function, makefile utility.

Text Books:

1. *The C Programming Language,* (Second Edition) B. W. Kernighan and D. M. Ritchi, PHI.

Reference Books:

1. *Programming in C,* (Second Edition)B. Gottfried, Schaum Outline Series.

2. *C: The Complete Reference*,(Fourth Edition), Herbert Schildt, McGraw Hill.

3. *Let Us C,*Yashavant Kanetkar, BPB Publications

Mapping of Course Outcomes with POs and PSOs

Course Outcomes	Program Outcomes											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	H	H	H	-	-	-	-	-	-	-	-	M
CO2	H	H	H	-	-	-	-	-	-	-	-	M
CO3	H	H	H	-	-	-	-	-	-	-	-	M
CO4	H	H	H	-	-	-	-	-	-	-	-	M

H = Highly Related M = Medium L = Low

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B.Tech.,Computer Science and Business Systems

CB-114 PRINCIPLES OF ELECTRICAL ENGINEERING

Semester I (First year)	**L**	**T**	**P**	**C**
	2	**-**	**-**	**2**

Course Objectives

- To understand the basic concepts of electric circuits
- To understand the basic concepts of magnetic circuits.
- To identify the types of sensors and measure quantities in AC and DC systems

Course Outcomes (COs)

1. Recognize the basic concepts and terminology of electrical quantities
2. Analyze the DC circuit using various network theorems and AC circuits with R-L-C elements.
3. Analyze the Static and dynamic characteristics of Electro-static and Electromagnetic fields.
4. Apply the concept of sensors in measurement of various electrical quantities

Program Outcomes (POs):

The graduate will demonstrate/ exhibit

PO1) An ability to apply knowledge of Applied Mathematics, Basic Engineering sciences.

PO2) An ability to identify, formulate and solve Electrical Engineering problems.

PO3) An ability to analyze and interpret data while designing components and systems to meet the needs of industry within realistic constraints.

PO4) Knowledge of contemporary issues.

PO5) An ability to work and visualize effectively in laboratories, industriesamong multidisciplinary teams.

PO6) Skill to use modern engineering tools, software and equipment in modern Electrical Engineering practice.

PO7) An understanding of managerial, professional and ethical responsibility.

PO8) An ability to communicate effectively in both verbal and written form.

PO9) The understanding of the impact of engineering solutions in global, economic, environmental, safety and societal context.

PO10) Recognition of the need and ability to engage in lifelong learning.

PO11) An ability to carry out interdisciplinary programs and research in National/International organizations.

CO No	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1
1	3	1									
2	1	3		1							
3	1	3		1							1
4	1	2		1					1		1

UNIT I [Text Book -1] **(7 Periods)**

Introduction: 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 sources, Kirchhoff-s laws and applications to network solutions using mesh and nodal analysis, Concept of work, power, energy, and conversion of energy.

UNIT II [Text Book -1] **(16 Periods)**

DC Circuits: Current-voltage relations of the electric network by mathematical equations to analyze the network (Thevenin's theorem, Norton's Theorem, Maximum Power Transfer theorem) Simplifications of networks using series-parallel, Star/Delta transformation. Superposition theorem.

AC Circuits: AC waveform definitions, form factor, peak factor, study of R-L, R-C,RLC series circuit, R-L-C parallel circuit, phasor representation in polar and rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3 phase Balanced AC Circuits.

UNIT III [Text Book -1, 2] **(10 Periods)**

Electrostatics and Electro-Mechanics: Electrostatic field, electric field strength, concept of permittivity in dielectrics, capacitor composite, dielectric capacitors, capacitors in series and parallel, energy stored in capacitors, charging and discharging of capacitors, Electricity and Magnetism, magnetic field and Faraday's law, self and mutual inductance, Ampere's law, Magnetic circuit, Single phase transformer, principle of operation, EMF equation, voltage ratio, current ratio, KVA rating, efficiency and regulation, Electromechanical energy conversion.

UNIT IV [Text Book -1, 3] **(12 Periods)**

Measurements and Sensors: Introduction to measuring devices/sensors and transducers (Piezoelectric and thermo-couple) related to electrical signals, Elementary methods for the measurement of electrical quantities in DC and AC systems(Current & Single-phase power). Electrical Wiring and Illumination system: Basic layout of the distribution system, Types of Wiring System &Wiring Accessories, Necessity of earthing, Types of earthing, Safety devices &system.Principle of batteries, types, construction and application, Magnetic material and B-H Curve, Basic concept of indicating and integrating instruments.

Text Books:

1. *A Textbook of Electrical Technology*,(vol. I),B. L. Theraja, Chand and Company Ltd., New Delhi.
2. *Basic Electrical Engineering*, V. K. Mehta, S. Chand and Company Ltd., New Delhi.
3. *Fundamentals of Electrical and Electronics Engineering*,Smarjith Ghosh, Prentice Hall (India) Pvt. Ltd.

Reference Books:

1. *Basic of Electrical Engineering*, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press. T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford University Press, 2011.
2. *Introduction to Electrodynamics*, D. J. Griffiths, (Fourth Edition), Cambridge University Press.
3. *Engineering Circuit Analysis*, William H. Hayt& Jack E. Kemmerly, McGraw-Hill Book Company Inc.

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(Autonomous)

(w.e.f. the academic year 2019-2020)

B.Tech.,Computer Science and Business Systems

CB 115 Fundamentals of Physics

Semester I (First year)

L	T	P	C
3	-	-	3

Course Pre-Requisites: Knowledge of Class XII level Physics & Mathematics.

Objectives:

1. To learn the fundamentals of oscillations and basic idea of EM.
2. To understand the phenomena of interference, diffraction and polarisation.
3. To know the wave particle duality, uncertainty principle etc. by learning the prerequisite quantum physics and understanding the basic concepts of crystallography.
4. To understand fundamentals of Lasers, fiber optics and various laws of thermodynamics.

Course Outcomes : At the end of the course, the student will be able to :	
CO1	Identify and illustrate physical concepts and terminology used in oscillations and Electromagnetism.
CO2	Recognise Interference, diffraction and polarisation phenomena and explain the conditions required for such phenomena to appear.
CO3	Explain the idea of wave function, role of uncertainty in quantum physics and analyse various crystalline structures for solids.
CO4	Describe the concepts of lasers, fiber optics and different laws of thermodynamics& their uses.

Unit – I [Text Books 1,2] (15 periods)

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

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

Unit – II [Text Books 2,3] (15 periods)

Interference: Principle of superposition-Young's experiment:Theoryof 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 - Brewster's law, double refraction, Concept of production of polarized beam of light from two SHM's acting at right angle, plane, elliptical and circularly polarized lights.

Unit – III [Text Books 4] (15 periods)

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

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

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

Unit – IV [Text Books 1,2] (15 periods)

Laser and Fiber optics: Einstein's theory of matter radiation interaction and Aand B coefficients; amplification of light by population inversion, different types of lasers: Ruby Laser, CO2 and Neodymium lasers; Properties of laser beams: mono-chromaticity, coherence:(Temporal and Spatial Coherence), directionality and brightness, laser speckles, applications of lasers in engineering.Fiber optics and Applications, Types of optical fibers.

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. *Fundamentals of Physics,* David Halliday, Robert Resnick and Jearl Walker, Wileyplus.
2. *Optics,* (Fifth Edition) Ajoy Ghatak, Tata McGraw Hill.
3. *Fundamentals of Optics,*(Third Edition) Jenkins and White, McGraw-Hill.
4. *Concepts of Modern Physics,*(Fifth Edition) A Beiser, McGraw Hill International.

Reference Books:

1. *Sears &Zemansky University Physics,* Addison-Wesley.
2. *Fundamentals of Optics,*(Third Edition)Jenkins and White, McGraw-Hill.

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Mapping of Course Outcomes with POs

Course Outcomes	Program Outcomes											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	M	M	-	-	-	-	-	-	-	-	-	L
CO2	M	M	-	-	-	-	-	-	-	-	-	L
CO3	M	M	-	-	-	-	-	-	-	-	-	L
CO4	M	M	-	-	-	-	-	-	-	-	-	L

H = Highly Related M = Medium L = Low

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(w.e.f. the academic year 2019-2020)

B.Tech.,Computer Science and Business Systems

CB 151 Fundamentals of Computer Science Lab

Semester I (First year)	**L**	**T**	**P**	**C**
	-	**-**	**4**	**2**

Laboratory

1. Algorithm and flowcharts of small problems like GCD
2. Structured code writing with:
   - i. Small but tricky codes
   - ii. Proper parameter passing
   - iii. Command line Arguments
   - iv. Variable parameter
   - v. Pointer to functions
   - vi. User defined header
   - vii. Make file utility
   - viii. Multi file program and user defined libraries
   - ix. Interesting substring matching / searching programs
   - x. Parsing related assignments

Text Books:

1. The C Programming Language, (Second Edition) B. W. Kernighan and D. M. Ritchi, PHI.

Reference Books:

1. Programming in C, (Second Edition)B. Gottfried, Schaum Outline Series.
2. C: The Complete Reference,(Fourth Edition), Herbert Schildt, McGraw Hill.
*3. Let Us C,*Yashavant Kanetkar, BPB Publications.

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(Autonomous)

(w.e.f. the academic year 2019-2020)

B.Tech.,Computer Science and Business Systems

CB 152 PRINCIPLES OF ELECTRICAL ENGINEERING Lab

Semester I (First year)	**L**	**T**	**P**	**C**
	-	**-**	**2**	**1**

Laboratory

1. Familiarization of electrical Elements, sources, measuring devices and transducers related to electrical circuits
2. Determination of resistance temperature coefficient.
3. Verification of Superposition Theorem.
4. Verification of Thevenin's Theorem.
5. Verification of Norton's Theorem.
6. Verification of Maximum Power Transfer Theorem.
7. Simulation of R-L-C series circuits for XL>XC , XL< XC
8. Simulation of Time response of RC circuit
9. Verification of relation in between voltage and current in three phase balanced star and delta connected loads.
10. Demonstration of measurement of electrical quantities in DC and AC systems.

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(w.e.f. the academic year 2019-2020)

B.Tech.,Computer Science and Business Systems

CB 153 Fundamentals of Physics Lab

Semester I (First year)

L	T	P	C
-	-	2	1

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 wave length of light by Laser diffraction method
5) Determination of wave length of light by Newton's Ring method
6) Determination of laser and optical fiber parameters
7) Determination of Stefan's Constant.

Course Pre-Requisites:

- *Need a background in the fundamental formulas & units of XII standard physics.*

Objectives:

1. To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
2. Communicate their ideas effectively, both orally and in writing; and function effectively in multidisciplinary teams.
3. To give skills that can transfer critical thinking into problem solving methods, how to identify what data is important, how to collect that data and then draw conclusions from it.
4. To learn the usage of electrical and optical systems for various measurements.

Course Outcomes: At the end of the course, the student will be able to :	
CO1	Describe the various procedures and techniques for the experiments.
CO2	Develop design/problem solving skills, practical experience through laboratory assignments which provide opportunities for developing team in multidisciplinary environments.
CO3	Recognise and describe to test the optical components using principles of interference, diffraction, laser & optical fiber parameters.

CO4	Apply the analytical techniques and graphical analysis to the experimental data.

Mapping of Course Outcomes with POs

Course Outcomes	**Program Outcomes**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	M	M	-	M	-	-	-	-	M	-	-	L
CO2	M	M	-	M	-	-	-	-	M	-	-	L
CO3	M	M	-	M	-	-	-	-	M	-	-	L
CO4	M	M	-	M	-	-	-	-	M	-	-	L

H = Highly Related M = Medium L = Low

R V R & J C COLLEGE OF ENGINEERING, CHOWDAVARAM, GUNTUR-19

(Autonomous)

(w.e.f. the academic year 2019-2020)

B.Tech. Computer Science and Business Systems

CB 154 Business Communication & Value Science-1 Lab

Semester I (First year)	**L**	**T**	**P**	**C**
	-	**-**	**4**	**2**

Nature of Course: Behavioural

Course Pre Requisites: Basic Knowledge of high school English

Course Objectives:

- Understand what life skills are and their importance in leading a happy and well-adjusted life
- Motivate students to look within and create a better version of self
- Introduce them to key concepts of values, life skills and business communication

Course Outcomes:

CO1: Recognize the need for life skills and values
CO2: Recognize own strengths and opportunities
CO3: Apply the life skills to different situations
CO4: Understand the basic tenets of communication
CO5: Apply the basic communication practices in different types of communication

UNIT-I

Introducing self: Activity on self-introduction, introducing others, SWOT analysis
Overview of Business Communication: Newspaper report, celebrity conversations, quiz
Self-awareness: Identity, body awareness, stress management

UNIT-II

Essential Grammar-I: Refresher on parts of speech, tenses, functional grammar, sentence formation, common errors
Communication Skills: Overview of communication skills, barriers of communication, effective communication, types of communication- verbal and non – verbal
Listening Skills: Law of nature-, importance of listening skills, difference between listening and hearing, types of listening
Expressing self: Connecting with emotions, visualizing and experiencing purpose

UNIT-III

Verbal communication: Pronunciation, clarity of speech
Email writing: Formal and informal emails
Vocabulary Enrichment: Exposure to words from General Service List (GSL) by West, Academic word list (AWL) technical specific terms related to the field of technology, phrases, idioms, significant abbreviations formal business vocabulary – Read Economic Times, Reader's Digest, National Geographic, Toastmaster style Table Topics speech with evaluation
Written Communication: Summary writing, story writing
Build your CV – start writing your comprehensive CV including every achievement in your life, no format, no page limit
Life skill: Stress management, working with rhythm and balance, colours, and teamwork

UNIT-IV

Understanding Life Skills: Movie based learning
Introduction to life skills What are the critical life skills
Multiple Intelligences Embracing diversity – Activity on appreciation of diversity
Life skill: Community service – work with an NGO and make a presentation, Join a trek
Values to be learnt: Leadership, teamwork, dealing with ambiguity, managing stress, motivating people, creativity, result orientation

Text Books:

There are no prescribed texts for Semester 1

Reference Books:

1. English vocabulary in use – Alan Mc'carthy and O'dell
2. APAART: Speak Well 1 (English language and communication)
3. APAART: Speak Well 2 (Soft Skills)
4. Business Communication – Dr. SarojHiremath

Web References:

1. Train your mind to perform under pressure- Simon sinek
   https://curiosity.com/videos/simon-sinek-on-training-your-mind-to-perform-underpressure-capture-your-flag/
2. 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-beforenumbers.html
3. Will Smith's Top Ten rules for success
   https://www.youtube.com/watch?v=bBsT9omTeh0

Online Resources:

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

CB 121 Linear Algebra				
I Year II Semester	L	T	P	C
	3	-	-	3

Course Objectives:

The objective of this course is to familiarize the Prospective engineers with techniques in Linear Algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more a level of mathematics and applications that they would find useful in their discipline.

