R.V.R. & J.C.COLLEGE OF ENGINEERING (Autonomous)
Chandramoulipuram :: Chowdavaram :: Guntur-522019
(w.e.f. the academic year 2020-2021)
B.Tech., Computer Science and Business Systems (R20 Regulations)

Semester I (First year)

S.NO.	CODE.NO	SUBJECT	SCHEME OFINSTRUCTION PERIODS PER WEEK			SCHEME OF EXAMINATION			CATEGORY CODE
			L	T	P	INT	EXT	CREDITS	
1	CB111	Discrete Mathematics	3	-	-	30	70	3	BS
2	CB112	Introductory Topics in Statistics , Probability & Calculus	3	-	-	30	70	3	BS
3	CB113	Fundamentals of Physics	3	-	-	30	70	3	BS
4	CB114	Fundamentals of Computer Science	3	1	-	30	70	3	ES
5	CB115	Principles of Electrical Engineering	3	-	-	30	70	3	ES
6	CB151	Fundamentals of Physics Lab	-	-	2	30	70	1	BS
7	CB152	Principles of Electrical Engineering Lab	-	-	2	30	70	1	ES
8	CB153	Fundamentals of Computer Science Lab	-	-	2	30	70	1	ES
9	CB154	Business Communication & Value Science–I Lab	-	-	3	30	70	1.5	HS
10	CBMC1	Constitution of India	2	-	-	100	-	-	MC
Total			**17**	**1**	**9**	**370**	**630**	**19.5**	

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	CB121	Linear Algebra	3	-	-	30	70	3	BS
2	CB122	Statistical Methods	3	-	-	30	70	3	BS
3	CB123	Principles of Electronics Engineering	3	-	-	30	70	3	ES
4	CB124	Data Structures &Algorithms	3	1	-	30	70	3	PC
5	CB125	Fundamentals of Economics	3	-	-	30	70	3	HS
	CB161	Statistical Methods Lab	-	-	2	30	70	1	BS
7	CB162	Principles of Electronics Engineering Lab	-	-	2	30	70	1	ES
8	CB163	Data Structures & Algorithms Lab	-	-	2	30	70	1	PC
9	CB164	Business Communication & Value Science –IILab	-	-	3	30	70	1.5	HS
10	CBMC2	Environmental Science	2	-	-	100	-	-	MC
Total			**17**	**1**	**9**	**370**	**630**	**19.5**	

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Semester III (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 211	Computational Statistics	3	-	-	30	70	3	BS
2	CB 212	Computer Organization &Architecture	3	-	-	30	70	3	PC
3	CB 213	Object Oriented Programming	3	1	-	30	70	3	PC
4	CB 214	Formal Languages & Automata Theory	3	-	-	30	70	3	PC
5	CB 215	Database Management Systems	3	1	-	30	70	3	PC
6	CB 251	Computational Statistics Lab	-	-	3	30	70	1.5	BS
7	CB 252	Object Oriented Programming	-	-	3	30	70	1.5	PC
8	CB 253	Database Management Systems	-	-	3	30	70	1.5	PC
9	CB SL1	Scripting Languages (Skill Course)	1	0	2	100	-	2	SC
10	CBMC3	Ethics & Human Values	2	-	-	100	-	-	MC
Total			**18**		**11**	**440**	**560**	**21.5**	

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	2	-	2	30	70	3	ES
2	CB 222	Introduction to Innovation, IP Management & Entrepreneurship	3	-	-	30	70	3	HS
3	CB 223	Design and Analysis of Algorithms	2	1	-	30	70	3	PC
4	CB 224	Operating Systems	3	-	-	30	70	3	PC
5	CB 225	Software Engineering	2	1	-	30	70	3	PC
6	CB 261	Business Communication &Value Science III lab	-	-	3	30	70	1.5	HS
7	CB 262	Design and Analysis of Algorithms Lab	-	-	3	30	70	1.5	PC
8	CB 263	Operating Systems & Software Engineering Lab	-	-	3	30	70	1.5	PC
9	CBSL2	Mobile Application development(Skill Course)	1	-	2	100	-	2	SC
10	CBMC4	Design Thinking	2	-	-	100	-	-	MC
Total			**15**	**2**	**13**	**440**	**560**	**21.5**	
Minor Degree Course: Full Stack Development/Cloud Computing(Open To All Branches)									

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CB 111	**Discrete Mathematics**			
Semester I (First year)	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

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 Booleanfunctions 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 notvalid.

UNIT-I[TextBook-1,3] (12 Periods)
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 Periods)
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, Karnaughmap.

UNIT-III[TextBook-5] (12 Periods)
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[TextBook-4] (12 Periods)
Graph Theory: Graphs and digraphs, complement, isomorphism, connectedness and reachability, adjacency matrix, Eulerianpaths 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 andSons.
2. *Digital Logic &Computer Design,* M. Morris Mano,Pearson.
3. *Elements of Discrete Mathematics,* (Second Edition) C. L. LiuMcGrawHill, NewDelhi.
4. *Graph Theory with Applications,* J. A. Bondyand U. S. R. Murty, Macmillan Press,London.
5. *Mathematical Logic for Computer Science,*L. Zhongwan,WorldScientific,Singapore.

Reference Books:

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

CO-PO Mapping

	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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CB 112	Introductory Topics 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 analyze 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:

CO1: Apply various models to design and conduct experiments, as well as to analyze and interpret the data.
CO2: Use the concept of probability and conditional probability to determine the outcomes.
CO3: Apply the knowledge of distribution theory to both software and hardware design problems.
CO4: Get knowledge of differential and integral calculus and its application.

UNIT-I[TextBook-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] (10Periods)

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

UNIT-III[TextBook-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[TextBook-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, WorldPress.
2. Introduction of Probability Models, S.M. Ross, Academic Press,N.Y.
3. Higher Engineering Mathematics, B. S. Grewal, KhannaPublication,Delhi.

Reference Books:

1. A first course in Probability, S.M. Ross,PrenticeHall.
2. Probability and Statistics for Engineers,(Fourth Edition), I.R. Miller, J.E. Freund andR. Johnson,PHI.
3. Introduction to the Theory of Statistics, A.M. Mood, F.A. Graybilland D.C. Boes,McGrawHillEducation.
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. WartikarandJ. N.Wartikar,VidyarthiPrakashan.

CO-PO Mapping

	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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CB 113	**Fundamentals of Physics**			
Semester I (First year)	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

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

Course Objectives:

- To learn the fundamentals of oscillations and basic idea of EM.
- To understand the phenomena of interference, diffraction and polarization.
- To know the wave particle duality, uncertainty principle etc. by learning the prerequisite

quantum physics and understanding the basic concepts of crystallography.

- 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: Recognize Interference, diffraction and polarization 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 analyze various crystalline structures for solids.

CO4: Describe the concepts of lasers, fiber optics and different laws of thermodynamics& their uses.

