SEMESTER I

Paper Name: Mathematics for Computer Science
Code:
Contact: 3L+1T
Credits: 4
Allotted Hrs: 36

UNIT I: Modern algebra

Binary Operation; Addition Modulo n; Multiplication modulo n; semi group; properties of groups; subgroup.

UNIT II: Trigonometry

Radian or circular Measure; Trigonometric Functions; Trigonometric ratios of angle θ when θ is acute; trigonometric ratios of certain standard angles; allied angles; compound angles; multiple and sub- multiple angles.

UNIT III: Limits and Continuity

The real number system; The concept of limit; concept of continuity.

UNIT IV: Differentiation

Differentiation of powers of x; Differentiation of ex and log x; differentiation of trigonometric functions; Rules for finding derivatives; Different types of differentiation; logarithmic differentiation; differentiation by substitution; differentiation of implicit functions; differentiation from parametric equation. Differentiation from first principles.

UNIT V: Integrations

Integration of standard Functions; rules of Integration; More formulas in integration; Definite integrals.

UNIT VI: Differential equations

First order differential equations; practical approach to Differential equations; first order and first degree differential equations; homogeneous equations. Linear equations; Bernoulli's equation; Exact Differential Equations.

UNIT VII: Complex Numbers

Complex Numbers; Conjugate of a complex number; modulus of a complex Number; geometrical representation of complex number; De Moivere's theorem; nthroots of a complex number.

UNIT VIII: Matrices and Determinants

Definition of a matrix; Operations on matrices; Square Matrix and its inverse;

determinants; properties of determinants; the inverse of a matrix; solution of equations using matrices and determinants; solving equations using determinants.

UNIT IX: Infinite Series

Convergence and divergence; series of positive terms; binomial series; exponential series;logarithmic series.

UNIT X: Probability

Concept of probability; sample space and events; three approaches of probability; kolmogorov's axiomatic approach to probability; conditional probability and independence of events; bay's theorem.

UNIT XI: Basics Statistics

Measures of central Tendency; Standard Deviation; Discrete series. Methods; Deviation taken from assumed mean; continuous series; combined standard deviation; coefficient of variation; variance.

Reference Books:

1. Banerjee A., De S.K. and Sen S.: Mathematical Probability, U.N. Dhur& Sons.

2. Gupta S. C and Kapoor V K: Fundamentals of Mathematical Statistics, Sultan Chand & Sons.

Paper Name: Programming for Problem Solving
Code:
Contact: 3L
Credits: 3
Allotted Hrs: 36

Unit I:

Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts. Number Systems: Binary, Octal, Decimal, Hexadecimal Introduction to C Language - Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements Arithmetic Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.

Unit II:

Conditional Control Statements: Bitwise Operators, Relational and Logical Operators, If, If- Else, Switch-Statement and Examples. Loop Control Statements: For, While, DoWhile and Examples. Continue, Break and Goto statements Functions: Function Basics, User-defined Functions, Inter Function Communication, Standard Functions, Methods of Parameter Passing. Recursion- Recursive Functions.. Storage Classes: Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers.

Unit III:

Preprocessors: Preprocessor Commands Arrays - Concepts, Using Arrays in C, Inter-Function Communication, Array Applications, Two- Dimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection and Bubble Sort.

Unit IV:

Pointers - Introduction, Pointers for Inter-Function Communication, Pointers to Pointers, Compatibility, Lvalue and Rvalue, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command Line Arguments. Strings - Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions.

Unit V:

Structures: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self Referential Structures, Unions, Type Definition (typedef), Enumerated Types. Input and Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/Output Functions, Character Input/Output Functions.

