SECOND YEAR COMPUTER SCIENCE AND ENGINEERING(AIDS) – CBCS PATTERN																				
Semester III																				
		TEACHING SCHEME								**EXAMINATION SCHEME**										
Sr No	**Course/Subject /Title**	Theory			Tutorial			Practical			Theory				Practical			Term Work		
		Credits	No of Lecture	Hours	credits	No of Hours	Hours	credits	No of Hours	Hours	mode	Marks	Total Marks	min	Hours	MAX	MIN	Hours	MAX	MIN
1	BSC-AIDS-301 Applied Mathematics	3	3	3	1	1	1				CIE	30	100	40	AS PER BOS GUIDELINES			AS PER BOS GUIDELINES	25	10
											ESE	70								
2	PCC-AIDS-302 Computer Networks	3	3	3				1	2	2	CIE	30	100	40		50	20		25	10
											ESE	70								
3	PCC-AIDS-303 Discrete Mathematics &Structures	3	3	3	1	1	1				CIE	30	100	40					25	10
											ESE	70								
4	PCC-AIDS-304 Data Visualization	3	3	3				1	2	2	CIE	30	100	40		25	10		25	10
											ESE	70								
5	PCC-AIDS-305 Computer architecture and OS	3	3	3	1	1	1				CIE	30	100	40					25	10
											ESE	70								
6	PCC-AIDS-306 Problem solving using programming language	2	2	2				2	4	4						50	20		50	20
7	HM-307 EVS	2	2	2																
	Total (Sem III)	**19**	**19**	**19**	**3**	**3**	**3**	**4**	**8**	**8**			**500**			**125**	**50**		**175**	**70**

CIE- Continuous Internal Evaluation **ESE**-End Semester Examination

SECOND YEAR COMPUTER SCIENCE AND ENGINEERING – CBCS PATTERN

Semester IV

		TEACHING SCHEME									EXAMINATION SCHEME									
Sr No	Course/Subject /Title	Theory			Tutorial			Practical			Theory				Practical			Term Work		
		Credits	No of Lecture	Hours	credits	No of Hours	Hours	credits	No of Hours	Hours	mode	Marks	Total Marks	min	Hours	MAX	MIN	Hours	MAX	MIN
1	PCC-AIDS-401Data Structure using Python	3	3	3				1	2	2					AS PER BOS GUIDELINES	50	20	AS PER BOS GUIDELINES	50	20
2	PCC-AIDS-402Introduction to Data Science	3	3	3				1	2	2	CIE	30	100	40					25	10
											ESE	70								
3	PCC-AIDS-403Automata Theory	3	3	3	1	1	1				CIE	30	100	40						
											ESE	70								
4	PCC-AIDS-404DBMS	3	3	3				1	2	2	CIE	30	100	40		50	20		25	10
											ESE	70								
5	PCC-AIDS-405Software Engineering	3	3	3	1	1	1				CIE	30	100	40						
											ESE	70								
6	PCC-AIDS-406Web Technology	2	2	2				1	2	2	CIE	30	100	40		50	20		50	20
											ESE	70								
7	HM-407EVS	2	2	2							CIE	30	100	40						
											ESE	70								
	Total (Sem IV)	**19**	**19**	**19**	**2**	**2**	**2**	**4**	**8**	**8**			**600**			**150**	**60**		**150**	**60**

APPLIED MATHEMATICS

TEACHING SCHEME	EXAMINATION SCHEME
Theory: 3 Hrs / Week	**ESE:** 70 **CIE:** 30
Tutorial: 1 Hrs / Week	**Term work:** 25
Practical: --	**Practical : --**

Course Objectives:

1. To develop mathematical skills and enhance thinking power of students.
2. To give the knowledge to the students of fuzzy set theory, numerical methods probability Linear algebra and statistics with an emphasis on the application of solving engineering problems
3. To prepare students to formulate a mathematical model using engineering skills & interpret the solution in real world.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Describe the statistical data numerically by using Lines of regression and Curve fittings.
2. Solve basic problems in probability theory, including problems involving the binomial, Poisson, and normal distributions.
3. Calculate numerical Integration.
4. Define fuzzy sets using linguistic words and represent these sets by membership functions, convexity, Normality, support, etc.
5. Solve examples on vector calculus.
6. Solve assignment problems by using different techniques of operation research.

Unit No	Content	No of lectures
01	**Correlation, Regression & Curve Fitting:**	**06**
	1.1 Introduction. 1.2 Karl Pearson's Coefficient of Correlation. 1.3 Lines of regression of bivariate data. 1.4 Fitting of Curves by method of Least-squares: 1.4.1 Fitting of Straight lines. 1.4.2 Fitting of exponential curves. 1.4.3 Fitting of second-degree Parabolic curves.	
02	**Probability Distribution:**	**06**
	2.1 Random variables. 2.2 Discrete Probability distribution. 2.3 Continuous probability distribution. 2.4 Binomial Distribution. 2.5 Poisson Distribution. 2.6 Normal Distribution.	