Unit–I[TextBooks1,2] **(15periods)**

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

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

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

Interference: Principleofsuperposition-Young'sexperiment:Theoryofinterferencefringes-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 Book 4] **(15periods)**

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 [TextBooks 1,2] **(15periods)**

Laser and Fiber optics: Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: Ruby Laser, CO2 and Neodymium lasers; 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: Zerothlaw 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 JearlWalker,Wileyplus.
2. *Optics,* (Fifth Edition) AjoyGhatak, Tata McGrawHill.
3. *Fundamentals of Optics,*(Third Edition) Jenkins and White,McGraw-Hill.
4. *Concepts of Modern Physics,*(Fifth Edition) A Beiser, McGraw HillInternational.

Reference Books:

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

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CO-PO MAPPING:

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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CB 114	Fundamentals of Computer Science			
Semester I (First year)	**L**	**T**	**P**	**C**
	3	**1**	**-**	**3**

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, Initialization, 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, Multidimensional array and Row/column major formats, Initialization 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, Formatted Input–scanf, Variable length argument list, file access including FILE structure, fopen, stdin, sdtout and stderr, Error Handling including exit, perror and error.h, Line I/O, related miscellaneous functions.

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 OutlineSeries.
2. *C: The Complete Reference,*(Fourth Edition), Herbert Schildt, McGrawHill.
3. *Let Us C,*YashavantKanetkar, BPBPublications

CO-PO MAPPING:

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

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CB 115	**Principles of Electrical Engineering**			
Semester I (First year)	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

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)

CO 1: Recognize the basic concepts and terminology of electrical quantities

CO 2: Analyze the DC circuit using various network theorems and AC circuits with R-L-C elements.

CO 3: Analyze the Static and dynamic characteristics of Electro-static and Electromagnetic fields.

CO 4: Apply the concept of sensors in measurement of various electrical quantities

UNIT I [TextBook-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 [TextBook-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] **(10Periods)**

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, Electro mechanical energy conversion.

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

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., NewDelhi.
3. *Fundamentals of Electrical and Electronics Engineering,*SmarjithGhosh, Prentice Hall (India) Pvt.Ltd.

Reference Books:

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

CO-PO Mapping:

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

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CB 151	**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.*

Course 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 in to 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: Recognize 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.

CO-PO MAPPING:

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

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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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CB 153	**Fundamentals of Computer Science Lab**			
Semester I (First year)	**L**	**T**	**P**	**C**
	-	**-**	**2**	**1**

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, McGrawHill.
3. *Let Us C,*YashavantKanetkar, BPB Publications.

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CB 154	**Business Communication & Value Science-1 Lab**			
Semester I (First year)	L	T	P	C
	-	-	3	1.5

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 text books for Semester 1

Reference Books:

1. English vocabulary in use – Alan Mc'carthyandO'dell
2. APAART: Speak Well 1 (English language andcommunication)
3. APAART: Speak Well 2 (SoftSkills)
4. Business Communication – Dr.SarojHiremath

Web References:

1. Train your mind to perform under pressure- Simon sinekhttps://curiosity.com/videos/simon-sinek-on-training-your-mind-to-perform- under pressure-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

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CBMC1	**Constitution of India**			
Semester I(First Year)	**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 (Article51A).
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. UnderstandspecialprovisionsrelatingtoWomenempowermentandalsochildren.Forthestabilityand 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[CO1]**(10 Periods)**

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 Periods)**

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:

TEXTBOOK:

DurgaDasBasu:"IntroductiontotheConstitutionofIndia"(studentedition)Prentice-HallEEE,19th/20th Edition,2001.

REFERENCE BOOK(s):

1. M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing,2002.
2. BrijKishoreSharma,"IntroductiontotheConstitutionofIndia",PHI,LearningPvt.Ltd.,New Delhi,2011.

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CB 121	Linear Algebra			
Semester II (First Year)	**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 typeof systems.
CO2: Describe Vector Space, Orthogonalityand Pojection.
CO3: Calculate Eigen values and Eigen Vectors.
CO4: Describe Singular value decomposition and Principal component analysis.

UNIT–I: **[CO-1](12 Periods)**
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 Periods)**
Vector space; Dimension; Basis; Orthogonality; Projections; Gram-Schmidt orthogonalization and QR decomposition.

UNIT–III: **[CO-3](12 Periods)**
Eigen values and Eigenvectors; Positive definite matrices; Linear transformations; Hermitian and unitary matrices.

UNIT–IV: **[CO-4](12 Periods)**
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, CengageLearning.
2. *Advanced Engineering Mathematics*, (Second Edition), Michael. D. Greenberg,Pearson.
3. *Introduction to linear algebra*, (Fifth Edition), Gilbert Strang, Wellesley-CambridgePress.
4. *Applied Mathematics* (Vol. I & II), P. N. Wartikar&J. N. Wartikar, Pune VidyarthiGrihaPrakashan.
5. *Digital Image Processing*, R C Gonzalez and R E Woods,Pearson.
6. https://machinelearningmastery.com/introduction-matrices-machine-learning/

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CO-PO MAPPING:

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

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CB 122	**Statistical Methods**			
Semester II (First Year)	**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 behavior 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 fornon-parametric data.

Course Outcomes:

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

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

UNIT-I **(CO1) (14periods)**

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 **(CO2) (12periods)**

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 **(CO3) (12periods)**

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.

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UNIT-IV **(CO4) (12periods)**

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

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CB 123	**Principles of Electronics Engineering**			
Semester II(First Year)	**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

CO 1: Understand the behavior of Semi Conductors with respect to current carrying capability and the operation of diode, diode circuits and rectifiers
CO 2: Understand the operation of BJT, JFET and MOSFET as well as amplifier circuits
CO 3: Understand the concepts of feedback and its advantages and disadvantages and to know the operation of operational amplifier.
CO 4: Understand the difference between analog and digital signals and implementation details of basic digital elements at circuit level.

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 piece wise 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, Oscillator sand 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), band width 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, de-multiplexer, flip-flop, shift registers, counters.

Text Books:

1. MicroelectronicsCircuits,AdelS.SedraandKennethCarlessSmith,OxifordUniversityPress.
2. Millmans'sIntegratedElectronics,JacobMilliman,ChristosHalkias,ChetanParikh,McGRawHill Education.
3. Digital Logic & Computer Design, M.MorrisMano,Pearson

Reference Books:

1. ElectronicDevicesandCircuitTheory,RobertL.Boylestad,LouisNashelsky.
2. SolidStateElectronicDevices,6th Edition,BenStreetman,SanjayBanerjee
3. Electronic Principle, Albert Paul Malvino.
4. ElectronicsCircuits:Discrete&Integrated,DSchillingCBeloveTApelewiczRSaccardi.
5. Micro electronics, Jacob Milliman, Arvin Grabel.
6. ElectronicsDevices&Circuits,S.Salivahanan,N.SureshKumar,A.Vallavaraj

CO-PO MAPPING:

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=Highly Related M=Medium L=Low

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CO-PEO MAPPING:

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

H=Highly Related M=Medium L=Low

CO-PSO MAPPING:

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=Highly Related M=Medium L=Low

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CB 124	**Data Structures & Algorithms**			
Semester II(First Year)	**L**	**T**	**P**	**C**
	3	**1**	**-**	**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 **(15 Periods)**

Basic Terminologies and Introduction to Algorithm & Data Organization: Algorithm specification, Recursion, Performance analysis, Asymptotic Notation - The Big-O, Omega and Theta notation, Programming Style, Refinement of Coding - Time-Space Trade Off, Testing, Data Abstraction

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

UNIT II **(13 Periods)**

Non-linear Data Structure: Trees (BinaryTree, 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 **(12Periods)**

Searching and 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, Heap sort, Introduction to Hashing

UNIT IV **(10 Periods)**

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

Text Books:

1. *Fundamentals of Data Structures*, E. Horowitz, S. Sahni,S. A-Freed, UniversitiesPress.
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 MITPress.
3. *Open Data Structures: An Introduction (Open Paths to Enriched Learning)*, (Thirty First Edition), Pat Morin, UBCPress.