Reference Books :

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
3. Gary J. Bronson, A First Book of ANSI C, 4th Edition, ACM
4. Kenneth A. Reek, Pointers on C, Pearson
5. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Paper Name: Introduction AI and Machine Learning
Code:
Contact: 3L+1T
Credits: 4
Allotted Hrs: 36

Unit I: Artificial intelligence fundamentals

A.I. systems integrating approaches and methods.- Advanced search- Constraint satisfaction problems - Knowledge representation and reasoning - Non-standard logics - Uncertain and probabilistic reasoning (Bayesian networks, fuzzy sets).- Foundations of semantic web: semantic networks and description logics. - Rules systems: use and efficient implementation.- Planning systems.

Unit II:Machine learning

Computational learning tasks for predictions, learning as function approximation, generalization concept. - Linear models and Nearest-Neighbors (learning algorithms and properties, regularization). - Neural Networks (MLP and deep models, SOM). - Probabilistic graphical models. - Principles of learning processes: elements of statistical learning theory, model validation. - Support Vector Machines and kernel-based models. - Introduction to applications and advanced models. Applicative project: implementation and use of ML/NN models with emphasis to the rigorous application of validation techniques.

Unit III: Human language technologies

Formal and statistical approaches to NLP. Statistical methods: Language Model, Hidden Markov Model, Viterbi Algorithm, Generative vs Discriminative Models Linguistic essentials (tokenization, morphology, PoS, collocations, etc.). Parsing (constituency and dependency parsing).Processing Pipelines. Lexical semantics: corpora, thesauri, gazetteers. Distributional Semantics: Word embeddings, Character embeddings. Deep Learning for natural language.

Applications: Entity recognition, Entity linking, classification, summarization.

Opinion mining, Sentiment Analysis. Question answering, Language inference, Dialogic interfaces. Statistical Machine Translation. NLP libraries: NLTK, Theano, Tensorflow.

Unit IV: Intelligent Systems for Pattern Recognition

Particular focus will be given to pattern recognition problems and models dealing with sequential and time-series data-Signal processing and time-series analysis-Image processing, filters and visual feature detectors-Bayesian learning and deep learning for machine vision and signal processing-Neural network models for pattern recognition on non-vectorial data (physiological data, sensor streams, etc)-Kernel and adaptive methods for relational data-Pattern recognition applications: machine vision, bio

informatics, robotics, medical imaging, etc.-ML and deep learning libraries overview: e.g. scikit-learn, Keras, Theano

Unit V: Smart applications&Robotics

Common designs for smart applications examples: fuzzy logic in control systems or cloud analysis of field sensors data streams Make or buy: selecting appropriate procurement strategies example: writing your own RRN architecture vs. using cloud services

Development platforms for smart objects examples: Brillo (IoT devices) or Android TV (Smart TVs)

Development platforms for smart architectures examples: TensorFlow (server-side RNNs), or the Face Recognition API (mobile) Cloud services for smart applications examples: Google Cloud Machine Learning API, Google Cloud Vision API, Google Cloud Speech API, or Deploying Deep Neural Networks on Microsoft Azure GPU VMs Deployment and operations examples: cloud hosting vs. device hosting, or harnessing user feedback to drive improvement

Measuring success: methods and metrics examples: defining user engagement and satisfaction metrics, or assessing the naturalness of smart interactions.

Introduction to robotics: main definitions, illustration of application domains-Mechanics and kinematics of the robot-Sensors for robotics-Robot Control-Architectures for controlling behaviour in robots-Robotic Navigation-Tactile Perception in humans and robots-Vision in humans and robots-Analysis of case studies of robotic systems-Project laboratory: student work in the lab with robotic systems

REFERENCES

1. “Artificial Intelligence: A Modern Approach” by Stuart Russell and Peter Norvig.
2. “Artificial Intelligence: A New Sythesis” by Nils J Nilsson
3. “Artificial Intelligence” by Negnevitsky
4. Intro. to artificial intelligence” by AkerkarRajendr
5. A “Artificial Intelligence and Machine Learning” by AnandHareendran S and Vinod Chandra S S.