03 Numerical Integration: **06**

3.1 Newton Cotes formulae.
3.2 Trapezoidal Rule.
3.3 Simpson's 1/3 rd rule.
3.4 Simpson's 3/8 th rule.
3.5 Weddle's Rule.

04 Introduction to Fuzzy sets: **06**

4.1 Crisp set and Fuzzy set.
4.2. Basic concepts of fuzzy sets.
4.3 Basic operations on fuzzy sets.
4.4 Properties of fuzzy sets.
4.5 Fuzzy Cardinality
4.6 Height of a fuzzy set, Normal and Subnormal fuzzy set

05 Vector Calculus: **04**

5.1 1Introduction, Vectors in R_n.
5.2 Vector Addition and Scalar Multiplication, Dot (Inner) Product, Located Vectors.
5.3 Hyper planes, Lines, Curves in R_n, Vectors in R_3 (Spatial Vectors).
5.4 ijk Notation, Complex Numbers, Vectors in C_n.

06 Assignment Problem: **06**

6.1 Definition, Balanced and Unbalanced assignment problem.
6.2 Hungarian Method.
6.3 Balanced assignment problems.
6.4 Unbalanced assignment problems.

Reference Books:

1. Linear Algebra, Seymour Lipschutz, Schaums outlines, 4th Edition, McGraw-Hill Publication.
2. Introduction to Linear Algebra, Gilbert Strang, 5th Edition, Wellesley-Cambridge Press.
3. Higher Engineering Mathematics, by B. S. Grewal (Khanna Publication Delhi).
4. Advanced Engineering Mathematics, by H. K. Das (S. Chand Publication).
5. Fuzzy Sets and Fuzzy Logic: Theory and Applications, by George J. Klir and Bo Yuan (Prentice Hall of India Private Limited).

General Instructions:

1. For the term work of 25 marks, batch wise tutorials are to be conducted.
2. The number of students per batch per tutorial should be as per university rules. Number of tutorials should be at least six (All units should be covered).

COMPUTER NETWORK

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs / Week	**ESE:** 70 **CIE:** 30
Tutorial : --	**Term work:** 25 marks
Practical: 2 Hrs. /Week	**Practical :** 50 Marks
Practical: 2 Hrs. /Week	**Practical :** 50 Marks

Prerequisite: Basic understanding of Computers

Course Outcomes:

Upon successful completion of this course, the student will be able to –

1. Implement network and data link layer.
2. To implement the client server model using sockets.
3. To analyze the protocol structure using network analyzing tools.
4. Apply the concepts of application layer services.
5. Understand multimedia streaming and relevant protocols.

Unit No	Content	No of lectures
01	**Introduction to Computer Network** Overview of OSI layer Model and TCP/IP protocol model, Addressing, Underlying technologies for LANs, WANs, and Switched WANs	**06**
02	**Data Link Layer and Medium Access Control Sub layer** Design issues for Data Link Layers, Framing methods, Error control: detection and correction, Flow control, Elementary Data Link protocols, Static and Dynamic channel allocation, Multiple Access protocols, Ethernet: IEEE 802.3, IEEE 802.4, IEEE 802.5, 802.11	**06**
03	**Network Layer and Internet Protocol** IPv4 Addresses, Sub-netting and Super netting, Class less Addressing, Delivery, Forwarding and routing; Routing methods, Congestion control algorithms: Principles, Congestion prevention policies, Load Shedding, Jitter Control, Datagram format, Fragmentation and reassembly models, ARP, RARP, ICMP, IGMP	**06**
04	**Transport Layer** UDP: Process to Process communication, User Datagram Format, Operation and uses of UDP. TCP: TCP Services and Features, TCP segment format, TCP Connections, Flow and error control in TCP, TCP Timers; Berkeley Sockets: Socket Addresses, Elementary Socket system calls byte ordering and address conversion routines, connectionless iterative server, connection oriented concurrent server, TCP and UDP Client server Programs.	**06**

05 Application layer: DNS, FTP, Telnet **06**

Domain Name Space, Distribution of name space, Resolution, DNS massages, BOOTP, DHCP Telnet Concept, NVT, Embedding, Options & options/sub-option negotiation, controlling the server, Out-of-band signaling, Escape charter, Mode of operation, user interface. FTP: Connections, Communication, Command processing, File transfer, User interface, Anonymous FTP, TFTP

06 Web application and Multimedia Services **06**

HTTP: Architecture, Web Documents, HTTP Transaction, Request and Response, HTTP Headers and Examples Electronic Mail: SMTP commands and responses, Mail transfer phases, MIME, POP3
Multimedia In Internet:
Streaming stored audio/video, Streaming live audio/video, Real time interactive audio/video.