CO-PO MAPPING:

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

CO-PEO MAPPING:

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 = HighlyRelated M=Medium L =Low

CO-PSO MAPPING:

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

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CB 125	Fundamentals of Economics			
Semester II(First Year)	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

COURSEOUTCOMES:

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 economicanalysis, in particular, how macro economic shocks affects businesses, develop a perspective that is supported with relevant information and integrative thinkingfor 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 Periods)**

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 – Inter temporal Consumption – Suppliers' Income Effect

UNIT II **[CO 2] (12 Periods)**

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 Periods)**

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 Periods)**

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 DanielL.Rubinfeld
2. *Macroeconomics,*Dornbusch,Fischer andStartz
3. *Economics,*Paul Anthony Samuelson,WilliamD.Nordhaus

REFERENCE BOOK(s):

1. *IntermediateMicroeconomics*:AModernApproach,HalR,Varian
2. *Principles of Macroeconomics*, N.GregoryMankiw

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			

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CB 161	**Statistical Methods Lab**			
Semester II(First Year)	**L**	**T**	**P**	**C**
	-	**-**	**2**	**1**

Course Objectives:

The student who successfully completes this course will have:

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

Course Outcomes:

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

CO 1: Write the programs in R to solve the statistical problems.
CO 2: Apply various built in functions in R to solve the computational and modeling problems.
CO 3: Interpret the statistical data by various functions of graphical representation.
CO 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

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CB 162	**Principles of Electronics Engineering Lab**			
Semester II(First Year)	**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:

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

Reference book:

1. ElectronicDevicesandCircuitTheory,RobertL.Boylestad,LouisNashelsky.

CO-PO MAPPING:

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=Highly Related M=Medium L=Low

CO-PEO MAPPING:

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

H=Highly Related M=Medium L=Low

CO-PSO MAPPING:

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=Highly Related M=Medium L=Low

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CB 163	**Data Structures & Algorithms Lab**			
Semester II(First Year)	**L**	**T**	**P**	**C**
	-	**-**	**2**	**1**

Course Description and Objectives:
The course is designed to develop skills to design and analyze 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

CO 1: Be able to design and analyze the time and space efficiency of the data structure.

CO 2: Be capable to identity the appropriate data structure for given problem.
CO 3: Have practical knowledge on the applications of data structures.
CO 4: 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

CO-PO MAPPING:

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

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CO-PEO MAPPING:

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

CO-PSO MAPPING:

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

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CB 164	**Business Communication & Value Science - II Lab**			
Semester II (First Year)	**L**	**T**	**P**	**C**
	-	**-**	**3**	**1.5**

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 social cause
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, Value statement, tagline and design and logo

Presentation Skills: Basics of presentation, techniques to make presentations, 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, discusses and explores, 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--ArunTiwari
2. The Family and the Nation; Dr. A.P.J Abdul Kalam; Publishing year: 2015; Co-author: AcharyaMahapragya
3. The Scientific India: A twenty First Century Guide to the World around Us; Dr. A.P.JAbdulKalam; 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: FreePress
6. Start With Why: How Great Leaders Inspire Everyone to Take Action; Simon Sinek;Published: 6 October 2011; Publisher: Penguin.
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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CBMC02	**Environmental Science**			
Semester II (First Year)	**L**	**T**	**P**	**C**
	2	**-**	**-**	**-**

Course Objectives: To enable the students to

- Understand that humans are an integral part of environment and hence their activities reflect on the environment.
- realize and appreciate the importance of ancient practices and their importance in the present times
- appreciate the contribution of individuals for the upkeep of environmental standards, in turn help the humans live better.

Course Objectives:
After successful completion of the course, the students are able to
CO 1: evaluate the implications of human activities and thereby promote ecofriendly technologies.
CO 2: promote awareness among the members of the society for a sustainable environment.
CO 3: include and give priority to environmental protection in all developmental projects.

A. AWARENESS ACTIVITIES - SMALL GROUP MEETINGS
I. Source of water for human consumption/activities:
a. collection of information pertaining to water resources and consumption in Andhra Pradesh
b. Water resource on campus: General / Laboratory use and
c. Drinking water - understands the background and adopt judicious management.
d. Recycled water for Gardening - Particularly Lawns.
e. Cut down wastage of electricity in class rooms / labs / hostels etc. by avoiding misuse.
II. After the group meetings and exposure to the local issues and healthy practices, students motivated to make:
a. Posters
b. Slogans/One liners for promoting awareness
III. Lectures from Experts (at least 2 in the course duration)
IV. A walk in the neighborhood to promote a chosen theme on environmental consciousness.

B. ACTUAL ACTIVITIES

1. Plantation on Campus and on the sides of approach road.
2. Distribution of saplings to the local colony dwellers and encourage plantation.
3. Development of Kitchen garden on campus - Cultivation of at least leafy vegetables and creepers like cucumber etc. for use in college canteen/hostels etc.
4. Adoption of "NO PLASTICS" on campus.
5. Field trip to gain knowledge of biodiversity, water shed, mining, pollution and other local issues.
6. Preparation of working models for energy generation/transformation etc.

C. THEORY SYLLABUS FOR ASSESSMENT
Part-I
1. Introduction to Environmental Studies, Scope and Importance.
2. Natural resources Renewable and Non-Renewable; Definition and importance of the following resources in detail: a. Forest b. Water c. Land d. Energy
3. Sustainable development - Concept and Measures.
4. Biodiversity - Definition, Types of Biodiversity, Values and threats to Biodiversity, Conservation of biodiversity, IUCN classification: Endangered, Threatened, Vulnerable, Rare species; Endemic and Exotic species.
5. Climate change - Global warming, Ozone depletion and Acid rain.

Part-II

6. Water shed, water shed management in detail.
7. Solid wastes and Solid waste management.
8. Environmental Legislation, Environmental acts - Wild life protection act, Water act, Forest conservation act, Air act and Environmental protection act.
9. Case studies: Chernobyl nuclear disaster, Bhopal gas tragedy, Narmada bachaoandolan, silent valley, Story of Tuvalu, Story of Ganga.
10. Earth summit and Kyoto protocol; Measures at individual level for conservation of natural resources and sustainable development.

Learning Resources:

Text Books:

1. AnubhaKaushik and C.P.Kaushik - Environmental Studies, 3rd Edition, New Age International Publishers, New Delhi., 2012.
2. R. Rajagopalan - Environmental studies from crisis to cure, 3rd Edition, Oxford University press, 2012.