Course Outcomes:

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

CO1: Apply knowledge of basics of Matrices, Determinants and solve the consistency of any type of systems.
CO2: Describe Vector Space, Orthogonality and Projection.
CO3: Calculate Eigen values and Eigen Vectors.
CO4: Describe Singular value decomposition and Principal component analysis.

UNIT – I: **[CO-1] (12)**

Introduction to Matrices and Determinants; Solution of Linear Equations; Cramer's rule; Inverse of a Matrix.

Vectors and linear combinations; Rank of a matrix; Gaussian elimination; LU Decomposition; Solving Systems of Linear Equations using the tools of Matrices.

UNIT – II: **[CO-2] (12)**

Vector space; Dimension; Basis; Orthogonality; Projections; Gram-Schmidt orthogonalization and QR decomposition.

UNIT – III: **[CO-3] (12)**

Eigenvalues and Eigenvectors; Positive definite matrices; Linear transformations; Hermitian and unitary matrices.

UNIT – IV: **[CO-4] (12)**

Singular value decomposition and Principal component analysis; Introduction to their applications in Image Processing and Machine Learning.

Text Books:

1. *Higher Engineering Mathematics*, B. S. Grewal, Khanna Publishers.

Reference Books:

1. *Advanced Engineering Mathematics*, (Seventh Edition), Peter V. O'Neil, Cengage Learning.
2. *Advanced Engineering Mathematics*, (Second Edition), Michael. D. Greenberg, Pearson.
3. *Introduction to linear algebra*, (Fifth Edition), Gilbert Strang, Wellesley-Cambridge Press.
4. *Applied Mathematics* (Vol. I & II), P. N. Wartikar& J. N. Wartikar, Pune Vidyarthi GrihaPrakashan.
5. *Digital Image Processing*, R C Gonzalez and R E Woods, Pearson.
6. https://machinelearningmastery.com/introduction-matrices-machine-learning/

Mapping of Course Outcomes with POs and PSOs

Course Outcomes	Program Outcomes											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	H	M		-	-	-	-	-	-	-	-	M
CO 2	M	M		-	-	-	-	-	-	-	-	M
CO 3	H	H		-	-	-	-	-	-	-	-	M
CO 4	H	H		-	-	-	-	-	-	-	-	H

H = Highly Related M = Medium L = Low

CB 122 Statistical Methods				
I Year II Semester	L	T	P	C
	3	-	-	3

Course Objectives:

The student who successfully completes this course will have:

1. The knowledge in various sampling techniques and to find the relationship between the bivariate data.
2. The skill to adapt Analysis of Variance and predict the future behaviour based on time series data.
3. The ability to understand the criteria of a good estimator.
4. The basic concepts of testing of hypothesis and its applications for non-parametricdata.

Course Outcomes:

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

1. Apply various techniques to collect the data and to fit the data by various models.
2. Design and conduct experiments by ANOVA and forecast the data by various models in time series.
3. Solve the problems based on estimation theory.
4. Test the hypothesis for non parametric data.

UNIT-I (14 periods) (CO1)

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.

Linear Statistical Models: Scatter diagram. Linear regression and correlation. Least squares method. Rank correlation. Multiple regression & multiple correlation.

UNIT-II (12 periods) (CO2)

ANOVA: Analysis of Variance (one-way classification), Analysis of Variance (two-way classification).

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

UNIT-III (12 periods) (CO3)

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 (12 periods) (CO4)

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

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.

Data Source:

- www.rbi.org.in

Text Books:

1. *Probability and Statistics for Engineers* (Fourth Edition), I.R. Miller, J.E. Freund and R. Johnson, Prentice Hall India Learning Private Limited.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										3
CO2	2	2										2
CO3	3	3										2
CO4	3	2										3

CB 123 Data Structures & Algorithms				
I Year II Semester	L	T	P	C
	3	-	-	3

Course Pre Requisite(s): Basic understanding of C programming language Course

Course Objective: The course is aimed to provide an understanding of key concepts underlying the choice and implementation of data structures, algorithms and step by step approach in solving problems with the help of these fundamental data structures.

Course Outcome(s)
Students will be able to:
CO1: Understand the fundamentals, analysis of algorithms and implement linear data structures
CO2: Understand and implement Non Linear data structure of Trees, and implement Non Linear data structure of Graphs.
CO3: Understand and implement the different search techniques.
CO4: Understand the concepts of distributed system security

Unit-I 15P

Basic Terminologies and Introduction to Algorithm & Data Organisation: 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

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

Unit-II 13P

Non-linear Data Structure: Trees (Binary Tree, Threaded Binary Tree, Binary Search Tree, B & B+ Tree, AVL Tree, Splay Tree) and Graphs (Directed, Undirected), Various Representations, Operations & Applications of Non-Linear Data Structures

Unit-III 12P

Searchingand Sorting on Various Data Structures: Sequential Search, Binary Search, Comparison Trees, Breadth First Search, Depth First Search Insertion Sort, Selection Sort, Shell Sort, Divide and Conquer Sort, Merge Sort, Quick Sort, Heapsort, Introduction to Hashing

Unit-IV 10P

File: Organisation (Sequential, Direct, Indexed Sequential, Hashed) and various types of accessing schemes.
Graph: Basic Terminologies and Representations, Graph search and traversal algorithms andcomplexity analysis.

Text Books:

1. *Fundamentals of Data Structures*, E. Horowitz, S. Sahni,S. A-Freed, Universities Press.
2. *Data Structures and Algorithms*,A. V.Aho, J. E.Hopperoft, J. D.UIlman, Pearson.

Reference Books:

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, The MIT Press.

3. *Open Data Structures: An Introduction (Open Paths to Enriched Learning)*, (Thirty First Edition), Pat Morin, UBC Press.

Mapping of Course Outcomes with POs

Course Outcomes	Program Outcomes											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	H	H	H	-	-	-	-	-	-	-	-	M
CO 2	H	H	H	H	H	-	-	-	-	-	-	M
CO 3	H	H	H	H	H		-	-	-	-	-	M
CO 4				H	H		-	-	-	-	-	M

H = Highly Related M = Medium L = Low

Mapping of Course Outcomes with PEO's

Course Outcomes	Program Educational Outcomes		
	PE01	PEO2	POE3
CO 1	H	H	M
CO 2	H	H	M
CO 3	H	H	M
CO 4	H	M	M

H = Highly Related M = Medium L = Low

Mapping of Course Outcomes with PSO's

Course Outcomes	Program Educational Outcomes		
	PSO1	PSO2	PSO3
CO 1	H	M	M
CO 2	H	M	M
CO 3	H	M	M
CO 4	H	M	M

H = Highly Related M = Medium L = Low

CB 124 Principles of Electronics Engineering				
I Year II Semester	L	T	P	C
	3	-	-	3

Course Pre Requisites:

Engineering Physics, Basic Electrical and Electronics Engineering

Course Objective:

The objective of this course is to introduce the fundamental concepts in electronics to know the operation Electronic devices and circuits and also the implementation Digital Circuits, realization of digital components of circuit level.

Course Outcomes:

Students will able to

- Understand the behavior of Semi Conductors with respect to current carrying capability and the operation of diode, diode circuits and rectifiers
- Understand the operation of BJT, JFET and MOSFET as well as amplifier circuits
- Understand the concepts of feedback and its advantages and disadvantages and to know the operation of operational amplifier.
- Understand the difference between analog and digital signals and implementation details of basic digital elements at circuit level.

Syllabus:

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-type and N-type semiconductors, drift & diffusion carriers.

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

UNIT - II

Bipolar Junction Transistor: Formation of PNP/NPN junctions, energy band diagram: Transistor mechanism and principal of transistor, CE, CB, CC configuration, Transistor characteristics: cut-off active and saturation mode, transistor action, injection efficiency, base transport factor and current amplification factor for CB and CE modes. Biasing and Bias stability: calculation of stability factor

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

UNIT - III

Feed Back Amplifier, Oscillators and Operational Amplifiers: Concept (Block diagram), properties, positive and negative feedback, loop gain, open loop gain, feedback factors; topologies of feedback amplifier; effect of feedback on gain, output impedance, input impedance, sensitivities(qualitative), bandwidth stability; effect of positive feedback: instability and oscillation, condition of oscillation, Barkhausen criteria. Introduction to integrated circuits, operational amplified 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 - IV

Digital Electronics Fundamentals: Difference between analog and digital signals, Logic ICs, half and full adder/subtractor, multiplexers, demultiplexer, flip-flop, shift registers, counters.

Text Books:

1. Microelectronics Circuits, Adel S.Sedra and Kenneth Carless Smith, Oxiford University Press.
2. Millmans's Integrated Electronics, Jacob Milliman, Christos Halkias, Chetan Parikh, McGRaw Hill Education.
3. Digital Logic & Computer Design, M. Morris Mano, Pearson

Reference Books:

1. Electronic Devices and Circuit Theory, Robert L. Boylestad, Louis Nashelsky.
2. Solid State Electronic Devices, 6th Edition, Ben Streetman, Sanjay Banerjee
3. Electronic Principle, Albert Paul Malvino.
4. Electronics Circuits: Discrete & Integrated, D Schilling C Belove T Apelewicz R Saccardi.
5. Microelectronics, Jacob Milliman, Arvin Grabel.
6. Electronics Devices & Circuits, S. Salivahanan, N. Suresh Kumar, A. Vallavaraj

Mapping of Course Outcomes with POs

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	L	M								M
CO2	H	H	L	M								M
CO3	H	H	L	M								M
CO4	H	H	L	M								M

H=HighlyRelated M=Medium L=Low

Mapping of Course Outcomes with PEOs

Course Outcomes	Program Educational Objectives		
	PEO1	PEO2	PEO3
CO1	H	L	
CO2	H	L	
CO3	H	L	
CO4	H	L	

H=HighlyRelated M=Medium L=Low

Mapping of Course Outcomes with PSOs

Course Outcomes	Program Specific Outcomes		
	PSO1	PSO2	PSO3
CO1	H	M	L
CO2	H	M	L
CO3	H	M	L
CO4	H	M	L

H=HighlyRelated M=Medium L=Low

CB 125 Fundamentals of Economics				
I Year II Semester	L	T	P	C
	3	-	-	3

COURSE OBJECTIVES:

COURSE OUTCOMES:

After successful completion of the course, the students are able to-

CO1.To explain, analyze and predict consumer behavior under conditions of certainty and uncertainty for individual and market demand for goods and supply, apply the concept of market equilibrium and calculate welfare measures such as consumer surplus, taxes, subsidies and social welfare.

CO2.To calculate the minimal cost input factor quantities for a firm and optimal selling prices, supply quantities and resulting profits of firms in different market structures (including perfect competition and various forms of imperfect competition, like monopolies, oligopolies, and monopolistic competition).

CO3. To recognize the key issues in macro economic analysis, in particular, how macro economic shocks affects businesses, develop a perspective that is supported with relevant information and integrative thinking for making conclusion.

CO4.To discuss and explain the role of the government in the economy ,analyze and predict the effect of government measures (policies etc.) on market prices for sustainable development.

UNIT I **[CO: 1] (12 Hours)**

Microeconomics: 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; 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 II **[CO: 2] (12 Hours)**

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 ,Oligopoly and Monopolistic Competition

UNIT III **[CO: 3] (12 Hours)**

Macroeconomics : National Income and its Components – GNP, NNP, GDP, NDP ; Consumption Function; Investment; Simple Keynesian Model of Income Determination and the Keynesian Multiplier ; Government Sector – Taxes and Subsidies ; External Sector – Exports and Imports

UNIT IV **[CO: 4] (12 Hours)**

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; Business Cycles and Stabilization – Monetary and Fiscal Policy – Central Bank and the Government; The Classical Paradigm – Price and Wage Rigidities – Voluntary and Involuntary Unemployment

LEARNING RESOURCES:

TEXT BOOK(s):

1. *Microeconomics ,* Pindyck,Robert S., and Daniel L.Rubinfeld
2. *Macroeconomics,* Dornbusch,Fischer and Startz
3. *Economics,* Paul Anthony Samuelson,William D.Nordhaus

REFERENCE BOOK(s):

1. *Intermediate Microeconomics* : A Modern Approach , Hal R,Varian
2. *Principles of Macroeconomics*, N.Gregory Mankiw

CO-PO Mapping :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												

CO-PSO Mapping:

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			

MC 001 Constitution of India				
I Year II Semester	L	T	P	C
	2	-	-	-

COURSE OBJECTIVES:

To provide basic information about Indian Constitution.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. understand the significance of many provisions of the Constitution as well as to gain insight into their back ground. They will also understand number of fundamental rights subject to limitations in the light of leading cases.
2. Study guidelines for the State as well as for the Citizens to be followed by the State in the matter of administration as well as in making the laws. It also includes fundamental duties of the Indian Citizens in Part IV A (Article 51A).
3. Understand administration of a State, the doctrine of Separation of Powers.
4. Know how the State is administered at the State level and also the powers and functions of High Court.
5. Understand special provisions relating to Women empowerment and also children. For the stability and security of the Nation, Emergency Provision are Justified.
6. Understand election commission as an independent body with enormous powers and functions to be followed both at the Union and State level. Amendments are necessary, only major few amendments have been included.