Paper Name: Electrical & Electronics Engineering
Code:
Contact: 3L+1T
Credits: 4
Allotted Hrs: 36

Unit I: ELECTRICAL CIRCUITS & MEASUREMENTS

Fundamental laws of electric circuits, Steady State Solution of DC Circuits – Introduction to AC Circuits -Sinusoidal steady state analysis, Power and Power factor -

Single Phase and Three Phase Balanced Circuits. Classification of instruments - Operating Principles of indicating Instruments

Unit II: ELECTRICAL MACHINES

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

Unit III: SEMICONDUCTOR DEVICES AND APPLICATIONS

Introduction - Characteristics of PN Junction Diode – Zener Effect - Zener Diode and its Characteristics - Half wave and Full wave Rectifiers - Voltage Regulation. Bipolar Junction Transistor - CB, CE, CC Configurations and Characteristics - Elementary Treatment of Small Signal Amplifier.

Unit IV: DIGITAL ELECTRONICS

Binary Number System – Boolean algebra theorems, Digital circuits - Introduction to sequential Circuits, Flip-Flops - Registers and Counters – A/D and D/A Conversion - digital processing architecture.

Unit V: FUNDAMENTALS OF COMMUNICATION ENGINEERING

Introduction - Elements of Communication Systems, Modulation and Demodulation: Principles of Amplitude and Frequency Modulations. Digital Communication - Communication Systems: Radio, Antenna, TV, Fax, ISDN, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

Reference Books:

1. DP Kothari and 1.J Nagarath, "Electrical Machines “Basic Electrical and Electronics Engineering", McGraw Hill Education(India) Private Limited, Third Reprint,2016
2. S.K. Bhattacharya "Basic Electrical and Electronics Engineering", Pearson India, 2011
3. Sedha R.S., “Applied Electronics”, S. Chand & Co., 2006
4. A.E.Fitzgerald, David E Higginbotham and Arvin Grabel, “Basic Electrical Engineering",
*Mc*Graw Hill Education(India) Private Limited, 2009
5. Del Toro, “Electrical Engineering Fundamentals”, Pearson Education, New Delhi, 2007
6. “Foundations of Electrical Engineering", Oxford University Press, 2013
7. MahmoodNahvi and Joseph A. Edminister, “Electric Circuits", Schaum' Outline Series,
McGraw Hill, 2002.
8. Mehta V K, “Principles of Electronics”, S.Chand& Company Ltd, 1994.

Paper Name: Computational Engineering Mechanics
Code:
Contact: 2L
Credits: 4
Allotted Hrs: 36

Unit I: Introduction to Computer Programming:

Basic computer programming concepts for engineering computations. Programming in MATLAB or similar computing environments is emphasized and Python R languages ay also be discussed.

Unit II: Engineering Computation:

Fundamental numerical methods and software tools used in engineering computation. Subjects include linear systems of equations, matrix computations, nonlinear equations, least squares approximations, interpolation, numerical integration and numerical solution of differential equations.

Unit III:Scientific Computation:

Restricted to Computational Engineering majors. Explores the basic tools needed for developing scientific computing software. These include advanced programming languages (e.g. C, C++, python), object oriented programming and data structures. Subjects may include abstract data types; creation, initialization, and destruction of objects; class hierarchies; polymorphism, inheritance and dynamic binding; generic programming using templates, linked lists, queues, stacks, trees and algorithms such as searching, sorting, and hashing.

Unit IV:Software Engineering and Design:

Restricted to computational engineering majors.Covers methods and tools for planning, designing, implementing, validating and maintaining large software systems. May include project work to build a software system as a team, using appropriate software engineering tools and techniques

Unit V: Applied Mathematics:

Introduction to modern mathematics, real analysis of functions of one variable, linear operator theory and ordinary differential equations. Elements of complex analysis, Fourier and Laplace transforms, partial differential equations, perturbation methods, analysis of functions of several variables

Unit VI: Statics:

Vector algebra, force systems, free-body diagrams; engineering applications of equilibrium, including frames, friction, distributed loads; centroids, moments of inertia