ASSESSMENT

1. Two assessments each of 40 marks will be done in the semester. The split up of each assessment is as follows:

a. Two internal theory examinations will be conducted for 18 marks each.
b. Evaluation of the prepared activity sheets and working models will be done for 12M (continual evaluation) twice in the semester in line with the theory examination.
c. 5 Marks for attendance and 5 marks for oral test.

Note: Weightages for a, b & c will be taken as per the assessment guidelines of the R-18 curriculum and projected to 100 marks.

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CB211	**ComputationalStatistics**			
Semester III (Second Year)	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

Course Objectives*:*

The student who successfully completes this course will have:

- To study the concepts of multivariate normal distributeddata.
- Todevelopasoundunderstandingofcurrent,moderncomputationalstatisticalapproaches and their application to a variety ofdatasets.
- To understand the key technologies in data science and business analytics such asdata
- mining, machine learning, visualization techniques, predictive modeling and statistics.
- To apply principles of data science to analyze and to effectively visualize thedata.

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 ofparameters.

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.

UNITIV

ClusterAnalysis:Introduction,Typesofclustering,Correlationsanddistances,clusteringbypartitionin g methods, hierarchical clustering, overlapping clustering, K-Means Clustering- Profilingand Interpreting Clusters.

Text Books:

1. T.W.Anderson,"AnIntroductiontoMultivariateStatisticalAnalysis",Wiley,3rd Edition,2003
2. Richard.A.JohnsonandDean.W.Wichern"AppliedMultivariateStatistical Analysis"PearsonPrenticeHall,6thEdition,2007
3. J.D.Jobson,"AppliedMultivariateDataAnalysis",VolI&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 &Architecture**			
Semester III (Second Year)	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

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

CO 1: Define the structure of computer and construct control sequence for an instruction.
CO 2: Demonstrate various I/O handling mechanisms and Design control unit organization.
CO3: IllustratememoryhierarchyandImplement algorithmsrelatedtocomputerarithmetic.
CO 4: Develop a pipeline for consistent execution of instructions and define various parallel processing concepts.

UNITI [Text book1,2] [CO 1] (13Periods)

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.

UNITII [Textbook 2] [CO 2] (13Periods)

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.

UNITIII [Text book 2] ***[CO 3] (13Periods)***

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 754format

UNITIV [Textbook 2] ***[CO 4] (13Periods)***

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*, CarlHamacher.

Reference Books:

1. *Computer Architecture and Organization*, John P.Hayes.
2. *Computer Organization and Architecture: Designing for Performance*, WilliamStallings.
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
CB212.1	3	2	2					2		2		2
CB212.2	3		1		2			2		2	2	2
CB212.3	3		3	2				2		2		2
CB212.4	3	2	2	2	2			2		2		2

CO – PSO MAPPING:

	PSO1	**PSO2**	**PSO3**
CB212.1	3	2	3
CB212.2	3	2	3
CB212.3	3	2	3
CB212.4	3	2	3

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CB213	**Object OrientedProgramming**			
Semester III (Second Year)	**L**	**T**	**P**	**C**
	3	**1**	**-**	**3**

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

- The difference between object oriented programming and proceduralprogramming.
- The C++ classes using appropriate encapsulation and designprinciples.
- The Advanced C++ features such as operator overloading, dynamic memory allocation, inheritanceand polymorphism, file I/O, exception handling,etc.
- The object oriented concepts to solve bigger computingproblems

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

CO 1: Understand the concepts and relative merits of C++
CO 2: Implement programs using object oriented concepts such as encapsulation, inheritance and polymorphism
CO 3: Implement stream I/O, templates and operator overloading
CO 4: Understand Object Oriented Design and Modeling

UNIT 1[Text book1] **(13Periods)**

ProceduralprogrammingAnOverviewofC: TypesOperatorandExpressions,ScopeandLifetime,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 II [Text book 1](13 Periods)
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.)

UNITIII [Text book1](13 Periods)
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

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UNIT IV [Textbook1,2] **(13Periods)**

Input and Output: Streams, Files, Library functions, formatted output
Object Oriented Design and Modeling: 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, BjarneStroustrup, AddisonWesley.*
2. *C++ and Object-Oriented Programming Paradigm, Debasish Jana, PHI Learning Pvt.Ltd.*

Reference Books:

1. *Programming –Principles and Practice Using C++, BjarneStroustrup, AddisonWesley.*
2. *The Design and Evolution of C++, BjarneStroustrup, AddisonWesley.*

CO-PO Mapping:

	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:

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

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CB214	**Formal Language & AutomataTheory**			
Semester III (Second Year)	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

Course Pre Requisites: CB 111 Discrete Mathematics

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 incomputing
- Explain deterministic and non- deterministicmachines.
- IdentifydifferentformallanguageclassesandtheirrelationshipsandDesigngrammars and recognizers for different formallanguages
- Determine the decidability and intractability of computationalproblems
- Comprehend the hierarchy of problems arising in the computersciences

Course Outcomes

At the end of this course students will:

CO 1: 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.

CO 2: 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 grammarsz.

CO 3: Be able to construct Turing machines and Post machines, and to prove the equivalence of languages described by Turing machines and Post machines

CO 4: 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

UNITI(21Periods)

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 (20 Periods)

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.

UNITIII (13 Periods)

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 (11Periods)

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

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,* MichaelSipser.
4. *Introduction to Languages and the Theory of Computation,* JohnMartin.
5. *Computers and Intractability: A Guide to the Theory of NP Completeness,* M. R. Garey andD. 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/

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CO-PO MAPPING:

Sl.No.	Course Outcome	PO's
1.	**CO 1:** 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.	**CO 2:** 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.	**CO 3:** 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.	**CO 4:** 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 :

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
CB214.1	M	-	L	-	-	-	-	-	-	-	-	L	M	M	-
CB214.2	M	L	L	M	-	-	-	-	-	-	-	L	M	M	-
CB214.3	L	L	L	M	-	-	-	-	-	-	-	L	M	M	-
CB214.4	L	L	L	M	M	-	-	-	-	-	-	L	-	-	-

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

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CB215	**Database ManagementSystems**			
Semester IV (Second Year)	**L**	**T**	**P**	**C**
	3	**1**	**-**	**3**

Course Objectives:

- To understand the fundamental concepts underlying database managementsystems:
  - database design methodology(normalization,…)
  - database management systems (query optimization, concurrency, recovery,security,…)
- Togainhands-onexperiencewithdatabaseapplicationsystemsandcommercialdatabase managementsystems.
- developing an application system using ORACLE & webtechnology
- Togetacquainted withdataanalysisissuessuchasdatamining,datawarehousingandinformation retrieval;

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

CO 1: ***Demonstrate*** the basic elements of a relational database management system, and identify the data models for relevant problems
CO 2: ***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.
CO 3: ***Extend*** normalization for the development of application software's
CO 4: ***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.

UNITI(CO1) (15Periods)
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

UNITII(CO2)(15Periods)

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**.**

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UNITIII (CO3) **(18Periods)**

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**.**

UNITIV(CO4)(12Periods)

Database Security: Authentication, Authorization and access control, DAC, MAC andRBAC models, Intrusion detection, SQL injection.
Advanced topics: Object oriented and object relational databases, Logical databases, Webdatabases, Distributed databases, Data warehousing and data mining.