UNIT I [CO:1] **(10)**

Preamble to the Constitution of India Domicile and Citizenship. Fundamental rights under Part III, Leading Cases. Relevance of Directive Principles of State Policy under Part-IV, IV-A Fundamental duties.

UNIT II [CO:2,3] **(10)**

Union Executive - President, Vice-President, Prime Minister, Union Legislature - Parliament and Union Judiciary - Supreme Court of India. State Executive - Governors, Chief Minister, State Legislature and High Court.

UNIT III [CO:3,5] **(10)**

Special Constitutional Provisions for Scheduled Casters and Tribes, Women and Children and Backward Classes, Emergency Provisions.

UNIT IV [CO:6] **(10)**

Electoral process, Centre State Relations (Amendment Procedure, 42nd, 44th, 74th, 76th, 86th and 91st Constitutional amendments).

LEARNING RESOURCES:

TEXT BOOK:

Durga Das Basu: "Introduction to the Constitution of India" (student edition) Prentice - Hall EEE, 19th/20th Edition, 2001.

REFERENCE BOOK(s):

1. M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.

2. Brij Kishore Sharma, "Introduction to the Constitution of India", PHI, Learning Pvt.Ltd., New Delhi, 2011.

CBV004 Programming with Python (Self Learning Module)				
I Year II Semester	L	T	P	C
	-	-	2	-

Course Objectives

At the end of the course the students will understand

1. Data types and control structures.
2. Procedural programming features of python.
3. file handling power of python.
4. object oriented programming in python.

Course Outcomes

After successful completion of the course, the students are able to

1. manipulate various types of data in python.
2. apply procedure oriented features of python.
3. develop applications for manipulating files.
4. apply Object oriented programming features of python.

UNIT I **15 Periods**

Data and Expressions- Literals, Variables and Identifiers, Operators, Expressions and Data Types.

Control Structures - What Is a Control Structure? Boolean Expressions (Conditions), Selection Control, Iterative Control.

UNIT II **15 Periods**

Lists - List Structures, Lists (Sequences) in Python, Iterating Over Lists (Sequences) in Python, More on Python Lists.

Functions- Program Routines, More on Functions.

Objects and Their Use - Software Objects, Turtle Graphics,

UNIT III **15 Periods**

Modular Design – Modules, Python Modules.

Text Files - What Is a Text File? Using Text Files, String Processing, Exception Handling.

Dictionaries and Sets - Dictionary Type in Python, Set Data Type.

UNIT IV **15 Periods**

Object-Oriented Programming - What Is Object-Oriented Programming? Encapsulation, Inheritance, Polymorphism

Recursion - Recursive Functions, Recursive Problem Solving, Iteration vs. Recursion.

Learning Resources:

Text Book:

1. Introduction to Computer Science Using Python: A Computational Problem-Solving Focus by Charles Dierbach, Wiley.

Reference Books:

1. Beginning python from novice to professional by Magnus Lie Hedland, 2nd Edition, Apress
2. Learning Python by Mark Lutz, 5th Edition,O'reilly
3. Programming Python by Mark Lutz, 4th Edition, O'reilly

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2						2		1	2
CO2	1	2	3	2					2		2	2
CO3	1	2	3	3					2		2	2
CO4	1	2	3	3					2		3	3

CO- PSO MAPPING:

	PSO1	PSO2	PSO3
CO1	1	1	1
CO2	1	1	1
CO3	1	3	3
CO4	1	3	3

CB 161 Statistical Methods Lab				
I Year II Semester	L	T	P	C
	-	-	2	1

Course Objectives:

The student who successfully completes this course will have:

1. The knowledge to use R for statistical programming, computation, modelling and graphics.
2. The skill to write functions and use R in an efficient way.
3. The ability to fit some basic types of statistical models using R.
4. The idea to expand the knowledge of R on their own.

Course Outcomes:

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

1. Write the programs in R to solve the statistical problems.
2. Apply various built in functions in R to solve the computational and modelling problems.
3. Interpret the statistical data by various functions of graphicalrepresentation.
4. Understand- reading, writing, working and manipulating the data in various data frames.

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**

CB 162 Data Structures & Algorithms Lab				
I Year II Semester	L	T	P	C
	-	-	2	1

Course Description and Objectives:

The course is designed to develop skills to design and analyse simple linear and nonlinear data structures. It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem. It enables them to gain knowledge in practical applications of data structures.

Course Outcomes:

At the end of this lab session, the student will

CO1: Be able to design and analyse the time and space efficiency of the data structure ·

CO2: Be capable to identity the appropriate data structure for given problem ·

CO3: Have practical knowledge on the applications of data structures.

CO4: Have practical knowledge on handling data structures with files.

Laboratory

1. Towers of Hanoi using user defined stacks.
2. Reading, writing, and addition of polynomials.
3. Line editors with line count, word count showing on the screen.
4. Trees with all operations.
5. All graph algorithms.
6. Saving / retrieving non-linear data structure in/from a file

Mapping of Course Outcomes with POs

Course Outcomes	Program Outcomes											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	H	H	H	-	-	-	-	-	-	-	-	M
CO 2	H	H	H	H	H	-	-	-	-	-	-	M
CO 3	H	H	H	H	H		-	-	-	-	-	M
CO 4				H	H		-	-	-	-	-	M

H = Highly Related M = Medium L = Low

Mapping of Course Outcomes with PEO's

Course Outcomes	Program Educational Outcomes		
	PE01	PEO2	POE3
CO 1	H	H	M
CO 2	H	H	M
CO 3	H	H	M
CO 4	H	M	M

H = Highly Related M = Medium L = Low

Mapping of Course Outcomes with PSO's

Course Outcomes	Program Educational Outcomes		
	PSO1	PSO2	PSO3
CO 1	H	M	M
CO 2	H	M	M
CO 3	H	M	M
CO 4	H	M	M

H = Highly Related M = Medium L = Low

CB 163 Principles of Electronics Engineering Lab				
I Year II Semester	L	T	P	C
	-	-	2	1

Course Pre Requisites:

Engineering Physics Lab

Course Objective:

To introduce the students the circuit level implementation and verification of the characteristics of diodes, transistors, op- amps and digital circuits.

Course Outcomes:

At the end of the course student will be

- Able to verify the characteristics of diode, BJT and MOSFET
- Able to understand the circuit level implementation of digital circuits
- To verify the operation of op-amp in inverting amplifier configuration
- To design a fixed bias circuit for a given specifications.

Syllabus:

1. Verification of basic logic gates operation using discrete components.
2. Binary to gray code converter.
3. Verification of half adder and half subtractor.
4. Verification of full adder.
5. Half wave rectifier operation and parameter calculation.
6. V-I characteristics of P-N junction diode.
7. V-I characteristics of zener diode.
8. Output characteristics of common base configuration.
9. Drain characteristics of MOSFET.
10. Inverting amplifier using op-amp.

Reference book:

1. Electronic Devices and Circuit Theory, Robert L. Boylestad, Louis Nashelsky.

Mapping of Course Outcomes with Pos

Course outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	L	M								M
CO2	H	H	L	M								M
CO3	H	H	L	M								M
CO4	H	H	L	M								M

H=HighlyRelated M=Medium L=Low

Mapping of Course Outcomes with PEOs

Course outcomes	Program Educational Objectives		
	PEO1	PEO2	PEO3
CO1	H	L	
CO2	H	L	
CO3	H	L	
CO4	H	L	

H=HighlyRelated M=Medium L=Low

Mapping of Course Outcomes with PSOs

Course outcomes	Program Specific Outcomes		
	PSO1	PSO2	PSO3
CO1	H	M	L
CO2	H	M	L
CO3	H	M	L
CO4	H	M	L

H=HighlyRelated M=Medium L=Low

CB 164 Business Communication & Value Science - II Lab				
I Year II Semester	L	T	P	C
	-	-	4	2

Nature of Course: Behavioural

Course Pre Requisites: Basic Knowledge of high school English

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:

Upon completion of the course, students shall have ability to:

- CO1: Understand tools of structured written communication
- CO2: Use tools of structured written communication
- CO3: Use electronic/social media to share concepts and ideas
- CO4: Develop materials for an organization dedicated to a socialcause
- CO5: Understand the basics of presentation
- CO6: Apply effective techniques to make presentations.
- CO7: Assess presentations based on given criteria
- CO8: Understand tools for quick reading.
- CO9: Apply the basic concept of speed reading, skimming and scanning
- CO10: Identify individual personality types and role in a team
- CO11: Recognize the concepts of outward behavior and internal behavior
- CO12: Understand the basic concepts of Morality and Diversity
- CO13: Create communication material to share concepts and ideas
- CO14: Argue on a topic based on morality and diversity
- CO15: Articulate opinions on a topic with the objective of influencing others
- CO16: Organize an event to generate awareness and get support for a cause

UNIT-I

Written Communication: Understand tools of structured written communication, research & report on social issue identified, create communication material to share concepts and ideas, create the magazine, launching an E Magazine

UNIT-II

Forming an NGO: Identify a social cause, Create Vision, Mission, Valuestatement, tagline and designand logo

Presentation Skills: Basics of presentation, techniques tomakepresentations, ORAI, assess presentation based on given criteria, use electronic/social media to share concepts and ideas, prepare and publish the second episode of the E Magazine
Speed Reading: Introduction to skimming and scanning, SATORI – Join the dots

UNIT-III

Brain storming: Ad campaign, discuss and explore, articulate & amplify a social issue
Communication: Design a skit, enact & promote a play, capture likes & reviews **p**repare and publish the third episode of the E Magazine
Team Work: Intro of Dr. Meredith Belbin's research on team work, Belbin's 8 Team Roles and Lindgren's Big 5 personality traits, Team Falcon practical

UNIT-IV

Morality and Diversity:Short film on diversity, Touch the target (Blind man) - Debriefing of the Practical, Film: "The fish and I'' by BabakHabibifar"
Communication material to share concepts: Narrate a story, feedback, research on a book, write a review in a blog, video record interviews of people Debate on the topic of diversity, prepare and publish the final episode of the E Magazine, SATORI, GD, revisit your resume, a day with the NGO

Text Books:

There are no prescribed texts for Semester 2 – there will be handouts and reference

Reference Books:

1. Guiding Souls: Dialogues on the purpose of life; Dr. A.P.J Abdul Kalam; Publishing Year-2005; Co-author--Arun Tiwari
2. The Family and the Nation; Dr. A.P.J Abdul Kalam; Publishing year: 2015; Co-author: Acharya Mahapragya
3. The Scientific India: A twenty First Century Guide to the World around Us; Dr. A.P.JAbdul Kalam; Publishing year: 2011; Co-author- Y.S.Rajan
4. Forge Your Future: Candid, Forthright, Inspiring ; Dr. A.P.J Abdul Kalam; Publishingyear: 2014
5. Abundance: The Future is Better Than You Think; Peter H. Diamandis and StevenKotler; Published: 21 Feb, 2012; Publisher: Free Press
6. Start With Why: How Great Leaders Inspire Everyone to Take Action; Simon Sinek;Published: 6 October 2011; Publisher: PenguinB.E. /B.Tech in Computer Science & Business Systems
Semester 2
7. Advertising & IMC: Principles and Practice; Sandra Moriarty, Nancy D. Mitchell, William
D. Wells; Published: 15 June 2016; Publisher: Pearson Education India

Web References:

1 Ethics: Fundamentals and Approaches to Ethics
https://www.eolss.net/Sample-Chapters/C14/E1-37-01-00.pdf

2 A Framework for Making Ethical Decisions
https://www.brown.edu/academics/science-and-technology-studies/framework-making-ethical-decisions

3 Five Basic Approaches to Ethical Decision-
http://faculty.winthrop.edu/meelerd/docs/rolos/5_Ethical_Approaches.pdf

Online Resources:

1 https://youtu.be/CsaTslhSDI
2 https://m.youtube.com/watch?feature=youtu.be&v=IIKvV8_T95M
3 https://m.youtube.com/watch?feature=youtu.be&v=e80BbX05D7Y
4 https://m.youtube.com/watch?v=dT_D68RJ5T8&feature=youtu.be
5 https://m.youtube.com/watch?v=7sLLEdBgYYY&feature=youtu.be

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(Autonomous)
(w.e.f. the academic year 2020-2021)
B.Tech., Computer Science and Business Systems
CB 211- COMPUTATIONAL STATISTICS

Semester III (Second year)

L	T	P	C
4	-	-	3

Course Objectives:

The student who successfully completes this course will have:

- To study the concepts of multivariate normal distributed data.
- To develop a sound understanding of current, modern computational statistical approaches and their application to a variety of datasets.
- To understand the key technologies in data science and business analytics such as data mining, machine learning, visualization techniques, predictive modelling, and statistics.
- To apply principles of data science to analyze and to effectively visualize the data.