Unit VI: Dynamics:

Two- and three-dimensional kinematics and dynamics, applied to a broad class of engineering problems

Unit VII: Mechanics of Solids:

Internal forces and deformations in solids; stress and strain in elastic and plastic solids; application to simple engineering problems

References:

1."Analytical Methods in Engineering" by J B Doshi

2. "Partial Differential Equations of Mathematical Physics" by A N Tychonov and A ASamarski

3."Linear Partial Differential Equations for Scientists and Engineers" by TynMyint-U and LokenathDebnath

4. "Fast Boundary Element Methods in Engineering and Industrial Applications" by Olaf Steinbach

5. "Relaxation Methods In Engineering Science" by R V Southwell

Paper Name: English Communication
Code:
Contact: 3L
Credits:
Allotted Hrs: 36

Unit I:Grammar:

Correction of sentence, Vocabulary / word formation, Single word for a group of words, Fill in the blank, transformation of sentences, Structure of sentences – Active / Passive Voice – Direct / Indirect Narration

Unit II:

Essay – Descriptive – Comparative – Argumentative – Thesis statement- Structure of opening / concluding paragraphs – Body of the essay

Unit III:

Reading Comprehension – Global – Contextual – Inferential – Select passages from recommended text

Unit IV:

Business Correspondence – Letter Writing – Formal.Drafting.Biodata- Resume'- Curriculum Vitae

Unit V:

Report Writing – Structure , Types of report – Practice Writing

Unit VI:

Communication / Public Speaking skills , Features of effective speech, verbal-nonverbal

Unit VII:

Group discussion – principle – practice

Reference Books:

1. Mark MaCormack : “Communication”
2. John Metchell“ How to write reports”
3. S R Inthira& V Saraswathi“ Enrich your English – a) Communication skills b) Academic
skills “ Publisher CIEFL & OUP
4. R.C. Sharma and K.Mohan , “Business Correspondence and Report Writing “ , Tata McGraw Hill , New Delhi , 1994
5. L.Gartside , “Model Business Letters” , Pitman , London , 1992
6. Longman , “Longman Dictionary of Contemporary English” (or ‘Oxford Advanced Learner’s Dictionary of Current English’ , OUP , 1998.
7. Maxwell Nurnberg and RosenblumMorris , “All About Words” , General Book Depot, New Delhi , 1995
8. A Text Book for English foe Engineers & Technologists

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Paper Name: Programming for Problem Solving Lab
Contacts: 4P
Credits: 2
Exercises should include but not limited to:

1. DOS System commands and Editors (Preliminaries)
2. UNIX system commands and vi (Preliminaries)
3. Simple Programs: simple and compound interest. To check whether a given number is a palindrome or not, evaluate summation series, factorial of a number , generate Pascal’s triangle, find roots of a quadratic equation
4. Programs to demonstrate control structure : text processing, use of break and continue, etc.
5. Programs involving functions and recursion
6. Programs involving the use of arrays with subscripts and pointers 7. Programs using structures and files.

Paper Name: Computational Engineering Mechanics Lab
Code:
Contact: 4P
Credits:2

1.Basic computer programming concepts for engineering computations. Programming in MATLAB.

2Fundamental numerical methods and software tools used in engineering computation. Subjects include linear systems of equations, matrix computations, nonlinear equations, least squares approximations, interpolation, numerical integration and numerical solution of differential equations.
3.Explores the basic tools needed for developing scientific computing software. These include advanced programming languages (e.g. C, C++, python), object oriented programming and data structures
4.Applied Mathematics
5. Statics ,Dynamcs and Mechanics