TEXT BOOKS:

1. TCP/IP protocol suit 4thEd. – Behrouz A. Forouzen (Tata Mag.Hill)
2. Computer Networks – Andrew S. Tanenbaum (PHI)
3. Unix Network Programming – W. Richard Stevens (PHI)

REFERENCE BOOKS:

1. TCP/IP Illustrated, The Protocols, Vol. I – W. Richard Stevens, G. Gabrani (PearsonEducation.)
2. Internetworking with TCP/IP, Vol. I Principles, Protocols, and Architectures – D. E. Comer(PearsonEd.)
3. Internetworking with TCP/IP, Vol. III, Client-Server Programming and Application (2nd Ed.) –D.E. Comer, David L. Stevens (Pearson Ed.)

TERM WORK

1. Study, design and configuration of IEEE 802.3 Ethernet and IEEE 802.11Wireless LANs (ReferringRFCs)
2. Study of following connectivity test tools with all its options– ipconfig, arp route, traceroute nmap, netstat, finger.
3. Implementing Framing methods
4. Implementation of Error detection code CRC and Hamming code
5. Programs to understand IP addressing, classful & classless addressing
6. Implement shortest path routing algorithm.
7. Client program using UDP to connect to well-known services (echo, time of the day service etc.).
8. Implementing concurrent TCP multi service client/server.
9. Study of network protocol analyzer (Ethereal or Wire-Shark) and understanding packet formats for UDP, TCP, ARP, ICMP protocols.
10. Study of following DNS Tools with all its options. nslookup, dig, host, whois.
11. Configuration of basic services for FTP, HTTP, Telnet etc. on Linux Platform.
12. Write program to send a mail using SMTP commands and receive a mail using POP3commands.

DISCRETE MATHEMATICS STRUCTURE

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs/Week	**ESE:** 70 **CIE**: 30
Tutorial : 1 Hrs/Week	**Term work:** 25 marks
Practical: ---	**Practical :---**

Prerequisite: Basic Mathematics

Course Objectives:

1. To expose the students to the mathematical logic related to computer science areas.
2. To enhance the problem-solving skills in the areas of theoretical computer science.
3. To use mathematical concepts in the development of computer applications.

Course Outcomes:

Upon successful completion of this course, the student will be able to –

1. Apply logic concepts in designing program.
2. Illustrate basic set concepts & apply operations onset.
3. Minimize the Boolean Function.
4. Apply basic concepts of probability to solve real world problem.
5. Represent data structures using graph concepts.
6. Design abstract machine, detect deadlocks.

Unit No	Content	No of lectures
01	**Mathematical Logic:** Statements & Notations, Connectives, Statement Formulas & truth table, Well-formed formulas, Tautologies, Equivalence of formulas, Duality law, Tautological Implications, functionally complete set of connectives, other connectives, Normal Forms, Theory of Inference for statement calculus.	10
02	**Set Theory:** Basic concepts of set theory, Operations on Sets, Ordered pairs & n-tuples, Cartesian product	04
03	**Relations & Functions:** Relations. Properties of binary relations. Matrix & Graph Representation of Relation., Partition & covering of Set, Equivalence Relations. Composition of Binary Relation., POSET & Hasse Diagram, Functions, Types of Functions, Composition of functions.	06

04 Algebraic Systems: **06**

Algebraic Systems: Examples & general Properties, Semi groups & Monoids, Groups: Definitions & Examples, Subgroup & Homomorphism.

05 Lattice and Boolean Algebra: **08**

Lattice as partially ordered sets, Lattice as Algebraic Systems., Special Lattices., Boolean Algebra: Definitions & examples, Boolean Functions., Representation & Minimization of Boolean Functions.

06 Graph Theory: **05**

Basic concepts of graph theory., Paths, Reachability & Connectedness, Matrix, Representations of Graphs., Storage Representation & Manipulations of Graphs. PERT & Related technologies.

TEXT BOOKS:

1. Discrete Mathematical Structures with Applicationto Computer Science" byJ.P.Tremblay & R. Manohar (MGH International)

REFERENCE BOOKS:

1. Discrete Mathematics –SemyourLipschutz, Marc Lipson (MGH), Schaum's outlines.
2. Discrete Mathematics and its Applications – Kenneth H. Rosen (AT&T Bell Labs)(mhhe.com/rosen)
3. Discrete Mathematical Structures – Bernard Kolman, Robert Busby, S. C. Ross and Nadeemur-Rehman (PearsonEducation)

DATA VISUALIZATION

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs/Week	**ESE:** 70 **CIE**: 30
Tutorial : --	**Term work:** 25
Practical: 2 Hr / Week	**Practical :** 25