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

CO1: Remember the basic concepts of multivariate normal distribution
CO2: Interpret the results of discriminant analysis
CO3: Develop a sound understanding of current, modern computational statistical approaches and their application to a variety of datasets.
CO4: Apply algorithms to build machine intelligence.

UNIT-I

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

UNIT-II

Discriminant Analysis: Statistical background, linear discriminant function analysis, Estimating linear discriminant functions and their properties.

UNIT-III

Principal Component Analysis: Principal components, Algorithm for conducting principal component analysis, deciding on how many principal components to retain, H-plot.

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

UNIT-IV

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. T.W. Anderson, "An Introduction to Multivariate Statistical Analysis", Wiley, 3rd Edition, 2003
2. Richard.A.Johnson and Dean.W. Wichern "Applied Multivariate Statistical Analysis" Pearson Prentice Hall, 6th Edition, 2007
3. J.D. Jobson, "Applied Multivariate Data Analysis", Vol I & II, Springer, 2012
4. H. Kris. "Statistical Tests for Multivariate Analysis"

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	1	1	2	2	2	1
CO2	3	3	3	3	3	3	1	1	2	2	2	1
CO3	3	3	3	3	3	3	1	1	2	2	2	1
CO4	2	3	3	3	3	3	1	1	2	2	2	1

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	2	3	3

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CB212 COMPUTER ORGANIZATION & ARCHITECHTURE

L	T	P	C
4	-	-	3

Semester III [second year]

COURSE OBJECTIVES:

At the end of the course the students will understand

- Working of computer system and the principles of instruction level architecture and instruction execution.
- Concepts of I/O devices, hardware components in CPU, and its working principles.
- State of art in memory system design and concepts of computer Arithmetic.
- Advanced pipelining techniques and basic concepts of parallel processors.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

CO1: Define the structure of computer and construct control sequence for an instruction.
CO2: Demonstrate various I/O handling mechanisms and Design control unit organization.
CO3: Illustrate memory hierarchy and Implement algorithms related to computer arithmetic.
CO4: Develop a pipeline for consistent execution of instructions and define various parallel Processing concepts.

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.
Data representation: Signed number representation, fixed and floating point representations, Character representation.

UNIT-II

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 – SCSI, USB .

Introduction to x86 architecture.

CPU control unit design: Hardwired and micro-programmed design approaches, design of a simple hypothetical CPU.

UNIT-III

Memory system design: Semiconductor memory technologies, memory organization.

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

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-IV

Pipelining basic concepts of pipelining, throughput and speedup, pipeline hazards.

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

LEARNING RESOURCES

Text Books:

1. Computer System Architecture M. M. Mano: 3rd ed., Prentice Hall of India, New Delhi, 1993.
2. Computer Organization and Embedded Systems, Carl Hamacher.

Reference Books:

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.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2					2		2		2
CO2	3		1		2			2		2	2	2
CO3	3		3	2				2		2		2
CO4	3	2	2	2	2			2		2		2

CO – PSO Matrix

	PSO1	**PSO2**	**PSO3**
CO1	3	2	3
CO2	3	2	3
CO3	3	2	3
CO4	3	2	3

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CB 213 **Object Oriented Programming**

Semester III (Second Year) **L T P C**
3 1 - 3

Course Objectives:

At the end of the course, the students will understand:

- The difference between object oriented programming and procedural programming.
- The C++ classes using appropriate encapsulation, inheritance and polymorphism and design principles.
- The Advanced C++ features such as operator overloading, dynamic memory allocation, file I/O, exception handling etc.
- The object oriented concepts to solve bigger computing problems

Course Outcomes:

After successful completion of the course, the students are able to:

CO1: Illustrate the concepts and relative merits of C++
CO2: Develop programs using object oriented concepts such as encapsulation, inheritance and Polymorphism
CO3: Apply stream I/O, templates and operator overloading
CO4: Build applications using Object Oriented Design and Modelling

UNIT-1

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, parameter passing –value vs reference, passing pointer by value or reference, Operator new and delete, the typecasting operator, Inline functions in contrast to macro, default arguments.

UNIT-2

The Fundamentals of Object Oriented Programming: Necessity for OOP, Data Hiding, Data Abstraction, Encapsulation, Procedural Abstraction, Class and Object.

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-3

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

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

UNIT-4

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

Reference Books:

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

CO-PO Mapping

Course Name: Object Oriented Programming (CB 213) III Semester (Second Year)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	----	M	----	----	----	----	----	----	M
CO2	H	H	H	----	M	----	----	----	----	----	----	M
CO3	H	H	H	----	M	----	----	----	----	----	----	M
CO4	H	H	H	----	M	----	----	----	----	----	----	M

CO-PSO Mapping

Course Name: Object Oriented Programming (CB 213) III Semester (Second Year)

	PSO1	PSO2	PSO3
CO1	H	M	L
CO2	M	H	L
CO3	M	H	L
CO4	M	H	L

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CB 214 FORMAL LANGUAGE & AUTOMATA THEORY

Semester III (Second year) **L T P C**
4 - - 3

Course Objectives:

To define mathematical methods of computing devices, called abstract machines, namely Finite Automata, Pushdown Automata, and Turning Machines, and to study the Capabilities of these abstract machines.

- To classify machines by their power to recognize languages and employ finite state Machines to solve problems in computing.
- Explain deterministic and non- deterministic machines.
- Identify different formal language classes and their relationships and Design grammars and recognizers for different formal languages.
- Determine the decidability and intractability of computational problems.
- Comprehend the hierarchy of problems arising in the computer sciences.

Course Outcomes:

At the end of this, course students will:

CO1: Be able to construct finite state machines and the equivalent regular expressions, and prove the equivalence of languages described by finite state machines and regular expressions.
CO2: Be able to construct pushdown automata and the equivalent context free grammars, and to prove the equivalence of languages described by pushdown automata and context free grammars.
CO3: Be able to construct Turing machines and Post machines, and to prove the equivalence of languages described by Turing machines and Post machines.
CO4: Be able to *Acquire* a fundamental understanding of core concepts relating to the theory of computation and computational models including (but not limited to) decidability and intractability.

UNIT-I

Introduction: Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages.

Regular languages and finite automata: Regular expressions and languages, deterministic finite automata (DFA) and equivalence with regular expressions, nondeterministic finite automata (NFA) and equivalence with DFA, regular grammars and equivalence with finite automata, properties of regular languages, *Kleene's theorem,* pumping lemma for regular languages, *Myhill-Nerode theorem and its uses,* minimization of finite automata.

UNIT-II

Context-free languages and pushdown automata: Context-free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, closure properties of CFLs. **Context-sensitive languages:** Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG.

UNIT-III

Turing machines: The basic model for Turing machines (TM), Turing recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMs as enumerators.

UNIT-IV

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

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.

Reference Books:

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.

Web References:

1 www.jflap.org/
2 automatonsimulator.com/
3 http://www.jflap.org/tutorial/grammar/bruteforceCFG/index.html
4 https://turingmachinesimulator.com/
5 http://weitz.de/pump/

Online Resources:

1 https://nptel.ac.in/courses/106104028/
2 https://nptel.ac.in/courses/106103070/

Mapping of Course outcomes to Program Outcomes

Sl.No.	Course Outcome	PO's
1.	**CO1: Be able to construct finite state machines and the equivalent regular expressions, and prove the equivalence of languages described by finite state machines and regular expressions.**	PO1,PO2,PO12
2.	**CO2: Be able to construct pushdown automata and the equivalent context free grammars, and to prove the equivalence of languages described by pushdown automata and context free grammars.**	PO1,PO2,PO3,PO4,PO12
3.	**CO3: Be able to construct Turing machines and Post machines, and to prove the equivalence of languages described by Turing machines and Post machines**	PO1,PO2,PO3,PO4,PO12
4.	**CO4: Be able to *Acquire* a fundamental understanding of core concepts relating to the theory of computation and computational models including (but not limited to) decidability and intractability.**	PO1,PO2,PO3,PO4,PO5,,PO12

Course mapping with PEO's and PO's
Mapping of Course to PEOs and POs

Course	**PEOS**	**POs**
FLAT	**PEO1,PEO2**	**PO1,PO2,PO3,PO4,PO5,PO12**

Mapping of Course Outcomes with POs and PSOs

CO 'S	Program Outcomes												Program Specific Outcomes		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**P011**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	M	-	L	-	-	-	-	-	-	-	-	L	M	M	-
CO2	M	L	L	M	-	-	-	-	-	-	-	L	M	M	-
CO3	L	L	L	M	-	-	-	-	-	-	-	L	M	M	-
CO4	L	L	L	M	M	-	-	-	-	-	-	L	-	-	-

H = Highly Related M = Medium **L** = Low

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CB 215 **SOFTWARE ENGINEERING** **L T P C**
3 1 - 3

Semester III [Second Year]

Course Objectives:
At the end of the course, the student will understand

- Knowledge of basic software engineering methods and practices, and their appropriate application.
- Requirements for Modelling and design.
- Principles of object orientation for construction of software.
- Quality management by applying various Testing Strategies.

Course Outcomes:
After successful completion of the course, the students are able to

CO1: Apply the software engineering lifecycle models and project management.
CO2: Analyse and specify software requirements.
CO3: Design, and develop a software project by object oriented principles.
CO4: Evaluate and assess the quality of the software.

UNIT- 1

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.

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 - 2

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- 3

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- 4

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.

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. Roger S. Pressman, Software Engineering -A Practitioner's Approach, Seventh Edition, McGraw Hill Publications.
2. Ian Sommerville, "Software Engineering", Addison-Wesley, 2011.

Reference Books:

1. Fundamentals of Software Engineering, Carlo Ghezzi, Jazayeri Mehdi, Mandrioli Dino.
2. Object Oriented Software Engineering: A Use Case Driven Approach --Ivar Jacobson.

CO – PO Matrix

	PO 1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2
CO 1	2	3	3					1	3	2	2	2
CO 2	2	3	3	2				1	3	2	2	2
CO 3	2	3	3	2	2			1	3	2	2	2
CO 4	2	2	2	2					2	2	2	2

CO – PSO Matrix

	PSO 1	PSO 2	PSO 3
CO 1	1	2	1
CO 2	2	2	2
CO 3	2	3	2
CO 4	2	2	2

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CB251- COMPUTATIONAL STATISTICS Lab

Semester III (Second Year) **L T P C**
- - 4 2

Course Objectives:
The student who successfully completes this course will have:
- The skill to write Python Programs in an efficient way.
- The idea to expand the knowledge of Python on their own.
- The knowledge to use Python for statistical computation, modelling, analysis and graphics.
- The ability to implement multivariate statistical analysis techniques using Python

Course Outcomes:
On completion of this course, students will be able to:
CO1: Write the programs in Python to solve the statistical problems.
CO2: Apply various built in functions in Python to solve the computational, analysis and modelling problems.
CO3: Interpret the statistical data by various functions of graphical representation.
CO4: Understand- reading, writing, working and manipulating the data in various data sets.

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
Visualization in Python: Matplotlib package, Plotting Graphs, Controlling Graph, Adding Text, More Graph Types, Getting and setting values, Patches
Multivariate data analysis: Multiple regression, multivariate regression, cluster analysis with various algorithms, factor analysis, PCA and linear discriminant analysis. Various datasets should be used for each topic.

Text Books:

1. *Programming Python*, Mark Lutz, Oriely Publishers
2. *Python for Data Analysis* , Wes c Kinney, Oriely Publishers
3. *Learning Python*, Mark Lutz, Oriely Publishers
4. *Python 3 for Absolute Beginners*, Tim Hall and J-P Stacey.
5. *Beginning Python: From Novice to Professional*, Magnus Lie Hetland. *Edition, 2005.*

Reference Books:

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. *The Foundations of Factor Analysis*, A.S. Mulaik.
4. *Introduction to Linear Regression Analysis*, D.C. Montgomery and E.A. Peck.
5. *Cluster Analysis for Applications*, M.R. Anderberg.
6. *Multivariate Statistical Analysis*, D.F. Morrison.

List of Experiments:

Lab Cycle- I:

1. Program to determine number of days in a given month
2. Coin change exercise program
3. Program to display a calendar month between the years 1800 and 2099
4. Password encryption/decryption program
5. Temperature conversion program
6. GPA calculation program

7. Word frequency count program
8. Mixed fraction class
9. Matrix manipulation program

Lab Cycle- II:

10. Visualization using matplot lib
    i. Bar graph
    ii. Pie chart
    iii. Box plot
    iv. Histogram
    v. Line chart and subplots
    vi. Scatter plot
11. Controlling colours and styles of various graph elements in matplot lib
12. Adding text at any location using text boxes
13. Composing multiple figures
14. Working with 2D figures

Lab Cycle- III:

15. Multiple Regression
16. Multivariate Regression
17. Principle component analysis for multivariate data
18. Factor Analysis for multivariate data
19. Cluster analysis for multivariate data
20. Linear discriminant analysis for multivariate data

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CB252 COMPUTER ORGANIZATION & ARCHITECHTURE LAB

Semester III (Second Year) **L T P C**
- - 2 1

Lab Exercises:

1. Circuits on breadboard or simulators

   (a) Implementation of Combinational Digital/Boolean Circuits: Adder, Subtractor, Multiplication Module, Division Module, Multiplexer, Demultiplexer, Encoder, Decoder.