Paper Name: English Communication lab
Contacts: 4P
Credit: 2

a) Honing 'Listening Skill' and its sub skills through Language Lab Audio device; 3P
b) Honing 'Speaking Skill' and its sub skills; 2P
c) Helping them master Linguistic/Paralinguistic features (Pronunciation/Phonetics/Voice modulation/ Stress/ Intonation/ Pitch &Accent) of connected speech; 2P 17
j) Honing 'Conversation Skill' using Language Lab Audio –Visual input; Conversational Practice Sessions (Face to Face / via Telephone , Mobile phone & Role Play Mode); 2P
k) Introducing 'Group Discussion' through audio –Visual input and acquainting them with key strategies for success; 2P
f) G D Practice Sessions for helping them internalize basic Principles (turn- taking, creative intervention, by using correct body language, courtesies & other soft skills) of GD; 4P
g) Honing 'Reading Skills' and its sub skills using Visual / Graphics/Diagrams /Chart Display/Technical/Non Technical Passages; Learning Global / Contextual / Inferential Comprehension; 2P
h) Honing 'Writing Skill' and its sub skills by using Language Lab Audio –Visual input; Practice Sessions 2P

Total Practical Classes 17

Books :

Dr. D. Sudharani: Manual for English Language Laboratory Pearson Education (WB edition),2010 Board of Editors: Contemporary Communicative English for Technical Communication Pearson Longman, 2010.

SEMESTER II

Paper Name: Discrete Mathematics
Code:
Contact: 3L+1T
Credits: 4
Allotted Hrs: 36

Unit I: Set Theory:

Definition of Sets, Venn Diagrams, complements, Cartesian products, power sets, counting principle, cardinality and countability (Countable and Uncountable sets), proofs of some general identities on sets, pigeonhole principle. Relation: Definition, types of relation, composition of relations, domain and range of a relation, pictorial representation of relation, properties of relation, partial ordering relation. Function: Definition and types of function, composition of functions, recursively defined functions.

Unit II: Propositional logic:

Proposition logic, basic logic, logical connectives, truth tables, tautologies, contradictions, normal forms (conjunctive and disjunctive), modus ponens and modus tollens, validity, predicate logic, universal and existential quantification. Notion of proof: proof by implication, converse, inverse, contrapositive, negation, and contradiction, direct proof, proof by using truth table, proof by counter example.

Unit III:Combinatories

Mathematical induction, recursive mathematical definitions, basics of counting, permutations, combinations, inclusion-exclusion, recurrence relations (nth order recurrence relation with constant coefficients, Homogeneous recurrence relations, Inhomogeneous recurrence relation), generating function (closed form expression, properties of G.F., solution of recurrence relation using G.F, solution of combinatorial problem using G.F.)

Unit IV: Algebraic Structure:

Binary composition and its properties definition of algebraic structure; Groyas Semi group, Monoid Groups, Abelian Group, properties of groups, Permutation Groups, Sub Group, Cyclic Group, Rings and Fields (definition and standard results).

Unit V: Graphs

Graph terminology, types of graph connected graphs, components of graph, Euler graph, Hamiltonian path and circuits, Graph coloring, Chromatic number. Tree: Definition, types of tree(rooted, binary), properties of trees, binary search tree, tree traversing (preorder, inorder, post order). Finite Automata: Basic concepts of Automation theory, Deterministic finite Automation (DFA), transition function, transition table, Non

Deterministic Finite Automata (NDFA), Mealy and Moore Machine, Minimization of finite Automation.

Reference Books:

1. Kenneth H. Rosen, “Discrete Mathematics and its Applications”, Mc.Graw Hill, 2002.
2. J.P.Tremblay& R. Manohar, “Discrete Mathematical Structure with Applications to PDF created with pdfFactory Pro trial version www.pdffactory.com Computer Science” Mc.Graw Hill, 1975.
3. V. Krishnamurthy, “Combinatories:Theory and Applications”, East-West Press.
4. Seymour Lipschutz, M.Lipson, “Discrete Mathematics” Tata McGraw Hill, 2005.
5. Kolman, Busby Ross, “Discrete Mathematical Structures”, Prentice Hall International.