Unit No	Content	No of lectures
01	**Introduction to Data Visualization** Brief history of data visualization, scientific design choices in data visualization- choice of graphical form, grammar of graphical techniques of large amount of data, crucial need of visualization techniques, challenges in visualization techniques, classification of visualization techniques for qualitative and quantitative data, power of visualization techniques, introduction to different visualization techniques.	**06**
02	**Static Graphical Techniques** Introduction to bar graph, basic understanding of making basic bar graph, grouping bars together, bar graphs on counts, customization of bar graphs by changing application of bar graph in business.	**06**
03	**Multivariate Graphical Techniques** Introduction to correlation matrix, application of correlation matrix in the multivariate analysis, network graph, basics of heat map, difference between heat map and tree map, introduction to higher dimensional scatter plot, axis adjustment in the higher dimensional scatter plot, addition of prediction surface of higher dimensional scatter plot.	**04**
04	**Graphical Validation** Basics of multivariate statistical visual representations and its results, dendrogram, importance of dendrogram in grouping (cluster analysis), Scree Plot, importance of Scree Plot, application of Scree Plot in determining number of clusters and factors, QQ plot, importance of QQ plot in distribution of data for the further quantitative analysis, PP plot, applications and usage of PP Plot for distribution detection.	**06**

05 Customization - I **06**

Introduction to annotations – adding: text, mathematical expression, lines, arrows, shaded shapes, highlighting the texts and items, adding error bars, introduction to axis, swapping x and y axis, changing the scaling ration in the axis, positioning of axis and arranging tick marks and labels, color, size, title, axis units, changing width and spacing of the bar chart, adding labels to bar graph.

06 Customization - II **06**

Changing the appearance of axis labels, circular graphs, using themes, changing the appearance of theme elements, creating the own themes, legends: removing the legends, position of legends, legend title, labels in legends.

TEXT BOOKS:

1. Data Visualization: Principles & Practices, Alexandru Telea, 2nd Ed, CRC Press
2. Hand Book of Data Visualization, Chun-houh Chen, Wolfgang Härdle, Antony Unwin, Springer Publication

REFERENCE BOOKS:

1. R Graphics Cook Book Winston Chang First Edition, O'Reilly Publication
2. ggplot2 Elegant Graphics for Data Analysis by Hadley Wickham Springer Publication

COMPUTER ARCHITECTURE & OPERATING SYSTEM

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs / Week	**ESE : 70** **CIE**: 30
Tutorial : --- 1 Hr / Week	**Term work:** 25
Practical: --	**Practical :** --

Pre-Requisites: None

Course Objectives:

After completion of the course, students will have adequate background, conceptual clarity andknowledge of appropriate solution techniques related to:

1. To understand the structure, function and characteristics of computer systems
2. To identify the elements of modern instructions sets and their impact on processor design
3. To understand the services provided by and the design of an operating system.
4. Understand the structure, organization memory management.

Course Outcomes:

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

1. Understand the theory and architecture of central processing unit & Analyze some of the design issuesin terms of speed, technology, cost, performance
2. Use appropriate tools to design verify and test the CPU architecture & Learn the concepts of parallelprocessing, pipelining and inter processor communication.
3. Understand the architecture and functionality of central processing unit & Exemplify in a better waythe I/O and memory organization, Memory management systems, Virtual Memory
4. Describe and explain the fundamental components of a computer operating system
5. Define, restate, discuss, and explain the policies for scheduling, deadlocks, memory management,synchronization, system calls, and file systems.

Unit No	Content	No of lectures
01	**Introduction, Arithmetic and Instruction Sets**	**06**

Introduction: Concept of computer organization and architecture, Fundamental unit, Computer function and interconnection, CPU structure and function.

Computer Arithmetic: The arithmetic and logic Unit, Integer representation, Integer arithmetic, Floating point representation, Floating point arithmetic, Introduction of arithmetic co-processor.

Instruction Sets: Characteristics, Types of operands, Types of operations, Assembly language, Addressing modes, Instruction format, Types of instruction, Instruction execution, Machine state and processor status, Structure of program, Introduction to RISC and CISC architecture.

02 Memory Organization and Management 08

Memory Organization: Internal Memory: Semiconductor main memory, Error correction, Advanced DRAM organization, Virtual memory systems and cache memory systems. External Memory: Organization and characteristics of magnetic disk, Magnetic tape, Optical memory, RAID, Memory controllers.

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Continuous Memory Allocation, Fixed and variable partition, Internal and external fragmentation and compaction, Paging: Principle of operation, Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging.

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

03 Control Unit & Input/ Output Organization 06

Control Unit: Control unit operation: Micro-operations, Control of the processor, Hardwired implementation, Micro-programmed Control Unit, Basic concepts, Micro-instruction sequencing, Micro-instruction execution, Applications of micro-programming.