   (b) Implementation of Sequential Circuits: Counters, Linear Feedback Shift Registers (LFSR)

2. C/C++ programming to understand the formats of char, int, float, double, long etc.

3. Machine language programming on x86 or higher version kits or simulators:

   (i) Add/subtract/multiplication/division/GCD/LCM

   (ii) Accessing some specific memory locations/ports

   (iii) Counting odd and even integers from a series of memory locations

   (iv) Printing values of selected registers
   (v) Handing interrupts

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CB 253 **Object Oriented Programming Lab**

Semester III(Second Year) **L T P C**
- - 4 2

Course Objectives:
At the end of the course, the student will understand:

- The Difference between object oriented programming and procedural programming
- The concepts of Constructors, inheritance, polymorphism and exception handling.
- The Application development using templates, files in C++
- The Different UML diagrams

Course Outcomes:
After successful completion of the course, the students are able to:

CO1: Demonstrate object oriented programming concepts to solve real time problems
CO2: Experiment with the concepts of constructors, inheritance and polymorphism **a**nd exception handling
CO3: Create software applications using templates, and files in C++
CO4: Illustrate the different UML diagrams

Lab Exercises:

1. Parameter passing: passing parameter by value vs by reference, passing array as constant pointer
2. Function overloading: writing string operations like strcat and strncat, strcpy and strncpy as overloaded functions.
3. Dynamically allocating space for a pointer depending on input and doing this repeatedly, depending on different inputs and finally de-allocating the pointer.
4. Define class complex with all possible operations: constructor, destructor, copy constructor, assignment operator with the data members stored as pointer to integers.
5. Define class vector of integers with all possible operations like constructor, destructor, copy constructor and assignment operators
6. Define class matrix of integers with all possible operations like constructor, destructor, copy constructor and assignment operators
7. Define class matrix of integers using vector, with all possible operations like constructor, destructor, copy constructor and assignment operators
8. Define class stack, queue, linked-list, array, set using some data-type (int) with data members kept as private and functions kept in both protected and public sections.
9. Define class complex with all possible operators: constructor, destructor, copy constructor, assignment operator and operators >, <, >=, <=, ==, ++ (pre and post), +, +=, ( ), with the data members stored as pointer to integers.
10. Define class vector of integers with all possible operations like constructor, destructor, copy constructor and assignment operators>, <, >=, <=, ==, ++ (pre and post), +, +=, ( )
11. Define class matrix of integers with all possible operations like constructor, destructor, copy constructor and assignment operators>, <, >=, <=, ==, ++ (pre and post), +, +=, ( ).
12. Define class matrix of integers using vector, with all possible operations like constructor, destructor, copy constructor and assignment operators>, <, >=, <=, ==, ++ (pre and post), +, +=, ( ).
13. Define stack and queue inherited from array class, with standard functions and operators
14. Define a class called ‘array’ with data type passed as template type with constructor, destructor, copy constructor and assignment operators and index operator.
15. Define template functions for compare and use it in the algorithms like bubblesort, insertion sort, merge sort.
16. Formatted input-output examples
17. Input manipulators

18. Overriding operators <<, >>
19. Define class model for complex number, student class, book class and show it using UML diagram as well as concrete class.
20. Show behavioural modelling through sequence diagram and activity diagram for workflow in a typical log-in, log-out situation.

Text Books:

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

Reference Books:

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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		L	T	P	C
CB 254	**SOFTWARE ENGINEERING LAB**	**-**	**-**	**4**	**2**

Semester III [Second Year]

Course Objectives:

At the end of the course, the student will understand

- Knowledge of basic software engineering methods and practices, and their appropriate application.
- Requirements for Modelling and design.
- Principles of object orientation for construction of software.
- Quality management by applying various Testing Strategies.

Course Outcomes:

After successful completion of the course, the students are able to

CO1: Apply the software engineering lifecycle models and project management.
CO2: Analyse and specify software requirements.
CO3: Design, and develop a software project by object oriented principles.
CO4: Evaluate and assess the quality of the software.

EXPERIMENTS:

Lab cycle 1:

Development of requirements specification, function oriented design using SA/SD.

Lab cycle 2:

Object-oriented design using UML.

1. ANALYSIS- SRS documentation
2. USECASE VIEW
   A. Construction of use case model
   B. Building a Business Process model using UML activity diagram.

LOGICAL VIEW- Construction of UML static class diagram.

Sample information systems for implementation:

1. Course registration system
2. ATM services
3. Advertising agency management system
4. Online shopping
5. Library management system

CO – PO Matrix

	PO 1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2
CO 1	2	3	3					1	3	2	2	2
CO 2	2	3	3	2				1	3	2	2	2
CO 3	2	3	3	2	2			1	3	2	2	2
CO 4	2	2	2	2					2	2	2	2

CO – PSO Matrix

	PSO 1	PSO 2	PSO 3
CO 1	1	2	1
CO 2	2	2	2
CO 3	2	3	2
CO 4	2	2	2

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B.Tech.,Computer Science and Business Systems

CB-221 OPERATIONS RESARCH

Semester IV (Second year)

L	T	P	C
3	1	-	3

Course Objectives:

The student who successfully completes this course will have:

1. Grasp the methodology of OR problem solving and formulate and solve linear programming problems.

2. Develop formulation skills in transportation models and assignment problems and finding solutions.

3. Understand the basics in the field of network models and inventory models.

4. Basic understanding of queuing models and simulation.

Course Outcomes:

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

CO1: Recognize the importance and value of Operations Research. Formulate a given simplified description of a suitable real-world problem as a linear programming model and use the simplex method to solve small linear programming models.

CO2:Solve & interpret transportation and assignment problems

CO3: Formulate and solve network models and inventory models.

CO4: Gain knowledge in queuing models and simulation.

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.

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-II

Transportation Problem
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.

Assignment Problem
AP - Examples, Definitions – decision variables, constraints, formulation, Balanced & unbalanced situations, Solution method – Hungarian, test for optimality (MODI method), degeneracy & its resolution.

UNIT-III

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.

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-IV

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.

Reference Books:

1. *Linear Programming*. K.G. Murthy.
2. *Linear Programming.* G. Hadley.
3. *Principles of OR with Application to Managerial Decisions*. H.M. Wagner.
4. *Introduction to Operations Research*. F.S. Hiller and G.J. Lieberman.
5. *Elements of Queuing Theory*. Thomas L. Saaty.
6. *Operations Research and Management Science, Hand Book*: Edited By A. Ravi Ravindran.
7. *Management Guide to PERT/CPM*. Wiest & Levy.
8. *Modern Inventory Management.* J.W. Prichard and R.H. Eagle.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CB221.1	3	3	3	3	1	-	-	-	-	-	-	1
CB221.2	3	3	3	3	1	-	-	-	-	-	-	1
CB221.3	3	3	3	3	1	-	-	-	-	-	-	1
CB221.4	3	3	3	3	1	-	-	-	-	-	-	1

CO – PSO Matrix:

	PSO1	**PSO2**	**PSO3**
CB221.1	3	1	-
CB221.2	3	1	-
CB221.3	3	1	-
CB221.4	3	1	-

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B.Tech.,Computer Science and Business Systems

CB 222 INTRODUCTION TO INNOVATION, IP MANAGEMENT & ENTREPRENUERSHIP

Semester IV (Second year)

L T P C
3 1 - 3

Course Objectives:

The course enable the students:

To identify and differentiate various types of innovation

To explore new vistas of entrepreneurship environment to generate innovative business ideas
To provide comprehensive knowledge to the students regarding the general principles of IPR
To enhance the students regarding the effect of IPR on emerging issues

Course Outcome(s):

At the end of this course, the students will:

CO1: Learn to be familiar with creative and innovating thinking styles
CO2: Learn to investigate, understand and internalize the process of founding a startup while becoming an entrepreneur
CO3: Learn to start new ventures while using IPR as an effective tool
CO4: Learn to manage various types of IPR to protect their innovations and intangible assets from exploitation to achieve competitive advantage

UNIT I

Unit I: Building an Innovative Organization [CO1] [Text Book 1]

Innovation as a core business process, Sources of Innovation, Knowledge push vs need pull innovations, The Role of innovation as a manageable activity vs random gambling activity; Creating new products and services, Exploiting open innovation and collaboration, Use of innovation for starting a new venture, Case Studies

Unit II: Entrepreneurship: An Innovators guide to Startups [CO2] [Text Book 2]

Opportunity recognition and entry strategies , Entrepreneurship as a style of management, Maintaining Competitive advantage-use of IPR to protect innovation, Financial Projections and

Valuation, Stages of financing , Debt,Venture Capital and other forms of Financing, Case Studies

Unit III: Introduction to Intellectual Property Rights (IPR) [CO3] [Text Book 3]

Introduction , Economics behind the development of IPR : Business Perspective, IPR in India-Genesis and Development, International Context, Concept of IP management, Use in marketing, Case Studies

Unit IV: Types of Intellectual Property [CO4] [Text Book 4]

Patent- Procedure, Licensing and Assignment, Infringement and Penalty; Trademark- Use in marketing, example of trademarks-Domain name; Geographical Indications-Definition GI, Protection; Copyright-Defintion, Industrial designs ;Industrial Protection, Case Studies

Class Discussion/Home Assignment:
1. is innovation manageable or just random gambling activity?
2. Innovation- Cooperating across networks vs 'go-it-alone' approach
3. Major court battles regarding violation of patents between two corporate companies

Text books:

1. Joe Tidd, John Bessant, "Managing Innovation: Integrating Technological, Market and Organizational change".
2. Robert Hirsh, Michael P Peters, Dean A Shepherd, " Entrepreneurship" Sixth Edition, ,Tata McGraw-Hill Companies, New Delhi
3. N.S. Gopala Krishnan & T.G. Agitha, "Principles of Intellectual Property", Eastern Book Company, Lucknow
4. R.C.Dreyfuss,J.Pila,"The Oxford Handbook of Intellectual Property Law", Oxford University Press

Mapping of Course Outcomes with PO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	H	H	H	H	H	M	H	H	M	H
CO2	H	L	M	L	H	H	H	H	H	H	H	H
CO3	L	L	H	H	H	H	H	H	M	M	L	H
CO4	L	L	M	H	H	H	H	H	H	H	H	H

Mapping of Course Outcomes with PEO's

	PEO1	PEO2	PEO3
CO1	L	M	H
CO2	L	M	H
CO3	L	H	H
CO4	L	H	H

Mapping of Course Outcomes with PSO's

	PSO1	PSO2	PSO3
CO1	L	M	H
CO2	L	M	H
CO3	L	M	H
CO4	L	M	H

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B.Tech.,Computer Science and Business Systems

CB223	**OPEARTING SYSTEMS**	**L**	**T**	**P**	**C**
Semester IV [second year]		**3**	**1**	**-**	**3**

COURSE OBJECTIVES:

At the end of the course the students will understand

1. operating system services, architecture and process scheduling.
2. concepts of multithreading, process synchronization and deadlock mechanisms.
3. different approaches to memory management.
4. concepts of file management, secondary storage management and UNIX programming.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

CO1: compare different types of operating systems, describe operating system architecture and its services,
design algorithms on CPU scheduling.
CO2: describe different types of threads, classical problems of process synchronization and analyze deadlock handling mechanisms.
CO3: describe and analyze memory management techniques and page replacement polices.
CO4: identify and compare different file allocation, disk free space management methods, disk scheduling mechanisms and UNIX shell programming.

UNIT I [Textbook 1] **[CO 1] (13)**

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.

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 II **[Textbook 1]**

[CO 2] (14)

Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads.

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.

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

UNIT III **[Textbook 1]**

[CO 3] (13)

Concurrent Programming: Critical region, conditional critical region, monitors, concurrent languages, communicating sequential process (CSP); Deadlocks - prevention, avoidance, detection and recovery.

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 IV **[Textbook 1, 2]**

[CO 4] (13)

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.

LEARNING RESOURCES

Text Books:

1. *Operating System Concepts Essentials,* Abraham Silberschatz, Peter Baer Galvin and Greg Gagne.
2. "Your Unix the ultimate guide", Sumitabha Das, 3rd edition, TMH.

Reference Books:

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.

CO-PO MAPPING:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CB223. 1	1	3	1	-	-	-	-	-	-	-	-	1
CB223. 2	2	3	2	-	-	-	-	-	-	-	-	1
CB223. 3	1	2	2	-	-	-	-	-	-	-	-	1
CB223. 4	2	2	2	-	-	-	-	-	-	-	-	1

CO – PSO Matrix:

	PSO1	PSO2	PSO3
CB223.1	2	2	-
CB223.2	2	3	-
CB223.3	2	2	-
CB223.4	2	2	-

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CB 224 DATABASE MANAGEMENT SYSTEMS

Semester IV [second year]	**L**	**T**	**P**	**C**
	3	**1**	**-**	**3**

Course Objectives:

• To understand the fundamental concepts underlying database management systems:

– database design methodology (normalization,…)

– database management systems (query optimization, concurrency, recovery, security,…)

• To gain hands-on experience with database application systems and commercial database management systems.

– developing an application system using ORACLE & web technology

• To get acquainted with data analysis issues such as data mining, data warehousing and information retrieval;

Course Out Comes:

After completion of this course the students will be able to

CO1 demonstrate the basic elements of a relational database management system, and identify the data models for relevant problems

CO2 ***design*** entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data into RDBMS and formulate SQL queries on the data.

CO3 ***extend*** normalization for the development of application software‘s.

CO4 ***apply and relate*** the Concepts of key notions of transaction, concurrency control, recovery, query evaluation, optimization techniques and be familiar with introduction to web database, distribute databases, data warehousing and mining.

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. **(CO1) (15)**

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.

Relational database design: Domain and data dependency, Armstrong's axioms, Functional Dependencies, Normal forms, Dependency preservation, Lossless design**.** **(CO2) (15)**

UNIT-III

Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

Storage strategies: Indices, B-trees, Hashing.

Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery**.** **(CO3) (18)**

UNIT-IV

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. **(CO4) (12)**

Text Books:

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

Reference Books:

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.