Paper Name: Digital Fabrication
Code:
Contact: 3L
Credits: 3
Allotted Hrs: 36

Unit I: Fabrication

The concepts of Fabrication are seen within the paradigms of DoX rules (Design for Machining, Design for Assembly, Design for Forming etcDiscuss how to make an object and to give shape

Unit II: Digital Fabrication

Flexibility -Generic form of handling data

Unit III: CAD Modelling

Art to CAD ,Training in using CAD software ,SolidEdge(but basics across all CAD softwares same)

Unit IV: 3D Printing

Using 3D printing and each student and team to fabricate a real part.

Reference Books:

1.Material Strategies in Digital Fabrication”Christopher Beorkrem”
2.Digital Fabrication in Architecture, Engineering and Construction
“ Caneparo, Luca”

Paper Name: Data Structure and Algorithm with Python
Code:
Contact: 3L+1T
Credits:
Allotted Hrs: 36

Unit I: Introduction to Data Structure:

Abstract Data Type.

Unit II: Arrays

1D, 2D and Multi-dimensional Arrays, Sparse Matrices.Polynomial representation (Polynomial Representation as Application).

Unit III: Linked Lists

Singly, Doubly and Circular Lists; Normal and Circular representation of Self Organizing Lists; Skip Lists, Polynomial representation (Polynomial Representation as Application).

Unit IV: Stacks

Implementing single / multiple stack/s in an Array; Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another; Applications of stack; Limitations of Array representation of stack

Unit V: Queues

Array and Linked representation of Queue, Circular Queue, De-queue, Priority Queues

Unit VI: Recursion

Developing Recursive Definition of Simple Problems and their implementation; Advantages and Limitations of Recursion; Understanding what goes behind Recursion (Internal Stack Implementation)

Unit VII: Trees

Introduction to Tree as a data structure; Binary Trees (Insertion, Deletion, Recursive and Iterative Traversals of Binary Search Trees); Threaded Binary Trees (Insertion, Deletion, Traversals); Height-Balanced Trees (Various operations on AVL Trees).

Unit VIII: Searching and Sorting

Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Insertion Sort, Merge Sort, Quick sort, Shell Sort, Comparison of Sorting Techniques

Unit IX:Hashing

Introduction to Hashing, Deleting from Hash Table, Efficiency of Rehash Methods, Hash

Table Reordering, Resolving collision by Open Addressing, Coalesced Hashing, Separate Chaining, Dynamic and Extendible Hashing, Choosing a Hash Function, Perfect Hashing Function.

Reference Books:

1. Fundamentals of Data Structures in C, Ellis Horowitz, SartajSahni, Susan AndersonFreed, Silicon Pr.
2. Data Structures: A Pseudocode Approach with C, Richard F. Gilberg and Behrouz A. Forouzan, Cengage Learning
3. Data Structures In C, Noel Kalicharan, CreateSpace Independent Publishing Platform.
4. Adam Drozdek, Data Structures and algorithm in C, Cengage Learning.
5. The C Programming Language, Brian W. Kernighan and Dennis Ritchie, Prentice Hall.
6. SartajSahni, Data Structures, Algorithms and applications in C++, Second Edition, Universities Press, 2011.
7. Aaron M. Tanenbaum, Moshe J. Augenstein, YedidyahLangsam, Data Structures Using C and C++, 2nd ed., PHI, 2009.

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL
NH-12 (Old NH-34), Simhat, Haringhata, Nadia -741249
Department of Information Technology

Paper Name: Intelligence of Biological Systems
Code:
Contact:2L
Credits: 2
Allotted Hrs: 36

Unit I: INTRODUCTION

Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline

Unit II: Classification&Genetics

Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilisation -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups,
Concepts of recessiveness and dominance.
Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics

Unit III:Biomolecules&Enzymes

Discuss monomeric units and polymeric structures. Discuss
about sugars, starch and cellulose. Amino acids and proteins.Nucleotides and DNA/RNA.Two carbon units and lipids. ,Enzyme classification.Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters

Unit IV: Macromolecular analysis&Metabolism

Proteins- structure and function. Hierarch in protein structure.Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements., Exothermic and endothermic versus
endergonic and exergoinc reactions , This should include the breakdown of glucose to $CO_2 + H_2O$ (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis).Energy yielding and energy consuming reactions. Concept of Energy Charge

Unit V: Microbiology

Concept of single celled organisms.Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions.Growth kinetics.