Text Books:

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

Reference Books:

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

CO-PO MAPPING:

CO'S	Program Outcomes												Program Specific Outcomes		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**P011**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1	M	-	L	-	-	-	-	-	-	-	-	L	M	M	-
CO 2	M	M	H	H	-	-	-	-	-	-	-	L	M	M	-
CO 3	L	M	M	M	-	-	-	-	-	-	-	L	M	M	-
CO 4	L	M	M	M	M	-	-	-	-	-	-	L	-	-	-

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

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CB251	**Computational StatisticsLab**			
Semester III (Second Year)	**L**	**T**	**P**	**C**
	-	**-**	**3**	**1.5**

Course Objectives:

The student who successfully completes this course will have:

- The skill to write Python Programs in an efficientway.
- The idea to expand the knowledge of Python on theirown.
- The knowledge to use Python for statistical computation, modelling, analysis andgraphics.
- The ability to implement multivariate statistical analysis techniques usingPython

Course Outcomes:

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

CO 1: Write the programs in Python to solve the statistical problems.
CO 2: Apply various built in functions in Python to solve the computational,analysisand modeling
problems.
CO 3: Interpret the statistical data by various functions of graphical representation.
CO 4: Understand- reading, writing, working and manipulating the data in various data sets.

Python Concepts, Data Structures, Classes: Interpreter, Program Execution, Statements,Expressions, FlowControls,Functions,NumericTypes,SequencesandClassDefinition,Constructors,Text&Binary Files - Reading andWriting

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, OrielyPublishers
2. *Python for Data Analysis ,* Wes c Kinney, OrielyPublishers
3. *Learning Python,* Mark Lutz, OrielyPublishers
4. *Python 3 for Absolute Beginners,* Tim Hall and J-PStacey.
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.

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List of Experiments

Lab Cycle- I:

1. Program to determine number of days in a givenmonth
2. Coin change exerciseprogram
3. Program to display a calendar month between the years 1800 and2099
4. Password encryption/decryptionprogram
5. Temperature conversionprogram
6. GPA calculationprogram
7. Word frequency countprogram
8. Mixed fractionclass
9. Matrix manipulationprogram

Lab Cycle- II:

10. Visualization using matplotlib
    (1) Bargraph
    (2) Piechart
    (3) Box plot
    (4) Histogram
    (5) Line chart andsubplots
    (6) Scatterplot
11. Controlling colours and styles of various graph elements in matplotlib
12. Adding text at any location using textboxes
13. Composing multiplefigures
14. Working with 2Dfigures

Lab Cycle- III:

15. MultipleRegression
16. MultivariateRegression
17. Principle component analysis for multivariatedata
18. Factor Analysis for multivariatedata
19. Cluster analysis for multivariatedata
20. Linear discriminant analysis for multivariatedata

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CB252	Object Oriented ProgrammingLab			
Semester III (Second Year)	**L**	**T**	**P**	**C**
	-	**-**	**3**	**1.5**

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 and 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 constantpointer
2. Function overloading: writing string operations like strcat and strncat, strcpy and strncpy as overloadedfunctions.
3. Dynamically allocating space for a pointer depending on input and doing this repeatedly, depending on different inputs and finally de-allocating thepointer.
4. Define class complex with all possible operations: constructor, destructor, copy constructor, assignment operator with the data members stored as pointer tointegers.
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 assignmentoperators
8. Defineclassstack,queue,linked-list,array,setusingsomedata-type(int)withdatamembers kept as private and functions kept in both protected and publicsections.
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 tointegers.
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 andoperators
14. Define a class called 'array' with data type passed as template type with constructor, destructor, copy constructor and assignment operators and indexoperator.
15. Define template functions for compare and use it in the algorithms like bubble sort, insertion sort, mergesort.
16. Formatted input-outputexamples
17. Input manipulators. Overriding operators<<,>>
18. Define class model for complex number, student class, book class and show it using UML diagram as well as concreteclass.
19. Show behavioral modeling through sequence diagram and activity diagram for workflow in a typical log-in, log-outsituation.

Text Books:

1. The C++ Programming Language, BjarneStroustrup,AddisonWesley.
2. C++ and Object-Oriented Programming Paradigm, Debasish Jana, PHI LearningPvt.Ltd.

Reference Books:

1. Programming – Principles and Practice Using C++, BjarneStroustrup,AddisonWesley.
2. The Design and Evolution of C++, BjarneStroustrup,AddisonWesley.

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CB253	**Database Management SystemsLab**			
Semester III (Second Year)	**L**	**T**	**P**	**C**
	-	**-**	**3**	**1.5**

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

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

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CO-PO/PSO MAPPING:

CO'S	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
CO 1	M	-	L	-	-	-	-	-	-	-	-	L	M	M	-
CO 2	M	M	H	H	-	-	-	-	-	-	-	L	M	M	-
CO 3	L	M	M	M	-	-	-	-	-	-	-	L	M	M	-
CO 4	L	M	M	M	M	-	-	-	-	-	-	L	-	-	-

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

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CBSL1	Skill Course (Scripting Languages)	L	P	C
		1	2	2

Prerequisites:

- A course on "Computer Programming and Data Structures."

Course Objectives:

The goal of the course is to study:

- Modify built-in shell variables and create and use user-defined shell variables.
- Create structured shell programming which accept and use positional parameters and exported variables.
- Use shell flow control and conditional branching constructs (while, for, case, if, etc.)
- Understand and make effective use of Linux utilities and Shell scripting language (bash) to solve Problems.
- Basic introduction to programming using Perl.
- Knowledge of CGI scripts.
- To understand basic concepts of PHP language and developing web applications.
- Course Outcomes:
- Upon learning the course, the student will have the:
- Understand the basic commands of linux operating system and can write shell scripts.
- Understand basics of Perl.
- Understand list arrays and hash.
- Develop web applications using PHP.

UNIT-I [10 Hours]

Introduction to Unix: Unix utilities – processs utilities, disk utilities, networking commands, text processing utilities and backup utilities. Introduction to unix file system, vi editor, file handling utilities, security by file permissions.

Shell Programming-Shell Variables-The Export Command-The Profile File a Script Run During Starting-The First Shell Script-The read Command-Positional parameters-The $? Variable knowing the exit Status-More about the Set Command-The Exit Command-Branching Control Structures-Loop Control Structures-The Continue and Break Statement-The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs-The here Document(<<)-The Sleep Command-Debugging Scripts-The Script Command-The Eval Command-The Exec Command.

UNIT – II [10 Hours]

Introduction to PERL and Scripting ,Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT-III [10 Hours]

JavaScript: Introduction to Scripting, Control Statements-I, Control Statements-II, Functions and Arrays.

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UNIT – IV [10 Hours]

PHP Basics – Features, Embedding PHP Code in your Web pages, outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control Structures. Function, Creating a Function, Function Libraries, Arrays, Strings and Regular Expressions.