Input/ Output Organization: External devices, I/O module, Programmed I/O, Interrupt driven I/ O, Direct memory access, I/O channels and processors, External interface. Instruction pipe-lining: Concepts. Parallel processing: Multiple processor organization, Symmetric multiprocessor, Cache coherence and the MESI protocol

04 Introduction OS & Processes and CPU Scheduling: 06

Introduction and Operating system structures: Definition, Types of Operating system, Real Time operating system, System Components- System Services, Systems Calls, System Programs, System structure. Virtual Machines, System Design and Implementation, System Generations.

05 Processes and CPU Scheduling 06

Processes and CPU Scheduling: Process Concept, Process Scheduling, Operation on process, Cooperating processes. Threads, Inter-process Communication, Scheduling criteria, scheduling Algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Scheduling Algorithms and performance evaluation.

06 Process Synchronization & Deadlocks 04

Process Synchronization: The critical-section problem, Critical regions, Synchronization Hardware, Semaphores, Classical Problems of synchronization, and Monitors Synchronizations in Solaris.

Deadlocks: Systems Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock, Combined approach to deadlock Handling.

TEXT BOOKS:

1. William Stalling, Computer Organization and Architecture: Designing for Performance, Prentice Hall Publication, 8th Edition, 2009.
2. Hayes, Computer Architecture and Organization, McGraw-Hill Publication, 3rd Edition, 2012.
3. Zaky, Computer Organization, McGraw-Hill Publication, 5th Edition, 2011
4. Andrew S. Tanenbaum, Modern Operating System, PHI Publication, 4th Edition, 2015.

REFERENCE BOOKS:

1. Hennessy and Patterson, Computer Architecture: A Quantitative Approach, Morgan and KaufmanPublication, 4th Edition, 2007.
2. Morris Mano, Computer System Architecture, Pearson Education India, 3rd Edition, 2007.
3. Mostafa Abd-El-Barr, Hesham El-Rewini, Fundamentals of Computer Organization and Architecture,Wiley Publication, 1st Edition, 2004.

PROBLEM SOLVING USING PROGRAMMING LANGUAGES

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 2 Hrs. / Week	**Theory :---**
Tutorial : ---	**Term work:** 50
Practical: 4 Hrs. / Week	**Practical :** 50

Prerequisite: Digital Electronics, Computer Fundamentals

Course Objectives:

1. To learn concepts of arrays and pointers in C
2. To learn file handling in C
3. To learn memory management in C
4. To learn structures in C

Course Outcomes:

Upon successful completion of this course, the student will be able to –

1. Articulate the principles of procedure-oriented problem solving and programming.
2. Explain programming fundamentals including statements, control flow and recursion
3. Able to formulate problems and implement algorithmic . .
4. Analyze and use data structures to solve the complex problem statements. .
5. Demonstrate file operations using file handling concepts through developing applications.

Unit No	Content	No of lectures
01	**Introduction to C:** The Form of a C Program, The Library and Linking, Separate Compilation, Compiling Program, C's Memory Map; Expressions – The Basic Data Types, Modifying the Basic Types, Identifies Names, Variables, The Four C Scopes, Type Qualifiers-const, volatile, Storage Class Specifiers; Statements - Selection Statements, Iteration, Statements, Jump Statements, Expression Statements, Block Statements.	04
02	**Console I/O & Basics of Array and Strings** Console I/O: Reading and Writing Characters, Reading and Writing Strings, Formatted Console I/O, printf(), scanf(), Suppressing Input. Arrays and Strings- Two-Dimensional Arrays, Arrays of Strings, Multidimensional Arrays, Array Initialization, Variable- Length Arrays.	04
03	**Functions:** The General Form of a Function, Understanding the Scope of a Function, Parameter passing, Passing arrays to functions, Function Arguments, argc	04

and argv-Arguments to main (), The return Statement, What Does main() Return?, Recursion, Function Prototypes, Declaring Variable Length Parameter Lists, The inline Keyword

04 Pointers: **04**

What Are Pointers? Pointer Variables, The Pointer 0perators, Pointer Expressions, Pointers and Arrays, Arrays of Pointers, Multiple Indirection, Initializing Pointers, Pointers to Functions and structures, C's Dynamic Allocation Functions, restrict-Qualified Pointers, Problems with Pointers.

05 Introduction to Python **04**

Introduction, History of Python, Introduction to Python Interpreter and program execution, Python Installation Process in Windows and Linux, Python IDE, Introduction to anaconda, python variable declaration, Keywords, Indents in Python, Python input/output operations

06 Python's Operators & Built in Types **04**

Arithmetic Operators, Comparison Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Ternary Operator, Operator Precedence, Python's Built-in Data types String, List, Tuple, Set, Dictionary (characteristics and methods)

TEXT BOOKS:

1. C the Complete Reference by Herbert Schild (Tata McGraw Hill) 4thEdition.
2. The C Programming Language- Brian W. Kernighan, Dennis Ritchie 2ndEdition.
3. Mark Lutz, "Learning Python", 5th edition, Orelly Publication,
4. Michel Dawson, "Python Programming for Absolute Beginers" ,

