SCHOOL OF INFORMATION TECHNOLOGY, RGPV BHOPAL

B.Tech(Computer Science and Business System) I Semester

CB 101 (DISCRETE MATHEMATICS)

Unit I- Boolean Algebra: Introduction of Boolean algebra, truth table, basic logic gate, basic postulates of Boolean algebra, principle of duality, canonical form, Karnaugh map.

Unit II- Abstract Algebra: Set, relation, group, ring, field.

Unit III- Combinatorics: Basic counting, balls and bins problems, generating functions, recurrence relations. Proof techniques, principle of mathematical induction, pigeonhole principle.

Unit IV- Graph Theory: Graphs and digraphs, complement, isomorphism, connectedness and reachability, adjacency matrix, Eulerian paths and circuits in graphs and digraphs, Hamiltonian paths and circuits in graphs and tournaments, trees; Planar graphs, Euler's formula, dual of a planer graph, independence number and clique number, chromatic number, statement of Four-color theorem.

Unit V- 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.

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

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

Course Outcomes-
On successful completion of the course, the students will be able to:
CO1. Design and createlogic circuits by applying the knowledge of Boolean algebra and logic gates
CO2. Apply the knowledge of Sets, Relations and groups to solve related problems
CO3. Identify or categorize counting problems and solve them

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CO4. Identifythe problems that can be solved by using graph theory and apply the knowledge of
    Graphs in developing algorithms and computer programs
CO5. Understand logical arguments and validate them.

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CB 102 (INTRODUCTORY TOPICS IN STATISTICS, PROBABILITY AND CALCULUS)

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

Unit II- 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 III- Probability: Concept of experiments, sample space, event, Definition of Combinatorial Probability, Conditional Probability, Bayes Theorem.

Unit IV- 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 V- Calculus: Basic concepts of Differential and integral calculus, application of double and triple integral.

Text Books-
1. Introduction of Probability Models, S.M. Ross, Academic Press, N.Y.
2. Fundamentals of Statistics, vol. I & II, A. Goon, M. Gupta and B. Dasgupta, World Press.
3. Higher Engineering Mathematics, B. S. Grewal, Khanna Publication, Delhi.

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

Course Outcomes-
On successful completion of the course, the students will be able to:

CO1:Apply the knowledge of diff erential calculus in optimizing functions of single variables.
CO2: Evaluate double, triple integrals and apply it in finding area and volume of solids.

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CO3: Understand the concepts of probability and random variables and apply it in solving real world problems.

CO4: Model and solve real life problems using various discrete and continuous distributions.

CO5: Analyze data using various statistical methods.

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CB 103(FUNDAMENTALS OF COMPUTER SCIENCE)

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)

Unit II- Types Operator and Expressions with discussion of variable naming and Hungarian Notation: Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, proper variable naming and Hungarian Notation.

Unit III- Control Flow with discussion on structured and unstructured programming: Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, goto labels, structured and un- structured programming.Functions and Program Structure with discussion on standard library: Basics of functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialisation, Recursion, Pre-processor,Standard Library Functions and return types.

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

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

LABORATORY (FUNDAMENTALS OF COMPUTER SCIENCE LAB)

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

Reference Books-
1. C: The Complete Reference,(Fourth Edition), Herbert Schildt, McGraw Hill.
2. Let Us C, YashavantKanetkar, BPB Publications

Course Outcomes-
On successful completion of the course, the students will be able to:

CO1: Formulate simple algorithms for arithmetic and logical problems.
CO2: Implement conditional branching, iteration and recursion
CO3: Use arrays, strings and functions to formulate algorithms and programs.
CO4: Design and develop applications using Pointers
CO5: Design and implement programs using structures and unix system interface.

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CB 104 (PRINCIPLES OF ELECTRICAL ENGINEERING)

Unit I- 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- 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.

Unit III- 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 (λ -Δ&λ -λ).

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

Unit V- 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.

For Further Reading -Principle of batteries, types, construction and application, Magnetic material and B-H Curve, Basic concept of indicating and integrating instruments.

LABORATORY (PRINCIPLES OF ELECTRICAL ENGINEERING LAB)

1. Familiarization of electrical Elements, sources, measuring devices and transducers related to electrical circuits

2. Determination of resistance temperature coefficient

3. Verification of Network Theorem (Superposition, Thevenin, Norton, Maximum Power

4. Transfer theorem)

5. Simulation of R-L-C series circuits for XL>XC , XL< XC

6. Simulation of Time response of RC circuit

7. Verification of relation in between voltage and current in three phase balanced star and delta connected loads.

8. Demonstration of measurement of electrical quantities in DC and AC systems.

Text Books-
1. Electric Machinery,(Sixth Edition) A.E. Fitzgerald, KingselyJr Charles, D. Umans Stephen, Tata McGraw Hill.
2. A Textbook of Electrical Technology,(vol. I),B. L. Theraja, Chand and Company Ltd., New Delhi.
3. Basic Electrical Engineering, V. K. Mehta, S. Chand and Company Ltd., New Delhi.
4. Theory and problems of Basic Electrical Engineering, (SecondEdition), J. Nagrath and Kothari, Prentice Hall of India Pvt. Ltd.