TEXT BOOKS:

1. Unix for programmers and users, Graham Glass, King Ables, 3rd edition, Pearson education. [UNIT-I]
2. Introduction to Unix Shell Programming by M.G.Venkateshmurthy, Pearson. [UNIT-I]
3. Perl by Example, E.Quigley, Pearson Education. [UNIT-II]
4. Harvey M. Deitel and Paul J.Deitel, "Internet& World Wide Web How to Program", 4/e, Pearson Education. [UNIT-III]
5. PHP: The Complete Reference, Steven Holzner, TATA McGraw Hill, 2013. [UNIT-IV]

Reference Books:

1. Your Unix the ultimate guide, Sumitabha Das, TMH. 2nd Edition.
2. Unix and shell programming by B.M. Harwani, OXFORD university press.
3. The Unix programming Environment by Brain W. Kernighan & Rob Pike, Pearson.
4. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
5. Perl Power, J.P. Flynt, Cengage Learning.
6. The World of Scripting Languages, David Barron, Wiley Publications.

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CBMC3	Ethics & Human Values	L	P	C
		2	0	-

Course Objectives:

At the end of the course the students will understand

- To create awareness to specific set of morals, values and ethics the professional must know and abide by, including work ethics, integrity and commitment etc.
- To realize the importance of moral autonomy, professional ideals and Ethical theories
- To study safety/risk aspects, welfare of the public and about employee rights
- Know about the global issues and code of ethics of professional bodies

Course Outcomes:

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

- Have basic understanding of how a prospective engineer should behave in his chosen field and society.
- Realize the importance of moral autonomy, professional ideals and Ethical theories.
- Know about the safety/ risk, welfare of the public and employee rights
- Gain exposure to global issues and codes of some professional bodies

UNIT I — CO1 15 periods

Human Values: Morals, Values and Ethics - Integrity- Work Ethics- Service Learning – Civic Virtue Respect for Others - Living Peacefully - Caring - Sharing - Honesty - Courage – Valuing Time –Co Operation - Commitment - Empathy - Self-Confidence – Stress Management-Character - Spirituality.

UNIT II — CO2 15 periods

Engineering Ethics: Senses of Engineering Ethics- Variety of Moral Issues - Types of Inquiry - Moral Dilemmas - Moral Autonomy - Kohlberg's Theory - Gillian-s Theory - Consensus and Controversy.
Professions and Professionalism: The nature and characteristics of Professions, Professionalism, the foundation and norms of Professional ethics, the need for separate code of conduct for
Professionals, Professional Rights, Theories about Right Action, Uses of Ethical Theories. Case studies like The Space Shuttle Challenger, Bhopal gas tragedy, Chernobyl disaster etc.

UNIT III — CO3 15 periods

Engineering as Social Experimentation: Engineering as Experimentation - Engineers as Responsible Experimenters Safety.
Responsibilities and Rights: Safety and Risk - Assessment of Safety and Risk,Risk Benefit Analysis and Reducing Risk. Collegiality and Loyalty - Respect for Authority –Collective Bargaining - Confidentiality - Conflicts of Interest - Occupational Crime - Employee Rights – Intellectual Property Rights (IPR) - Discrimination.

UNIT IV CO4 15 periods

Multinational Corporations - Environmental Ethics - Computer Ethics - Business ethics - Engineers As Managers - Consulting Engineers - Engineers As Expert Witnesses and Advisors - Codes Of Ethics - Sample Code Of Ethics Like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management Etc.,

Learning Resources:

Text Books:

1. Mike martin and Ronald Schinzinger, "Ethics in Engineering" McGraw-Hill, New York1996
2. Govindarajan M, Natarajan S, Senthil Kumar V.S., "Engineering Ethics", PHI, NewDelhi
3. Bayles.M. D, Professional ethics, California, Wards worth publishing company,1981
4. Koehn.D, The ground of Professional Ethics, Routledges,1995

Reference Books:

1. Charles D,Fleddermann, "Engineering Ethics", Pearson / PHI, New Jersey 2004 (IndianReprint)
2. CharlesEHarris,MichaelS.ProtchardandMichaelJRabins,"EngineeringEthics-ConceptsandCases" Wadsworth Thompson Learning, United States, 2000 (Indian Reprint nowavailable)
3. John R Boatright, "Ethics and the conduct of business" Pearson, New Delhi,2003.
4. Edmund G.Seebauer and Robert L Barry, "Fundamentals of Ethics forScientists and Engineers" Oxford University Press, Oxford, 2001.

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CB221	**Operations Research**			
Semester IV (Second Year)	**L**	**T**	**P**	**C**
	2	**-**	**2**	**3**

Course Objectives:

The student who successfully completes this course will have:

- Grasp the methodology of OR problem solving and formulate and solve linear programming problems.
- Develop formulation skills in transportation models and assignment problems and finding solutions.
- Understand the basics in the field of network models and inventory models.
- Basic understanding of queuing models and simulation.

Course Outcomes:

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

CO 1: 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.
CO 2: Solve & interpret transportation and assignment problems
CO 3: Formulate and solve network models and inventory models.
CO 4: 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., Hyper plane, Convex set, Convex polyhedron, Extreme points, Basic feasible solutions.

Geometric method: 2-variable case, Special cases – infeasibility, unboundedness, redundancy &degeneracy, Sensitivity analysis.

SimplexAlgorithm–slack,surplus&artificialvariables,computationaldetails,big-Mmethod,identification and resolution of special cases through simplexiterations.

Duality – formulation, results, fundamental theorem of duality, dual-simplex and primal-dual algorithms.

UNIT II

TransportationProblem

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

Projectdefinition,Projectschedulingtechniques– Ganttchart,PERT&CPM,Determinationofcriticalpaths, Estimation of Project time and its variance in PERT using statistical principles, Concept of project crashing/time-costtrade-off.

Inventory Control

Functions of inventory and its disadvantages, ABC analysis, Concept of inventory costs, Basics of inventory policy(order,leadtime,types),Fixedorder-quantitymodels– EOQ,POQ&Quantitydiscountmodels.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, Probabilisticsituations.

UNIT IV

Queuing Theory

Definitions– queue(waitingline),waitingcosts,characteristics(arrival,queue,servicediscipline)ofqueuing 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. RaviRavindran.
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
CO 1	3	3	3	3	1	-	-	-	-	-	-	1
CO 2	3	3	3	3	1	-	-	-	-	-	-	1
CO 3	3	3	3	3	1	-	-	-	-	-	-	1
CO 4	3	3	3	3	1	-	-	-	-	-	-	1

CO – PSO MAPPING:

	PSO1	**PSO2**	**PSO3**
CO 1	3	1	-
CO 2	3	1	-
CO 3	3	1	-
CO 4	3	1	-

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CB222	**Introduction To Innovation, IP Management & Entrepreneurship**			
Semester IV (Second Year)	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

Course Objectives: The course enables 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 Outcomes:

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

Building anInnovativeOrganization [CO1] [TextBook1]

Innovationasacorebusinessprocess,SourcesofInnovation,Knowledgepushvsneedpullinnovations, The Role of innovation as a manageable activity vs random gambling activity; Creating new products andservices,Exploitingopeninnovationandcollaboration,Useofinnovationforstartinganewventure, CaseStudies

UNIT II

Entrepreneurship:AnInnovatorsguidetoStartups [CO2] [TextBook2]

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 IntellectualPropertyRights(IPR) [CO3] [TextBook3]

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

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UNIT IV

Types ofIntellectualProperty **[CO4] [TextBook4]**

Patent-Procedure,LicensingandAssignment,InfringementandPenalty;Trademark-Useinmarketing, example of trademarks-Domain name; Geographical Indications-Definition GI, Protection; Copyright- Definition, Industrial designs ; Industrial Protection, CaseStudies

Class Discussion/Home Assignment:

1. is innovation manageable or just random gamblingactivity?
2. Innovation- Cooperating across networks vs 'go-it-alone'approach
3. Major court battles regarding violation of patents between two corporatecompanies.