CO'S	Program Outcomes												Program Specific Outcomes		
	PO 1	PO2	PO 3	PO4	PO5	PO 6	PO7	PO 8	PO 9	PO1 0	P01 1	PO1 2	PSO1	PSO2	PSO3
CB224.1	M	-	L	-	-	-	-	-	-	-	-	L	M	M	-
CB224.2	M	M	H	H	-	-	-	-	-	-	-	L	M	M	-
CB224.3	L	M	M	M	-	-	-	-	-	-	-	L	M	M	-
CB224.4	L	M	M	M	M	-	-	-	-	-	-	L	-	-	-

H = Highly Related M = Medium L = Low

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B.Tech., Computer Science and Business Systems

CB 225 **Software Design with UML**

Semester IV [second year]	**L**	**T**	**P**	**C**
	3	**1**	**-**	**3**

Course Objectives:

At the end of the course, the student will understand

1. To know the importance of modeling in the software development life cycle
2. To understand the object-oriented approach to analyzing and designing systems and software solutions
3. To employ the UML notation and symbols to create effective and efficient system designs

Course Outcomes:

After successful completion of the course, the students are able to

CO1. Understand the software development process models.
CO2. Interpret the contemporary issues and discuss about analysis and coding standards.
CO3. Analyse the design methods and modelling
CO4. Employ UML diagrams for real time problems

Syllabus

UNIT - 1

Introduction to on 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 the 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 - 2

Requirements Analysis Using Case Modeling

- Analysis of system requirements.
- Actor definitions.
- Writing a case goal.
- Use Case Diagrams.
- Use Case Relationships.

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 - 3

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.

Package Diagram Model.

- Description of the model.
- White box, black box.
- Connections between packagers.
- Interfaces.
- Create Package Diagram.
- Drill Down.

UNIT - 4

Dynamic Model: State Diagram / Activity Diagram.

- Description of the State Diagram.
- Events Handling.
- Description of the Activity Diagram.
- Exercise in State Machines.

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.

LEARNING RESOURCES:

TEXT BOOK:

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

REFERENCE BOOK(s):

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

CO-PO Mapping:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CB225. 1	2	3	3				2	1	3	2	2	2
CB225. 2	2	3	3	2			2	1	3	2	2	2
CB225. 3	2	3	3	2	2		2	1	3	2	2	2
CB225. 4	2	2	2	2			1		2	2	2	2

CO-PSO Mapping:

COs	PSO1	PSO2	PSO3
CB225. 1	1	2	1
CB225. 2	2	2	2
CB225. 3	2	3	2
CB225. 4	2	2	2

R V R & J C COLLEGE OF ENGINEERING, CHOWDAVARAM, GUNTUR-19

(Autonomous)

(w.e.f. the academic year 2020-2021)

B.Tech., Computer Science and Business Systems

MC003	**ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE**	**L**	**T**	**P**	**C**
		2	**-**	**-**	**-**

Semester IV [second year]

Pre requisites: NIL

Course Objectives:

To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.

Course Outcomes:

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

1. Understand the concept of traditional knowledge and its importance
2. Apply significance of traditional knowledge protection
3. Analyze the various enactments related to the protection of traditional knowledge
4. Evaluate the concepts of intellectual property to protect the traditional knowledge and the traditional knowledge in different sectors

UNIT- I [08 Periods]

Introduction to traditional knowledge: Definition of traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, characteristics, the historical impact of social change on traditional knowledge systems, traditional knowledge Vs western knowledge, traditional knowledge vis-à-vis formal knowledge.

UNIT-II [08 Periods]

Protection of traditional knowledge: the need for protecting traditional knowledge, Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT-III [08 Periods]

A: Legal frame work and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006; Plant Varieties Protection and Farmer's Rights Act, 2001 (PVPFR Act).

B: The Biological Diversity Act 2002 and Rules 2004 and the protection of traditional knowledge bill, 2016.

UNIT-IV [08 Periods]

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, Traditional knowledge in different sectors: Engineering, medicine system, biotechnology and agriculture, Management of biodiversity, Food security of the country and protection of TK.

TEXT BOOK:

1. Traditional Knowledge System in India, by Amit Jha, ATLANTIC Publishers, 2009.

REFERENCES:

1. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin
Kumar Singh, Pratibha Prakashan Publishers, 2012.

2. Traditional Knowledge System in India by Amit Jha, ATLANTIC Publishers, 2002.

3. "Knowledge Traditions and Practices of India" by Kapil Kapoor and Michel Danino.

E- RESOURCES:

1. https://www.youtube.com/watch?v=LZP1StpYEPM

2. https://nptel.ac.in/courses/121106003/

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(w.e.f. the academic year 2020-2021)

B.Tech.,Computer Science and Business Systems

CB-261 **OPERATIONS RESARCH LAB**

Semester IV [second year]

L	T	P	C
-	-	2	1

Course Objectives:

The student who successfully completes this course will have:

1. Grasp the methodology of OR problem solving and formulate and solve linear programming problems.

2. Develop formulation skills in transportation models and assignment problems and finding solutions.

3. Understand the basics in the field of network models and inventory models.

4. Basic understanding of queuing models and simulation.

Course Outcomes:

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

CO1: Formulate a given simplified description of a suitable real-world problem as a linear programming model and solve linear programming models.

CO2: Solve and interpret transportation and assignment problems

CO3: Formulate and solve network models and inventory models.

CO4: Gain knowledge in solving queuing models and simulation.

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.

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.

Transportation Problem
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.

Assignment Problem
AP - Examples, Definitions – decision variables, constraints, formulation, Balanced & unbalanced situations, Solution method – Hungarian, test for optimality (MODI method), degeneracy & its resolution.

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.

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.

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.

List of Experiments

Lab Cycle- I:

1. To solve Linear Programming Problem using Graphical Method with
   (i) Unbounded solution
   (ii) Infeasible solution
   (iii) Alternative or multiple solutions.
2. Solution of LPP with simplex method.
3. Problem solving using Big M method.
4. Solution of following special cases in LPP using Simplex method
   (i) Unrestricted variables
   (ii) Unbounded solution
   (iii) Infeasible solution
   (iv) Alternative or multiple solution.
5. Problems based on Dual simplex method.
6. Solution of Transportation Problem.
7. Solution of Assignment Problem.
8. Solution of Travelling Salesman Problem.

Lab Cycle- II:

9. Project planning (Deterministic case-CPM).
10. Project planning (Probabilistic case-PERT).
11. Crashing of the Project.
12. Problems based on selective inventory classification (ABC analysis).
13. To find optimal inventory policy for EOQ model.
14. To solve multi-item inventory model with different constraints.
15. To solve All-units quantity discounts model.

Lab Cycle- III:

16. To find optimal inventory policy for Probabilistic inventory model with discrete demand.

17. To find optimal inventory policy for Probabilistic inventory model with continuous demand.

18. To determine the performance measures for M/M/1 queuing model.

19. To determine the performance measures for M/M/1/N queuing model.

20. To determine the performance measures for M/M/C/∞ queuing model.

21. To determine the performance measures for M/M/C/N queuing model.

Text Books:

2. *Operations Research: An Introduction.* H.A. Taha.

Reference Books:

9. *Linear Programming*. K.G. Murthy.
10. *Linear Programming.* G. Hadley.
11. *Principles of OR with Application to Managerial Decisions*. H.M. Wagner.
12. *Introduction to Operations Research*. F.S. Hiller and G.J. Lieberman.
13. *Elements of Queuing Theory*. Thomas L. Saaty.
14. *Operations Research and Management Science, Hand Book*: Edited By A. Ravi Ravindran.
15. *Management Guide to PERT/CPM*. Wiest & Levy.
16. *Modern Inventory Management.* J.W. Prichard and R.H. Eagle.
17. CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CB261.1	3	3	3	3	3	-	-	-	-	-	-	1
CB261.2	3	3	3	3	3	-	-	-	-	-	-	1
CB261.3	3	3	3	3	3	-	-	-	-	-	-	1
CB261.4	3	3	3	3	3	-	-	-	-	-	-	1

18.

19. CO – PSO Matrix:

20.

	PSO1	**PSO2**	**PSO3**
CB261.1	3	2	-
CB261.2	3	2	-
CB261.3	3	2	-
CB261.4	3	2	-

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(Autonomous)

(w.e.f. the academic year 2020-2021)

B.Tech. Computer Science and Business Systems

CB262 Business Communication & Value Science-III Lab

Semester IV (Second year)	**L**	**T**	**P**	**C**
	-	**-**	**4**	**2**

Nature of Course: Behavioural

Course Pre Requisites: Basic Knowledge of English (Verbal & Written)
Completion of all units from semester 1 &2

Course Objectives

- Develop technical writing skills
- Introduce students to Self-analysis techniques like SWOT & TOWS
- Introduce students to key concepts of:
  - Pluralism & cultural spaces
  - Cross-cultural communication
  - Science of Nation building

Course Outcomes

Upon completion of the course, students shall have ability to:

CO1: Apply & analyze the basic principles of SWOT & life positions.
CO2: Understand, analyze & leverage the power of motivation in real life
CO3: Identify & respect pluralism in cultural spaces
CO4: Understand and apply the concepts of Global, local and translocational
CO5: Analyze cross cultural communication
CO6: Apply the science of Nation building
CO7: Identify the common mistakes made in cross-cultural communication
CO8: Understand, apply & analyze the tools of technical writing
CO9: Recognize the roles and relations of different genders.
CO10: Understand Artificial intelligence &recognize its impact in daily life
CO11: Identify the best practices of technical writing
CO12: Differentiate between the diverse culture of India

Objectives for Semester 4

After completing this semester, learners will be able to:

- Summarize the basic principles of SWOT and Life Positions.
- Apply SWOT in real life scenarios.
- Recognize how motivation helps real life.
- Leverage motivation in real-life scenarios.
- Identify pluralism in cultural spaces.

- Respect pluralism in cultural spaces.
- Differentiate between the different cultures of India.
- Define the terms global, glocal and translocational.
- Differentiate between global, glocal and translocational culture.
- Recognize the implications of cross-cultural communication.
- Identify the common mistakes made in cross-cultural communication.
- Apply cross-cultural communication.
- Differentiate between the roles and relations of different genders.
- Summarize the role of science in nation building.
- Define AI (artificial intelligence).
- Recognize the importance of AI.
- Identify the best practices of technical writing.
- Apply technical writing in real-life scenarios.

UNIT-I

Introducing SWOT: SWOT analysis, basic principles, real life scenarios and application
SWOT Vs TOWS: The Balancing Act
Motivation: Stories, YouTube videos on Maslow's Theory, identifying and leveraging motivation

UNIT-II

Pluralism: Identify pluralism in cultural spaces, differentiate and respect pluralism, differentiate between global, glocal and translocational culture
Cross-cultural communication: Implications, common mistakes, roles and relations of different genders

UNIT-III

Role of science in nation building: Group findings and learnings, presentations
Technical writing: Introduction, basic rules, best practices, application in real life scenario, practice

UNIT-IV

Artificial Intelligence: AI in Everyday Life, voice assist and future implications, debate and discuss, communicating with machines, recognize the importance of AI
Best practices of technical writing: Technical writing in profession, technical writing in real-life scenarios, scenario-based assessment on technical writing
Project: Visit rural area/ underprivileged parts of city to address some of the local issues; if relevant, suggest a practical technology solution to the issues

Text Books

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

Reference Books

There are no prescribed reference books for Semester 4 – there will be handouts and reference links shared

Web References

1. Examples of Technical Writing for Students:**https://freelance-writing.lovetoknow.com/kinds-technical-writing**
2. 11 Skills of a Good Technical Writer: https://clickhelp.com/clickhelp-technical-writing-blog/11-skills-of-a-good-technical-writer/
3. 13 benefits and challenges of cultural diversity in the workplace:https://www.hult.edu/blog/benefits-challenges-cultural-diversity-workplace/

Online Resources

1. https://youtu.be/CsaTslhSDI
2. https://m.youtube.com/watch?feature=youtu.be&v=IIKvV8_T95M
3. https://m.youtube.com/watch?feature=youtu.be&v=e80BbX05D7Y
4. https://m.youtube.com/watch?v=dT_D68RJ5T8&feature=youtu.be
5. https://m.youtube.com/watch?v=7sLLEdBgYYY&feature=youtu.be

Subject Name: Business Communication & Value Science Lab- III Lab Code: CB 262

Mapping of Course Outcomes with POs and PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	Po10	Po11	Po12
CO1	-	-	L	-	-	-	L	-	M	M	-	M
CO2	-	-	-	-	-	L	M	L	M	-	-	L
CO3	-	-	L	-	-	M	L	-	M	L	L	-
CO4	M	-	M	-	-	-	-	-	L	-	-	-
CO5	-	-	M	-	-	H	-	-	M	H	-	L
CO6	L	-	-	-	-	L	M	M	-	-	L	-
CO7	-	-	L	-	-	M	-	-	H	L	-	M
CO8	-	-	L	-	M	-	-	-	-	H	-	-
CO9	-	-	-	-	-	L	-	-	M	M	-	-
CO10	M	M	L	-	-	-	-	L	-	-	-	L
CO11	-	-	-	-	-	-	-	-	-	M	L	-
CO12	-	-	M	-	-	-	M	-	L	L	-	L

H = Highly Related M = Medium L = Low

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(w.e.f. the academic year 2020-2021)

B.Tech. Computer Science and Business Systems

CB263 OPEARTING SYSTEMS LAB	**L**	**T**	**P**	**C**
	-	**-**	**2**	**1**

Semester IV [second year]

COURSE OBJECTIVES:

At the end of the course the students will understand

1. operating system services, architecture and process scheduling.
2. concepts of multithreading, process synchronization and deadlock mechanisms.
3. different approaches to memory management.
4. concepts of file management, secondary storage management and UNIX programming.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

CO1: compare different types of operating systems, describe operating system architecture and its services, design algorithms on CPU scheduling.
CO2: describe different types of threads, classical problems of process synchronization and analyze deadlock handling mechanisms.
CO3: describe and analyze memory management techniques and page replacement polices.
CO4: identify and compare different file allocation, disk free space management methods, disk scheduling mechanisms and UNIX shell programming.