Reference Books-
1. Basic of Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press. T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford University Press, 2011.
2. Introduction to Electrodynamics, D. J. Griffiths, (Fourth Edition), Cambridge University Press.
3. Engineering Circuit Analysis, William H. Hayt& Jack E. Kemmerly, McGraw-Hill Book Company Inc.
4. Fundamentals of Electrical and Electronics Engineering,Smarjith Ghosh, Prentice Hall (India) Pvt. Ltd.

Course Outcomes-
On successful completion of the course, the students will be able to:

CO1: Analyseelectricalcircuitsanditselements.
CO2: ApplycircuittheoremsonDCcircuits
CO3: AnalyzeandsolveACcircuits
CO4: AcquiretheknowledgeinElectrostaticsand Electro –mechanics.
CO5: AnalyzeElectricalMeasuring,wiringandvarioussensors.

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CB 105 (FUNDAMENTALS OF PHYSICS)

Unit I- 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.

Unit II- Interference-principle of superposition-young's experiment:Theory of interference fringes-types of interference-Fresnel's prism-Newton's rings, Diffraction-Two kinds of diffraction-Difference between interference and diffraction-Fresnel's half period zone and zone plate-Fraunhofer diffraction at single slit-plane diffraction grating. Temporal and Spatial Coherence.

Unit III- Polarization of light:Polarization - Concept of production of polarized beam of light from two SHM acting at right angle; plane, elliptical and circularly polarized light, Brewster's law, double refraction.

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

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

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

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

Unit V- Laser and Fiberoptics: Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: Ruby Laser, CO_2 and Neodymium lasers; Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in engineering.Fiber optics and Applications, Types of optical fibers.

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

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LABORATORY (FUNDAMENTALS OF PHYSICS LAB)

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.

Text Books-
1.Concepts of Modern Physics, (Fifth Edition) A Beiser, McGraw Hill International.

2.Fundamentals of Physics, David Halliday, Robert Resnick and Jearl Walker, Wileyplus.

Reference Books-
1. Optics, (Fifth Edition)AjoyGhatak, Tata McGraw Hill.
2. Sears &ZemanskyUniversity Physics, Addison-Wesley.
3. Fundamentals of Optics, (Third Edition)Jenkins and White, McGraw-Hill.

Course Outcomes-
On successful completion of the course, the students will be able to:

CO1: Understand the principles of interference and polarization of light.
CO2: Understand the principles lying behind crystallography and oscillations.
CO3: Understand the basics of electromagnetism and thermodynamics.
CO4: Learn the principles of semiconductor physics and quantum mechanics.
CO5: Learn the fundamentals of lasers and Fiber Optics principles.

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CB 106 (BUSINESS COMMUNICATION & VALUE SCIENCE – I)

Unit I- Overview of LOL (include activity on introducing self), Class activity – presentation on favorite cricket captain in IPL and the skills and values they demonstrate Self-work with immersion – interview a maid, watchman, sweeper, cab driver, beggar and narrate what you think are the values that drive them, Overview of business communication

Activity: Write a newspaper report on an IPL match

Activity: Record a conversation between a celebrity and an interviewer

Quiz, Self-awareness – identity, body awareness, stress management

Unit II- Essential Grammar – I: Refresher on Parts of Speech – Listen to an audio clip and note down the different parts of speech followed by discussion, Tenses: Applications of tenses in Functional Grammar – Take a quiz and then discuss, Sentence formation (general & Technical), Common errors, Voices. Show sequence from film where a character uses wrong sentence structure (e.g. Zindagi Na MilegiDobara where the characters use 'the' before every word)

Unit III- Communication Skills: Overview of Communication Skills, Barriers of communication, Effective communication, Types of communication- verbal and non – verbal – Role-play based learning, Importance of Questioning, 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,

Activity: Skit based on communication skills, Evaluation on Listening skills – listen to recording and answer questions based on them.

Unit IV- Email writing: Formal and informal emails, activity, Verbal communication: Pronunciation, clarity of speech, 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 and take part in a GD, using the words you learnt/liked from the articles.

Group discussion using words learnt, Practice: 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

Project: Create a podcast on a topic that will interest college students

Life skill: Stress management, working with rhythm and balance, colors, and teamwork

Project: Create a musical using the learnings from unit

Unit V-Understanding Life Skills: Movie based learning – Pursuit of Happiness. What are the skills and values you can identify, what can you relate to 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, Life skill: Join a trek – Values to be learned: Leadership, teamwork, dealing with ambiguity, managing stress, motivating people, creativity, result orientation.

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

Course Outcomes-
On successful completion of the course, the students will be able to:

CO1:Comprehend conversations and talks presented in English.
CO2: Recognize the need for life skills and values.
CO3: Recognize own strengths and opportunities.
CO4: Apply the life skills to different situations.
CO5: Understand the basic tenets of communication.