REFERENCE BOOKS:

1.Programming in ANSI C by E.Balaguruswamy.(TataMcGraw Hill) 4th Edition.
2. David Beazley, Brian Jones., "Python Cookbook", Third Edition, Orelly Publication

ENVIORMENT STUDIES (For Sem III & IV)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 2 Hrs/Week	ESE (For 4th Sem) – 70marks
Tutorial :--	(For 4th Sem) Environmental Project Report 30 marks

Unit No	Content	No of lectures
01	**Nature of Environmental Studies:** Definition, scope and importance. Multidisciplinary nature of environmental studies Need for public awareness. Concept of sustainability. Sustainable development and it's goals with Indian context.	**03**
02	**Ecosystems:** Concept of an ecosystem, Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem, Ecological succession. Food chains, food webs and ecological pyramids, Introduction, types, characteristics features, structure and function of the following ecosystem: Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d)Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) Degradation of the ecosystems and it's impacts.	**09**
03	**Natural Resources and Associated Problems** **Forest resources**: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. **Water resources**: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. **Mineral resources**: Usage and exploitation. Environmental effects of extracting and using mineral resources. **Food resources**: World food problem, changes caused by agriculture, effect of modern agriculture, fertilizer-pesticide problems. **Energy resources**: Growing energy needs, renewable and non- renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, nuclear energy,	**08**

Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Consumerism, ecological foot prints, carbon foot prints, carbon credits.

Role of an individuals in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

04 Biodiversity and its Conservation **08**

Introduction- Definition: genetic, species and ecosystem diversity.

Bio-geographical classification of India.

Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values., India as a mega- diversity nation, Western Ghat as a biodiversity region, Hot-spots of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man- wildlife conflicts, Endangered and endemic species of India,

Conservation of biodiversity: In-situ and Ex- situ conservation of biodiversity. Convention on Biological Diversity.

05 Environmental Pollution: **08**

Definition: Causes, effects and control measures of:

Air pollution, Water pollution, Soil pollution, Marine pollution Noise pollution

Thermal pollution, nuclear hazards, Global Level Environmental Problems like Global warming, acid rain, ozone layer depletion, Nuclear accidents and holocaust.

Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Solid waste management control rules, Role of an individual in prevention of pollution.

06 Social Issues and the Environment **04**

Human population growth, impact on environment.Human Health and welfare, Environmental ethics: Role of Indian religious traditions and culture in conservation of the environment.

Environmental movements- Chipko Movement, Appiko Movement, Silent Valley. Resettlement and rehabilitation of people; its problems and concerns.

Water conservation, rain water harvesting, watershed management. Water conservation by Dr.Rajendra Singh, Anna Hazare etc.

Disaster management: floods, earthquake, cyclone, tsunami and landslides. Wasteland reclamation, Environmental communication and public awareness, case studies.

07 Environmental Protection- Policies and practices **05**

Air (Prevention and Control of Pollution)
Act.1981

Water (Prevention and control of Pollution)
Act - 1974

Wildlife Protection Act-1972

Forest Conservation Act-1980

National and International conventions and agreements on environment

08 Field Work (Environmental Project Report) **10**

Visit to a local area to document environmental assets-River/forest/grassland/hill/mountain, or Visit to a local polluted ite/Industry, or Urban/Rural/Industrial/Agricultural or Study of common plants, insects, birds.or Study of simple ecosystems - ponds, river, hill slopes, etc. (Field work is equal to 10 lecture hours)

REFERENCE

Agarwal, K.C.2001, Environmental Biology, Nidi Pubi. Ltd., Bikaner.

Bharucha Erach, The Biodiversity of India, Mapin Publishing pvt. Ltd.,Ahmedabad380013, India, Email:mapin@icenet.net (R)

Brunner R.C.,1989, Hazardous Waste Incineration, McGraw Hill Inc., 480p

Clank R.S. Marine Pollution, Clanderson Press Oxford (TB)

Cunningham, W.P. Cooper, T.H.Gorhani, E. & Hepworth, M.T.2001,

Environmental Encyclopedia, Jaico Publ. Hpise, Mumbai, 1196p

De A.K., Environmental Chemistry, Wiley Western Ltd.

Down to Earth , Cebtre fir Scuebce and Environment (R)

Gleick, H.,1993, Water in crisis, Pacific Institute for studies in Dev. Environment & Security. Stockholm Env. Institute. Oxford Univ. Press 473p

Hawkins R.e., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)

Heywood, V.H.& Watson, R.T.1995, Global Biodiversity Assessment,Cambridge Univ. Press 1140p.

Jadhav, H.& Bhosale, V.M.1995, Environmental Protection and Laws, Himalaya Pub. Hcuse, Delhi 284p.

Mickinney, M.L.& School. R.M.1196, Environmental Science Systems & Solutions, Web enhanced edition, 639p.