Text books:

1. JoeTidd,JohnBessant,"ManagingInnovation:IntegratingTechnological,Marketand Organizationalchange".
2. Robert Hirsh,MichaelP Peters, Dean A Shepherd," Entrepreneur ship" Sixth Edition,, Tata McGraw-Hill Companies, NewDelhi
3. N.S.GopalaKrishnan&T.G.Agitha,"Principles of Intellectual Property EasternBookCompany,Lucknow
4. R.C.Dreyfuss,J.Pila,"TheOxfordHandbookofIntellectualPropertyLaw",Oxford UniversityPress

CO-PO MAPPING:

	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

CO-PEO MAPPING:

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

CO-PSO MAPPING:

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

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CB223	**Design and Analysis ofAlgorithms**			
Semester IV(Second Year)	**L**	**T**	**P**	**C**
	2	**1**	**-**	**3**

Course Objectives:

- To teach paradigms and approaches used to analyze and design algorithms and to appreciatethe impact of algorithm design inpractice.
- To be able to carry out the Analysis of various Algorithms for mainly Time and SpaceComplexity
- To explain different computationalmodels.
- To Classify the Algorithms with respect to their computationalcomplexity.

Course Outcomes:

CO 1: Ability to understand mathematical formulation, complexity analysis and methodologies to solve recurrence relations for algorithms.

CO 2: Ability to design algorithms using standard paradigms like: Greedy, Dynamic Programming, Branchand Bound, Backtracking

CO 3: Ability to design algorithms using advance data structuresandimplement traversalstechniques.

CO 4: 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.

UNITI(CO1) (08Periods)

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.

UNITII(CO2) (20Periods)

FundamentalAlgorithmicStrategies: Brute-Force,Heuristics,Greedy,DynamicProgramming,Branchand Bound and Backtracking methodologies; Illustrations of these techniques for Problem-Solving, Bin Packing, Knapsack, Travelling SalesmanProblem.

UNITIII(CO3) (10Periods)

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.

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UNITV **(CO4) (10Periods)**

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.

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

CO-PO MAPPING:

CO'S	Program Outcomes												Program Specific Outcomes		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**P011**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1	H	H		-	-	-	-	-	-	-	-	L	M	M	-
CO 2	M	M	H	H	-	-	-	-	-	-	-	L	M	M	-
CO 3	L	M	M	M	M	-	-	-	-	-	-	L	M	M	-
CO 4	L	M	M	M	M	-	-	-	-	-	-	L	-	-	-

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

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CB224	**Operating Systems**			
Semester IV (Second Year)	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

COURSE OBJECTIVES:

At the end of the course the students will understand

- Operating system services, architecture and processscheduling.
- Concepts of multithreading, process synchronization and deadlockmechanisms.
- Different approaches to memorymanagement.
- Concepts of file management, secondary storage management and UNIXprogramming.

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 handlingmechanisms.

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.

UNITI [Textbook 1][CO 1] (13Periods)

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.

Schedulingalgorithms:Pre-emptiveandnon-pre-emptive,FCFS,SJF,RR;Multiprocessorscheduling:Real Time scheduling: RM andEDF.

UNITII [Textbook1][CO 2] (14Periods)

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

Inter-processCommunication:Concurrentprocesses,precedencegraphs,CriticalSection,RaceConditions, Mutual Exclusion, Hardware Solution, Semaphores, Strict Alternation, Peterson's Solution, TheProducer / Consumer Problem, Event Counters, Monitors, Message Passing, Classical IPC Problems:Reader's&Writer Problem, Dinning Philosopher Problem, Barber's shopproblem.

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 Periods)**

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 Periods)**

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.

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CO-PO MAPPING:

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

CO-PSO MAPPING:

	PSO1	PSO2	PSO3
CO 1	2	2	-
CO 2	2	3	-
CO 3	2	2	-
CO 4	2	2	-

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CB225	**Software Engineering**			
Semester III (Second Year)	**L**	**T**	**P**	**C**
	2	**1**	**-**	**3**

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 Modeling 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
CO 1: Apply the software engineering lifecycle models and project management.
CO 2: Analyze and specify software requirements.
CO 3: Design, and develop a software project by object oriented principles.
CO 4: Evaluate and assess the quality of the software.

UNIT – I **[CO1] (13 Periods)**
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; introductionto measurement of software size; introduction to the concepts of risk and its mitigation; configuration management.

UNIT -2 **[CO2] (13 Periods)**
Software Requirements Analysis, Design and Construction: Introduction to Software Requirements Specifications (SRS) and requirement elicitation techniques; techniques for requirement modeling – 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 **[CO3] (13Periods)**
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.

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UNIT- 4 **[CO4] (13 Periods)**

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 MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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 MAPPING:

	PSO1	PSO2	PSO3
CO1	1	2	1
CO 2	2	2	2
CO 3	2	3	2
CO 4	2	2	2

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CB261	**Business Communication &Value Science III lab**			
Semester IV (Second Year)	**L**	**T**	**P**	**C**
	-	**-**	**3**	**1.5**

Nature of Course: Behavioural

Course Pre Requisites:

Basic Knowledge of English(Verbal &Written) Completionofallunitsfromsemester1&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 trans locational
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 tool soft 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 practice soft technical writing
CO12:Differentiate between the diverse culture of India

Objectives forSemester4

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, local and trans locational.
- Differentiate between global, local and trans locational 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.