List of Experiments:

1. Simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time. a. FCFS b. SJF c. Round Robin (pre-emptive)

2. Simulate multi-level queue scheduling algorithm considering the following scenario. All the processes in the system are divided into two categories - system processes and user processes.

System processes are to be given higher priority than user processes. Use FCFS scheduling for

the processes in each queue.

3. Simulate the following file allocation strategies. a. Sequential b. Indexed c. Linked

4. Simulate the MVT and MFT memory management techniques.

5. Simulate the following contiguous memory allocation techniques a. Worst-fit b. Best-fit c.

First-fit

6. Simulate paging technique of memory management.

7. Simulate Bankers algorithm for the purpose of deadlock avoidance.

8. Simulate page replacement algorithms a. FIFO b. SC c. NRU d. LRU

9. Simulate disk scheduling algorithms a. FCFS b. SCAN c. C-SCAN

10. Simulate producer-consumer problem using semaphores.

11. Basics of UNIX commands.

12. Shell programming

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(w.e.f. the academic year 2020-2021)

B.Tech., Computer Science and Business Systems

CB 264 DATABASE MANAGEMENT SYSTEMS LAB

Semester IV [second year]	**L**	**T**	**P**	**C**
	-	**-**	**2**	**1**

COURSE OBJECTIVES:

• Provide the fundamental concepts of database creation.

• Implement the concepts of Data manipulation

• Develop procedures for querying multiple tables.

• Understand the concepts of PL / SQL.

COURSE OUTCOMES: After completion of the course, the student will 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 remodeled 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

CO'S	Program Outcomes												Program Specific Outcomes		
	PO 1	PO2	PO 3	PO4	PO5	PO 6	PO7	PO 8	PO 9	PO1 0	P01 1	PO1 2	PSO1	PSO2	PSO3
CB224.1	M	-	L	-	-	-	-	-	-	-	-	L	M	M	-
CB224.2	M	M	H	H	-	-	-	-	-	-	-	L	M	M	-
CB224.3	L	M	M	M	-	-	-	-	-	-	-	L	M	M	-
CB224.4	L	M	M	M	M	-	-	-	-	-	-	L	-	-	-

H = Highly Related M = Medium L = Low

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(w.e.f. the academic year 2020-2021)

B.Tech., Computer Science and Business Systems

CB 265	SOFTWARE DESIGN WITH UML LAB	L	T	P	C
		-	-	4	2

Semester IV [Second Year]

Course Objectives:

At the end of the course, the student will understand

1. The importance of a component and functionality of each UML model element throughout the software process.
2. the artifacts of requirements that are used as starting points for analysis and design.
3. Interactions among analysis classes to identify the design model elements.
4. Component and deployment models for a particular application or software project.

Course Outcomes:

After successful completion of the course, the students are able to

1. Develop models during analysis and design for implementing real time problems.
2. Construct UML models which are used during the phases of the Rational Unified Process.
3. Analyze interactions among analysis classes for developing the class model and identify the dynamic behaviour of the system.
4. Identify the functionality of each UML model in development and to deploy object-oriented software.

Lab Cycle

1. Problem statement
2. Requirements elicitation.
3. Identification of Actors , usecases and construction of Use case diagram.
4. Building a Business Process model using UML activity diagram or swim lane diagram.
5. Construction of Sequence diagram.
6. Construction of Collaboration diagram.
7. Construction of UML class diagram and static class diagram.
8. Construction of UML static class diagram.
9. Construction of UML Component diagram
10. Construction of UML Deployment diagram.

Note: Construct the above models for the following case studies:

a) Course Registration System
b) AGATE LTD. Advertising Agency
c) ATM SERVICES
d) Library Management System
e) Online Banking
f) Online Shopping

CO – PO Matrix

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CB215. 1	2	3	3					1	3	2	2	2
CB215. 2	2	3	3	2				1	3	2	2	2
CB215. 3	2	3	3	2	2			1	3	2	2	2
CB215. 4	2	2	2	2					2	2	2	2

CO – PSO Matrix

	PSO 1	PSO 2	PSO 3
CB215.1	1	2	1
CB215.2	2	2	2
CB215.3	2	3	2
CB215.4	2	2	2

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(w.e.f. the academic year 2019-2020)

B.Tech.,Computer Science and Business Systems

CB311-DESIGN AND ANALYSIS OF ALGORITHMS

L	T	P	C
3	1	-	3

Course Objectives:

1. To teach paradigms and approaches used to analyze and design algorithms and to appreciate the impact of algorithm design in practice.
2. To be able to carry out the Analysis of various Algorithms for mainly Time and Space Complexity
3. To explain different computational models.
4. To Classify the Algorithms with respect to their computational complexity.

Course Outcomes:

CO1: Ability to understand mathematical formulation, complexity analysis and methodologies to solve recurrence relations for algorithms.
CO2: Ability to design algorithms using standard paradigms like: Greedy, Dynamic Programming, Branch and Bound, Backtracking.
CO3: Ability to design algorithms using advance data structures and implement traversals techniques.
CO4: Ability to understand NP class problems and formulate solutions using standard approaches, and to apply algorithm design principles to derive solutions for real life problems and comment on complexity of solution.

Syllabus

UNIT-I

Introduction: Characteristics of Algorithm. Analysis of Algorithm: Asymptotic analysis of Complexity Bounds – Best, Average and Worst-Case behaviour; Performance Measurements of Algorithm, Time and Space Trade-Offs, Analysis of Recursive Algorithms through Recurrence Relations: Substitution Method, Recursion Tree Method and Masters' Theorem. CO1 (8H)

UNIT-II

Fundamental Algorithmic Strategies: Brute-Force, Heuristics, Greedy, Dynamic Programming, Branch and Bound and Backtracking methodologies; Illustrations of these techniques for Problem-Solving, Bin Packing, Knapsack, Travelling Salesman Problem. CO2 (20H)

UNIT-III

Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm. CO3
(10H)

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.

Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE, Introduction to Quantum Algorithms. CO4
(10H)

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.

Reference Books:

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.

Quantum Computation and Quantum Information, Michael A. Nielsen and Isaac L. Chuang.

Mapping of Course Outcomes with POs and PSOs

CO'S	Program Outcomes												Program Specific Outcomes		
	PO1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO1 0	P01 1	PO1 2	PSO1	PSO 2	PSO 3
CB311.1	H	H		-	-	-	-	-	-	-	-	L	M	M	-
CB311.2	M	M	H	H	-	-	-	-	-	-	-	L	M	M	-
CB311.3	L	M	M	M	M	-	-	-	-	-	-	L	M	M	-
CB311.4	L	M	M	M	M	-	-	-	-	-	-	L	-	-	-

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B.Tech.,Computer Science and Business Systems

Semester V (THIRD YEAR)

CB-312 COMPILER DESIGN

L	T	P	C
3	1	-	3

COURSE OBJECTIVES:

At the end of the course, the student will understand

1. various phases of compiler and LEX tool.
2. various parsers and Yacc tool.
3. data structures used in symbol tables and intermediate code forms
4. code optimization methods and issues in code generation.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. design lexical analyser.
2. implement bottom-up and top-down parsers..
3. recognize the role of semantic analyzer and represent various Intermediate code forms.
4. apply code generation, optimization techniques and runtime allocation strategies during implementation of compiler.

UNIT – I [CO1] [14 HOURS]

Introduction: Phases of compilation and overview : Compilers - Analysis of the source program - Phases of a compiler - Cousins of the Compiler - Grouping of Phases - Compiler construction tools.

Lexical Analysis (scanner): Regular languages, finite automata, regular expressions, relating regular expressions and finite automata, The role of lexical analyzer; Input buffering scheme; Specification of tokens; Recognition of tokens; Language for specifying Lexical analyzer (Lex,flex); Design of scanner generator.

UNIT – II [CO2] [14 HOURS]

Syntax Analysis (Parser): Context-free languages and grammars, push-down automata, **Top-down Parsing –** Recursive descent parser, predictive parser, LL(1) grammar

Bottom-up parsing – Shift-Reduce parser, Operator Precedence parser, LR Parsers - LR(O) items, SLR(1), CLR(1), LALR(1) grammars and ambiguity in LR parsing, LALR(1) parser generator (YACC tool)

UNIT – III **[CO3]** **[12 HOURS]**

Semantic Analysis: Attribute grammars, Syntax Directed definition- construction of syntax trees, Bottom-up evaluation of S-attribute Definitions - L-attribute Definitions.

Intermediate Code Generation: Intermediate languages – SDT scheme for Assignment Statements - SDT scheme for Case Statements-SDT scheme for Boolean Expressions, SDT scheme for Flow of control constructs - SDT scheme for Procedure calls.

Symbol Table: Basic structure, symbol attributes and management, data structures used for symbol tables;

Code Improvement (optimization): control-flow, data-flow dependence etc.; local optimization, global optimization, loop optimization, peep-hole optimization.

UNIT – IV **[CO4]** **[12 HOURS]**

Architecture dependent code improvement: instruction scheduling (for pipeline), loop optimization (for cache memory) etc. Issues in the design of code generator - The target machine - Runtime Storage management - Basic Blocks and Flow Graphs - Next-use Information - A simple Code generator - DAG representation of Basic Blocks.

Run Time Environments: Source Language issues - Storage Organization - Storage Allocation strategies –Static allocation scheme, Stack allocation scheme, Heap allocation scheme- Access to non-local names - Parameter Passing methods- Call-by-Value, Call-by-Reference, Call-by-Name methods.

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

Books:

1. *Compilers: Principles, Techniques and Tools*, V. Aho, R. Sethi and J. Ullman.

REFERENCE BOOK(s):

1. Alfred V.Aho, Jeffrey D. Ullman, Principles of Compiler Design, Narosa publishing, 2002.
2. Lex &Yacc - John R. Levine, Tony Mason, Doug Brown, 2nd Edition, O'reilly.
3. Engineering a Compiler - Keith Cooper & Linda Torezon, 2nd Edition Elsevier.

Mapping of Course Outcomes with POs

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	3	2	1				3			3
CO2	2	3	3	2	1				3			3
CO3	2	1	1	1					2			3
CO4	1	1	1	1					1			3

R V R & J C COLLEGE OF ENGINEERING, CHOWDAVARAM, GUNTUR-19

(Autonomous)

(W.e.f. the academic year 2020-2021)

B.Tech.; Computer Science and Business Systems

CB-313 **L T P C**

SEMESTER V (III Year) 3 1 - 3

FUNDAMENTALS OF MANAGEMENT

COURSE OBJECTIVES:

The course enable the students:

a) To familiarize the students with the foundation and evolution of management thought

b) To learn the functions of management and practices of leadership

c) To understand the theory of Organisational behaviour, Organisational design and structure to achieve company objective

d) To identify the core business ethics issues and ethical concepts relevant to resolving moral issues in business

COURSE OUTCOMES

1. This course will teach students the management theories, evolution of management over the years and the basic concepts
2. The course helps the students to analyse the basic functions of management and leadership concepts
3. The course helps the students to develop an understanding about how organisations work
4. The course helps the students to grasp the intricacies of different areas of management such as ethical finance, ethical marketing, advertising and corporate social responsibilityetc.

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 –onward),Contribution of Management Thinkers: Taylor, Fayol, Elton Mayo etc.

[CO1] [10 Hours] [Text Book 2, 4]

UNIT II

Functions of Management: Planning, Organising, Staffing, Directing, Controlling Leadership: Concept, Nature, Importance, Attributes of a leader, Developing leaders across the organisation, Leadership Grid

[CO2] [10 Hours] [Text Book 2, 4]

UNIT III

Organisational Behaviour : Introduction , Personality, learning and Reinforcement, Motivation, Group Dynamics, Power & Influence, Work stress and Stress Management, Decision making, Problems in Decision making, Decision making, Organisational Culture, Managing Cultural Diversity Organisational Design: Classical, Neoclassical and Contingency approaches to Organisational Design, Organisational Theory and Design, Organisational structure (Simple structure, Functional structure, Divisional structure, Matrix Structure) [CO3][10 Hours] [Text Book 1, 3]

UNIT IV

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

[CO4] [10 Hours] [Text Book 2, 4]

Text Books:

1. Richard L.Daft , “Understanding the Theory and Design of Organisations”
2. Harold Koontz and Heinz Weihrich, “Essentials of Management”, McGraw-Hill, New York
3. Robbins &Judge,” Organisational Behaviour”, Prentice Hall of India
4. Peter F Drucker, “The Practice of Management”, McGraw Hill

Reference Books:

1. Stephen Robbins, Timothy A.Judge , Neharika Vohra , Organisational Behaviour

MappingofCourseOutcomeswithPO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	L	L	L	L	H	M	H	H	H	M	H
CO2	L	L	L	L	L	M	L	H	H	H	H	H
CO3	L	L	L	L	L	H	L	H	M	M	L	H
CO4	L	L	L	L	L	H	M	H	H	H	H	H

MappingofCourseOutcomeswithPEO's

	PEO1	PEO2	PEO3
CO1	H	L	H
CO2	H	L	H
CO3	H	L	H
CO4	H	M	H

MappingofCourseOutcomeswithPSO's

	PSO1	PSO2	PSO3
CO1	L	M	H
CO2	L	M	H
CO3	L	M	H
CO4	L	M	H

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(Autonomous)
(W.e.f. the academic year 2020-2021)
B.Tech.Computer Science and Business Systems

CB-314 **L T P C**
SEMESTER V (III Year) 3 1 - 3

Business Strategy

COURSE OBJECTIVES:
The course enable the students:

1. To familiarize the students the concepts of Strategic Management and its process.
2. To learn the Core competencies available within the firm to gain sustainable competitive advantage.
3. To understand the forces of industry attractiveness and industry life cycle stages.
4. To identify the strategic alternatives for growth of a firm, their evaluation and implementation.