Mhaskar A.K., Mastter Hazardous, Techno-Science Publications (TB)

Miller T.G.Jr., Environmental Science. Wadsworth Publications Co. (TB)

Odum, E.P.1971, Fundamentals of Ecology, W.B.Saunders Co. USA, 574p.

Rao M.N.& Datta, A.K.1987, Waste Water Treatment, Oxford & IBH Publ. Co. Pvt. Ltd., 345p

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Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, vol. I anfd II, Environmental Media (R)

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SEMESTER - IV

DATA STRUCTURES USING PYTHON

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 2 Hrs / Week	**ESE : - --** **CIE**: ---
Tutorial :	**Term work:** 50
Practical: -- 2 Hr / Week	**Practical :** 50

Prerequisite: Fundamentals of programming

Course Objectives:

After completion of the course, students will have adequate background, conceptual clarity and knowledge of appropriate solution techniques related to:

1. Introduce the fundamental concept of Python programming to the students
2. Understand various data structures in Python and write algorithms and programs using them
3. Compare alternative implementations of data structures with respect to performance
4. Discuss the computational efficiency of the principal algorithms for sorting, searching, andhashing

Course Outcomes:

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

1 Write programs using basic concepts of Python Programming

2 Implement algorithms for arrays, linked structures, stacks, queues, trees, and graphs

3 Write programs that use arrays, linked structures, stacks, queues, trees, and graphs

4 Compare and contrast the benefits of dynamic and static data structures implementation

5 Discuss the computational efficiency of the principal algorithms for sorting, searching,
and hashing

Unit No	Content	No of lectures
01	**Introduction to Programming**	**07**

Introduction to Programming, Why Programming, what is a Program? Problem Solving, Algorithms and Data Structure Introduction to Programming, Variables, Data Types, Input-Output Statements, Indentation, Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators,

Membership Operators, Identity Operators, Expressions and order of evaluations. Control Flow- if, if-elif-else, for, while break, continue, pass Collections- String, Lists, Tuples, Dictionaries, Sets, Map

02 Functions & Object-Oriented Programming using Python 07

Functions- Built-in and User defined functions, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function- Global and Local Variables, Recursions

Need for OOP, Classes and Objects, OOP Concepts, Constructor, Class Diagram, Encapsulation, Statics, Relationship, Inheritance, and Abstract Classes, Exception Handling

03 Data Structures in Python 07

ADT- Defining the ADT, Using the ADT, Pre conditions and post conditions

Introduction to Data Structures, Types of Data Structures, Arrays- Need for array, Array ADT, Implementing array, 2-D arrays, Linked Structures- Singly Linked List & Operations with algorithms, Application- Polynomials, Doubly Linked Lists, Circular Linked List

Stacks- Stack ADT, Implementing the stack- using Python List and using a linked list, Stack Applications- Evaluating Postfix expressions

Queues- Queue ADT, Implementing the queue- using Python List and using a linked list, Priority Queue, Applications of Queues

04 Non-Linear Data Structures in Python 06

Binary Trees- Tree Structure, Properties, Implementation, Tree Traversals, Heaps-Definition, Implementation, Heap Sort

Binary Search Trees- Operations and Algorithms (searching, insertion, deletion, min, max), AVL Tree-Insertions, deletions, implementation

Hash Tables- Hashing techniques, Hash functions, Applications

05 Searching & Sorting Algorithms and Analysis 05

Search Algorithms- Linear Search Algorithm, Binary Search Algorithm,

Comparison Sort Algorithms- Introduction, Selection Sort, Insertion Sort, Bubble Sort, Merge Sort, Quick Sort

06	**Algorithmic Techniques**	**04**

Algorithm Technique- Greedy Approach, Dynamic Programming, Complexity Analysis of Algorithms- Introduction, Analysis of Algorithms, Big-O Notation, Evaluating the Python List.

TEXT BOOKS:

1. Data Structures and Algorithms Using Python, Rance D. Necaise
2. Python for Everybody, Exploring Data Using Python 3, Dr. Charles R. Severance
3. Data Structures and Algorithms in Python, Michael T. Goodrich, Roberto Tamassia, Michael

H. Goldwasser.

INTRODUCTION TO DATA SCIENCE

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs / Week	**ESE : -** 70 CIE: - 30
Tutorial :	**Term work:** 25 marks
Practical: -- 2 Hr / Week	**Practical :** --