UNITI

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

UNITII

Pluralism: Identify pluralism in cultural paces, differentiate and respect pluralism, differentiate between global, local and trans locational culture Cross-cultural communication: Implications, common mistakes, roles and relations of different genders

UNITIII

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

UNITIV

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 Semester4–there will be handouts and reference links shared

Reference Books

There are no prescribed reference books for Semester4–there will be handouts and reference links shared

Web References

1.Examples ofTechnical Writing for Students:https://freelance-
writing. love to know.com/kinds- technical-writing.
2.11 Skills of a Good TechnicalWriter: https://clickhelp.com/clickhelp-technical-
writing- blog/11-skills-of-a-good-technical-writer/
3.13 benefits and challenges of cultural diversity in theworkplace:
https://www.hult.edu/blog/benefits-challenges-cultural-diversity-workplace/

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CO-PO MAPPING:

CO	PROGRAMMEOUTCOMES											
	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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CB262	**Design and Analysis of Algorithms Lab**			
Semester IV (Second Year)	**L**	**T**	**P**	**C**
	-	**-**	**3**	**1.5**

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

1. Givenasetofitems, eachwithaweightand avalue,determinethenumberofeachitemtoinclude in a collection so that the total weight is less than or equal to a given limit and the total value is as largeaspossible.
2. Given a connected and undirected graph, find a minimum spanning tree that has minimumcost.
3. Given a weighted undirected graph. Finds a subset of the edges that forms a tree that includesevery vertex, where the total weight of all the edges in the tree is minimized by using primsapproach.
4. Given a Graph, find a minimum spanning tree that takes a graph as input and finds the subset ofthe edges of that graph which form a tree that includes every vertex has the minimum sum of weights among allthetrees.
5. Given a graph and a source vertex in the graph, find shortest paths from source to all vertices inthe givengraph.
6. Given a schedule containing arrival and departure time of trains in a station, find minimumnumberof platforms needed in the station so to avoid any delay in arrival of any train.
7. Given a graph and a source vertex src in graph, find shortest paths from src to all vertices inthe given graph. The graph may contain negative weightedges.
8. ForaweighteddirectedGraph,findshortestdistancesbetweeneverypairofverticesGivenweight s 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 approach Greedyapproach.
9. 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 setis unique(no duplicates arepresented)
10. Given a Graph, determine whether a given graph contains Hamiltonian Cycle ornot.
11. 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, ordiagonal. Provide a solution by usingBacktracking.
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, ordiagonal. Provide a solution by using Branch andBound.

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CB263	**Operating Systems & Software Engineering Lab**			
Semester IV (Second Year)	**L**	**T**	**P**	**C**
	-	**-**	**3**	**1.5**

Operating Systems Lab

List of Experiments:

1. Simulate the following non-preemptive CPU scheduling algorithms to find turnaroundtime 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 schedulingfor the processes in eachqueue.
3. Simulate the following file allocation strategies. a. Sequential b. Indexed c.Linked
4. Simulate the MVT and MFT memory managementtechniques.
5. Simulate the following contiguous memory allocation techniques a. Worst-fit b.Best-fit
6. c. First-fit
7. Simulate paging technique of memorymanagement.
8. Simulate Bankers algorithm for the purpose of deadlockavoidance.
9. Simulate page replacement algorithms a. FIFO b. SC c. NRU d.LRU
10. Simulate disk scheduling algorithms a. FCFS b. SCAN c.C-SCAN
11. Simulate producer-consumer problem usingsemaphores.
12. Basics of UNIXcommands.
13. Shellprogramming

Soft Ware Engineering Lab

LIST OF EXPERIMENTS:

Lab cycle 1:

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

Lab cycle 2:

Object-oriented design using UML.

1. ANALYSIS- SRSdocumentation
2. USECASEVIEW
   i. Construction of use casemodel
   ii. Building a Business Process model using UML activitydiagram.
3. LOGICAL VIEW- Construction of UML static classdiagram.

Sample information systems for implementation:

1. Course registrationsystem
2. ATMservices
3. Advertising agency managementsystem
4. Onlineshopping
5. Library managementsystem

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CBSL2	**Mobile Application Development**			
Semester IV (Second Year)	**L**	**T**	**P**	**C**
	1	**-**	**2**	**2**

Course Objectives:
At the end of the course the students will understand the
1. To provide knowledge on tools required for Mobile Application Development using Android.
2. To provide knowledge on Android User Interface using Views.
3. To provide knowledge on Android User Interface for pictures and menus.
4. To provide knowledge on android databases.

Course Outcomes:
After successful completion of the course, the students are able to
1. Install the required tools for android application development..
2. Design user interfaces for android applications.
3. Design user interfaces for menus using Views..
4. Develop android applications using android database.

UNIT I Text Book - 1 **[CO1]**

Android Programming: What Is Android? Obtaining the Required Tools, Creating Your First Android Application.Android studio for Application development: Exploring IDE, Using code completion, debugging your Application, Generating a signed APK.

UNIT II Text Book - 1 **[CO2]**

Activities, Fragments, and Intents: Understanding Activities, Linking Activities Using Intents, Fragments, Displaying Notifications.
Android User Interface: Components of a Screen, Adapting To Display Orientation, Managing Changes to Screen Orientation, Utilizing the Action Bar, Creating the User Interface Programmatically.

UNIT III Text Book - 1 **[CO3]**

User Interface with Views: Using Basic Views, Using Picker Views, Using List Views To Display Long Lists, Understanding Specialized Fragments.
Pictures and Menus with Views: Using Image Views to Display Pictures, Using Menus with Views,

UNIT IV Text Book - 1 **[CO4]**

Using Web View.Notifications - Creating and Displaying notifications, Displaying Toasts.
Data Persistence: Saving and Loading User Preferences, Persisting Data to Files, Creating and Using Databases.

LEARNING RESOURCES:

TEXT BOOK:

1. Beginning Android Programming with Android Studio, J.F.DiMarzio, Wiley India (Wrox), 2017.

REFERENCE BOOK(s):

1. Wei-Meng Lee, Beginning Android 4 Application Development, Wiley India (Wrox), 2012.
2. Reto Meier, Professional Android 4 Application Development, Wiley India, (Wrox), 2012.
3. James C Sheusi, Android Application Development for Java Programmers, Cengage Learning, 2013.

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CBMC4	**Design Thinking**			
Semester IV (Second Year)	**L**	**T**	**P**	**C**
	2	**-**	**-**	**-**

COURSE OBJECTIVES:
1. To create awareness of design thinking among students of engineering
2. To teach a systematic approach for identifying and applying design thinking process
3. To enable the use of doodling and storytelling as a means of presenting ideas and prototypes
4. To motivate students to create value proposition statements for identified problems

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

UNIT – I: **(CO1)**
Design Thinking Overview and Motivation: Design Thinking for business–Stories, Examples and Case Studies; Design Thinking for Students; Introduction to Design Thinking – Stanford's 5-step model;
*Activities to understand Design Thinking and its applications

UNIT – II: **(CO2)**
Doing Design: Empathize Phase: Empathy; Importance of Empathy; Empathy Tools; Introduction to Immersion Activity; Persona, Importance of Persona Creation; Data collection and Inferences
*Activities for Empathize Phase

UNIT – III: **(CO3)**
Doing Design: Define Phase: Problem Statements–Introduction, Definition, and Validation;
Need Analysis: Types of Users, Types of Needs; Addressable Needs and Touch points; Structuring Need Statements;
*Activities for Define Phase
Doing Design: Ideate Phase
Ideation tools: Six Thinking Hats; Ideate to generate solutions; Brainstorming, Doodling and Storytelling to present ideas; Ideation by SCAMPER, ideation by reconstruct and deconstruct.
*Activities for Ideate Phase

UNIT – IV: **(CO4)**
Doing Design: Prototype Phase
Introduction to Prototype; Methods of Prototyping; Value proposition for the solution *Activities for Prototype Phase.

Doing Design: Test Phase
Importance of testing; Feedback Collection; Documentation of Feedback; Inference from Feedback; Looping of Design Thinking; Agile and Design Thinking to deliver customer satisfaction;
*Activities for Test Phase

TEXT BOOKS:

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

REFERENCES:

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