Reference Books:

1) Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2) Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H. John Wiley and Sons
3) Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman

Paper Name: Environmental Science
Code:
Contact: 1L
Credits:
Allotted Hrs: 36

Unit I: General

Basic ideas of environment, basic concepts, man, society & environment, their interrelationship. 1L

Mathematics of population growth and associated problems, Importance of population study in environmental engineering, definition of resource, types of resource, renewable, non- renewable, potentially renewable, effect of excessive use vis-à-vis population growth,

Sustainable Development. 2L

Materials balance: Steady state conservation system, steady state system with non conservative pollutants, step function. 1L

Environmental degradation: Natural environmental Hazards like Flood, earthquake, Landslide-causes, effects and control/management; Anthropogenic degradation like Acid rain-cause, effects and control. Nature and scope of Environmental Science and Engineering.2L

Unit II: Ecology

Elements of ecology: System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem- components types and function. 1L

Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundar

ban); Food chain [definition and one example of each food chain], Food web. 2L

Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur]. 1L

Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity. 2L

Unit III: Air pollution and control

Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere,Tropopause and Mesopause. Energy balance:Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as albedo], Problems.Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food.Global warming and its consequence, Control of Global warming. Earth's heat budget. Lapse rate: Ambient lapse rate Adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion). Atmospheric

dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model. Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant. Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN. Smog, Photochemical smog and London smog. Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green house gases, effect of ozone modification. Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP. cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference).

Unit IV:Water Pollution and Control

Hydrosphere, Hydrological cycle and Natural water. Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds. River/Lake/ground water pollution: River: DO, 5 day BOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river[deoxygenation, reaeration], COD, Oil, Greases, pH. Lake: Eutrophication [Definition, source and effect]. Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only) Standard and control: Waste water standard [BOD, COD, Oil, Grease], Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening] Wastewater treatment system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition. Water pollution due to the toxic elements and their biochemical effects: Lead, Mercury, Cadmium, and Arsenic

Unit V:Land Pollution

Lithosphere; Internal structure of earth, rock and soil 1L Solid Waste: Municipal, industrial,
commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and
disposal method- Open dumping, Land filling, incineration, composting, recycling. Solid waste management and control (hazardous and biomedical waste).

Unit VI: Noise Pollution

Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbourhood noise] Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, 10 L (18hr Index), Ldn.Noise pollution control.

Unit VII:Environmental Management:

Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/ agreement/ protocol.

Reference Books

1. Masters, G. M., “Introduction to Environmental Engineering and Science”, Prentice-Hall of India Pvt. Ltd., 1991.

2. De, A. K., “Environmental Chemistry”,New Age International.

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Paper Name: Digital Fabrication Lab
Code:
Contact: 4P
Credits: 2

1.Design for Machining, Design for Assembly, Design for Forming etc
2.How to make an object and to give shape
3.Art to CAD
4.Use of SolidEdge
5.3D printing

Paper Name: Data Structure with Python Lab
Contact: 4P
Credit: 2

Experiments should include but not limited to :

Implementation of array operations: Stacks and Queues: adding, deleting elements Circular Queue: Adding & deleting elements Merging Problem : Evaluation of expressions operations on Multiple stacks & queues : Implementation of linked lists: inserting, deleting, inverting a linked list. Implementation of stacks & queues using linked lists: Polynomial addition, Polynomial multiplication Sparse Matrices : Multiplication, addition. Recursive and Nonrecursive traversal of Trees Threaded binary tree traversal.AVL tree implementation Application of Trees. Application of sorting and searching algorithms Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.