COURSE OUTCOMES:

1. Students are able to learn the fundamental concepts of strategic management to analyze business situations and apply these concepts to solve business problems.
2. The Course will helps the students to understand the fundamental principles of and interrelationships among business functions such as: R&D, Production, Marketing, Finance, HR and Information Technology.
3. Students are able to understand the inter-relationships of business to Individuals, other Organizations, Government and Society.
4. Course helps the students to analyze Complex, Unstructured Qualitative and Quantitative Problems by using appropriate Tools.

UNIT I

Strategic Management Introduction: Importance of Strategic Management, Vision, Mission and Objectives, Schools of thought in Strategic Management, Strategy Content, Process, and Practice, Fit Concept and Configuration Perspective in Strategic Management.

[CO1] [10 Hours] [Text Book 1, 2]

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.

[CO2] [10 Hours] [Text Book 2, 3]

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, Generic Strategies and the Value Chain.

[CO3][10 Hours] [Text Book 1, 3]

UNIT IV

Corporate Strategy, Growth Strategies, Strategy Implementation: Structure and Systems : The Motive for Diversification, Related and Unrelated Diversification, Business Portfolio Analysis, Expansion, Integration and Diversification, Strategic Alliances, Joint Ventures, and Mergers & Acquisitions, The 7S Framework, Strategic Control and Corporate Governance

[CO4] [10 Hours] [Text Book 2, 3]

Text Books:

1. Robert M. Grant (2012). *Contemporary Strategic Management*, Blackwell, 7th Edition.

2. Azhar Kazmi (2008). *Strategic Management and Business Policy,* McGraw Hill Publications, 3rd Edition.

3.Michael E. Porter, *Competitive Strategy*, 1980.

Reference Books:

1. M.E. Porter, *Competitive Advantage*, 1985
2. Richard Rumelt (2011) *Good Strategy Bad Strategy: The Difference and Why It Matters*.

Mapping of Course Outcomes with PO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	L	L	L	L	M	H	M	H	H	M	H
CO2	L	L	L	L	L	H	H	H	H	H	H	H
CO3	L	L	L	L	L	H	H	H	M	H	H	H
CO4	L	L	L	L	L	H	H	H	H	H	H	H

Mapping of Course Outcomes with PEO's

	PEO1	PEO2	PEO3
CO1	H	L	H
CO2	H	L	H
CO3	H	M	H
CO4	H	L	H

MappingofCourseOutcomeswithPSO's

	PSO1	PSO2	PSO3
CO1	L	M	H
CO2	L	M	H
CO3	L	M	H
CO4	L	M	H

R V R & J C COLLEGE OF ENGINEERING, CHOWDAVARAM, GUNTUR-19

(Autonomous)

(w.e.f. the academic year 2020-2021)

B.Tech.,Computer Science and Business Systems

CB315 (CBEL03) MACHINE LEARNING(Elective 1)

Semester V (Third Year)

Course Objectives:

At the end of the course, the students will understand:

- basic concepts and applications of machine learning.
- supervised learning and its applications
- unsupervised learning and its applications
- association rule mining algorithms

Course Outcomes:

After successful completion of the course, the students are able to:

- Apply the machine learning concepts in real life problems.
- design and implement machine learning solutions to classification, regression,
- design and implement machine learning solutions to clustering,
- apply association rule mining to get insights into the data

UNIT-1

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 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;

UNIT-2

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 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-3

Regression: Multi-variable regression; Model evaluation; Least squares regression; Regularization; LASSO; Applications of regression Association rule mining algorithms including apriori Expectation-Maximization (EM) algorithm for unsupervised learning

UNIT-4

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

References:

[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.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CB315.1	3	3	3	3	3							2
CB315.2	3	3	3	3	3							2
CB315.3	3	3	3	3	3							2
CB315.4	3	3	3	3	3							2

CO – PSO Matrix:

	PSO1	**PSO2**	**PSO3**
CB315.1	3	3	-
CB315.2	3	3	-
CB315.3	3	3	-
CB315.4	3	3	-

MC004	DESIGN THINKING AND INNOVATION	L	T	P	M	C
		2	-	-		-

COURSE OBJECTIVES:

1. Identify the design thinking processes and methods.
2. Plan research activities to gather and empathize from a user's viewpoint.
3. Ideate techniques to help arrive at the best solution and evaluation.
4. Identify design thinking approaches for business challenges.

COURSE OUTCOMES:

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

1. Interpret the concepts of Design thinking.
2. Investigate a problem to determine its root cause.
3. Take part in group thinking and experiment with different solutions.
4. Develop innovative thinking and creative problem solving.

UNIT – I

Introduction to Design Thinking – Origin of Design Thinking, Features & Principles of Design Thinking, Applications of Design Thinking, Role of Research in Design Thinking.

[8periods] [CO 1]

UNIT – II

Modules of Design Thinking – Inspiration – methods & tools used in Explore and Empathize phases of Design Thinking, Case study-activity. [8 periods] [CO 2]

UNIT – III

Modules of Design Thinking – Ideation & Implementation – methods & tools used in Experiment, Engage and Evolve phases of Design Thinking, Case study-activity.

[8 periods] [CO 3]

UNIT – IV

Design Thinking applied in Business & Strategic Innovation – Ten Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization, Creative Culture, Strategy & Organization – Design Thinking approaches.

[8 periods] [CO 4]

LEARNING RESOURCES:

TEXT BOOKS:

1. "Design Thinking for Entrepreneurs and Small Businesses" by Beverly Rudkin Ingle, Apress. [UNIT -1]
2. "Change by design", Tim Brown, Harper Collins, 2009 [UNIT -1]
3. "Design Thinking- The Guide Book" – Facilitated by the Royal Civil service Commission, Bhutan. [UNIT –II & III]
4. Idris Mootee, "Design Thinking for Strategic Innovation", John Wiley & Sons (2013). [UNIT -IV]

REFERENCE BOOKS:

1. "Design Thinking Business Innovation", Rio de Janeiro – 2012 1st edition, MJV press.
2. "Design Thinking- Understanding How Designers Think and Work" by Nigel Cross, Berg publishers.

WEB REFERENCES:

- IDEO: Design Thinking for Educators toolkit https://designthinkingforeducators.com/.
- https://dschool.stanford.edu/resources/a-virtual-crash-course-in-design-thinking
- https://dschool-old.stanford.edu/groups/designresources/wiki/4dbb2/ (wallet Project)

CB351 Design and Analysis of Algorithms Lab				
III year I semester	**L**	**T**	**P**	**C**
	-	**-**	**2**	**1**

Pre-requisites : **Data Structure, Programming skills**
Academic Session : **16-06-2021 to 20-11-2021**
Contact Hours/Week : **02(01 Lab of 02 hours /Week)**
Internal Assessment : **40 Marks**
External Assessment : **60 Marks**

Course Objectives:

- To learn the importance of designing an algorithm in an effective way by considering space and time complexity
- To learn graph search algorithms.
- To study network flow and linear programming problems
- To learn the dynamic programming design techniques.
- To develop recursive backtracking algorithms.

Course Outcomes:

Upon completion of the course, the students will be able to

-Design an algorithm in an effective manner

-Design and apply iterative and recursive algorithms.

- Design and implement optimization algorithms in specific applications.

Each and every student is expected to complete a minimum of 12 tasks for evaluation.

1. Given a set of items, each with a weight and a value, determine the number of each item to include in a collection so that the total weight is less than or equal to a given limit and the total value is as large as possible.

2. Given a connected and undirected graph, find a minimum spanning tree that has minimum cost.

3. Given a weighted undirected graph. Finds a subset of the edges that forms a tree that includes every vertex, where the total weight of all the edges in the tree is minimized by using prims approach.

4. Given a Graph, find a minimum spanning tree that takes a graph as input and finds the subset of the edges of that graph which form a tree that includes every vertex has the minimum sum of weights among all the trees.

5. Given a graph and a source vertex in the graph, find shortest paths from source to all vertices in the given graph.

6. Given a schedule containing arrival and departure time of trains in a station, find minimum number of platforms needed in the station so to avoid any delay in arrival of any train.

7. Given a graph and a source vertex srcin graph, find shortest paths from srcto all vertices in the given graph. The graph may contain negative weight edges.

8. For a weighted directed Graph, find shortest distances between every pair of vertices

9. Given weights and values of n items, we need to put these items in a knapsack of capacity W to get the maximum total value in the knapsack by using Dynamic approachGreedy approach.

10. Given a Set, find subset of elements that are selected from the set whose sum adds up to a given number K. We are considering the set contains nonnegative values. It is assumed that the input set is unique (no duplicates are presented)

11. Given a Graph, determine whether a given graph contains Hamiltonian Cycle or not.

12. The N-Queen's puzzle is the problem of placing N chess queens on an N×N chessboard so that no two queens threaten each other. Thus, a solution requires that no two queens share the same row, column, or diagonal. Provide a solution by using Backtracking.

13. The N-Queen's puzzle is the problem of placing N chess queens on an N×N chessboard so that no two queens threaten each other. Thus, a solution requires that no two queens share the same row, column, or diagonal. Provide a solution by using Branch and Bound.

Mapping of Course Outcomes with POs and PSOs

CO'S	Program Outcomes												Program Specific Outcomes		
	PO1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO1 0	P01 1	PO1 2	PSO1	PSO 2	PSO 3
CB224.1	M	-	L	-	-	-	-	-	-	-	-	L	M	M	-
CB224.2	M	M	H	H	-	-	-	-	-	-	-	L	M	M	-
CB224.3	L	M	M	M	-	-	-	-	-	-	-	L	M	M	-
CB224.4	L	M	M	M	M	-	-	-	-	-	-	L	-	-	-

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(Autonomous)

(w.e.f. the academic year 2019-2020)

B.Tech.,Computer Science and Business Systems

Semester V (THIRD YEAR)

CB-352 COMPILER DESIGN LAB

L	T	P	C
-	-	4	2

List of Experiments

1. Design a lexical analyzer for given language and the lexical analyzer should ignore redundant spaces, tabs and new lines. It should also ignore comments. Although the syntax specification states that identifiers can be arbitrarily long, you may restrict the length to some reasonable value. Simulate the same in C language.
2. Write a C program to identify whether a given line is a comment or not.
3. Write a C program to recognize strings under 'a*', 'a*b+', 'abb'.
4. Write a C program to test whether a given identifier is valid or not.
5. Write a C program to find whether given string is keyword or not.
6. Write a C program to test whether a given string is constant or not.
7. Write a c program to count blank space and count the no. of lines.
8. Write a C program to simulate lexical analyzer for validating operators.
9. Implement the lexical analyzer using JLex, flex or other lexical analyzer generating tools.
10. Construction of recursive descent parser for the given grammar.
11. Write a C program for implementing the functionalities of predictive parser.
12. Design of LALR Bottom up Parser.
13. Program to implement semantic rules to calculate the expression that takes an expression with digits, + and * and computes the value.

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(w.e.f. the academic year 2019-2020)

B.Tech.,Computer Science and Business Systems

CB-353 MACHINE LEARNING LAB

Semester V (Third Year)

L	T	P	C
-	-	2	1

Course Objectives:

At the end of the course, the students will understand:

- basic concepts and applications of machine learning.
- supervised learning and its applications
- unsupervised learning and its applications
- association rule mining algorithms

Course Outcomes:

After successful completion of the course, the students are able to:

- Apply the machine learning concepts in real life problems.
- design and implement machine learning solutions to classification, regression,
- design and implement machine learning solutions to clustering,
- apply association rule mining to get insights into the data

UNIT-1

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

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;

UNIT-2

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

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-3

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

Association rule mining algorithms including apriori

Expectation-Maximization (EM) algorithm for unsupervised learning

UNIT-4

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

References:

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

List of Experiments

(1) Implementation of Naive Bayes Classification
(2) Implementation of Decision Tree Classification
(3) Implementation of Random Forests Classification
(4) Implementation of k-Nearest Neighbour Classification
(5) Implementation of Support Vector Machines Classification
(6) Implementation of Classification using Artificial neural networks
(7) Implementation of Ensembles of Classifiers
(8) Implementation of Minimum spanning tree clustering
(9) Implementation of K-Nearest Neighbours Clustering
(10) Implementation of one association rule mining algorithm
(11) Implementation of one anomaly detection algorithms
(12) Implementation of EM algorithm for some specific problem

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CB315.1	3	3	3	3	3							2
CB315.2	3	3	3	3	3							2
CB315.3	3	3	3	3	3							2
CB315.4	3	3	3	3	3							2

CO – PSO Matrix:

	PSO1	**PSO2**	**PSO3**
CB315.1	3	3	-
CB315.2	3	3	-
CB315.3	3	3	-
CB315.4	3	3	-

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(w.e.f. the academic year 2019-2020)

B.Tech.,Computer Science and Business Systems

CB-354	**Mini Project**	**L**	**T**	**P**	**C**
		-	**-**	**2**	**1**