Unit No	Content	No of lectures
01	**What is data science?** Introduction to Data Science, the data science Venn diagram, Terminology, Data science case studies, Summary, Types of Data, Flavors of Data: Structured versus unstructured data, Quantitative and qualitative data, The four levels of data: Nominal level, Ordinal level, Interval level, and Ratio level	**04**
02	**The Five Steps of Data Science:** Overview of the five steps, Explore the data, obtain the data, model the data, communicate and visualize the results.	**04**
03	**Concept of Data Science** Traits of Big data, Web Scraping, Analysis vs Reporting, Introduction to Programming, Tools for Data Science, Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK	**05**
04	**Machine Learning** Overview of Machine learning concepts – Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforcement learning	**05**
05	**Visualizing Data: Bar Charts, Line Charts, Scatterplots** Working with data: Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling	**06**
06	**Case Studies of Data Science:** Applications: Weather forecasting, Stock market prediction, Object recognition, Real Time Sentiment Analysis	**05**

TEXT BOOKS:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media

2. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media

3. Jain V.K., “Data Sciences”, Khanna Publishing House, Delhi

Reference Books:

1.Jain V.K., “Big Data and Hadoop”, Khanna Publishing House, Delhi.
2. Jeeva Jose, “Machine Learning”, Khanna Publishing House, Delhi.
3. Chopra Rajiv, “Machine Learning”, Khanna Publishing House, Delhi.
4.Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press
5. Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", Third Edition, Morgan Kaufmann Publishers

AUTOMATA THEORY

TEACHING SCHEME	EXAMINATION SCHEME
Theory: 3 Hrs/Week	**ESE**: 70 **CIE:** 30
Tutorial: 1 Hr / Week	**Term work:** ---
Practical: ---	**Practical : ---**

Prerequisite: Basic Mathematical Concepts, Sets, graphs.

Course Objectives:

1. To introduce students to the mathematical foundations of computation, the theory of formal languages and grammars
2. To strengthen the students' ability to understand and conduct mathematical proofs for computations
3. To make the students understand the use of automata theory in Compliers & System Programming.
4. To analyze and design finite automata, pushdown automata, grammars & Turing machines

Course Outcomes:

Upon successful completion of this course, the student will be able to –

1. Understand basic concepts of Regular Language and Regular Expressions
2. Select appropriate abstract machine to recognize a given formal language.
3. Generate complex languages by applying Union, Intersection, Complement, Concatenation and Kleene * operations on simple languages.
4. Apply parsing concepts for syntax analysis.
5. Be familiar with thinking analytically and intuitively for problem solving situations in related areas of theory in computer science.

Unit No	Content	No of lectures
01	**Regular Languages and Finite Automata** Proofs, Recursive Definitions, Regular expressions and regular languages, FiniteAutomata,unions,intersection&complementsofregularlanguages,Applications of FA	**07**
02	**Nondeterminism and Kleene's Theorem** Nondeterministic finite automata, NFA with null transition, Equivalence of FA's, Kleene's Theorem (Part I & Part II), Minimal Finite Automata	**06**
03	**Context free Grammars**	**05**

Definition, Union, Concatenation and Kleene *'s of CFLs, Derivation trees and ambiguity, Simplified forms and normal forms

04 Parsing and Push down Automata **06**

Definition of Pushdown Automata, Deterministic PDA, Equivalence of CFG's& PDA's, Top down parsing, bottom up parsing.

05 Context free languages **05**

CFL's and non CFL's, Pumping Lemma, intersections and completes of CFLs

06 Turing Machines **07**

Definition,TMaslanguageacceptors,combiningTuringMachines,Computing partial function with a TM, Multi-tape TMs, and Universal TM

TEXT BOOKS:

1. Introduction to Languages & the Theory of Computations – John C. Martin (Tata MGHEdition)
2. Discrete Mathematical Structures with applications to Computer Science – J .P. Trembley & R.Manohar (MGH)

Reference Books:

1. Introduction to Automata Theory, Languages and computation – John E. Hopcraft,Raje
2. Motwani, Jeffrey D. Ullman (PearsonEdition)
3. Introduction to theory of Computations – Michael Sipser (Thomson Books/Cole)
4. Theory of Computation –Vivek Kulkarni

DATABASE MANAGEMENT SYSTEM

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs/Week	**ESE**: 70 **CIE:** 30
Tutorial : --	**Term work:** 25
Practical: 2 Hr / Week	**Practical :---**

Pre-requisites: Set Theory, Operating System, Data Structures.

Course Objectives:

1. To understand fundamental concepts and algorithms of Database Systems.
2. To gain familiarity with SQL and DBMS.
3. To learn database design techniques.

Course Outcomes:

1. Understand fundamentals of database management systems.
2. Represent logical design of database using E-R Diagram.
3. Analyze & construct good database design.
4. Apply SQL queries to design & manage the database.
5. Understand transactions, concurrency control and apply to database system.
6. Understand failures in database and appropriate recovery techniques.

Unit No	Content	No of lecture
01	**INTRODUCTION TO DATABASES**	**06**
	Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Database Users & Administrators, Structure of Relational Databases, Database Schema, Keys, Relational Query Languages	
02	**E-R MODEL AND DATABASE DESIGN**	**06**
	E-R Model: The Entity-Relationship Model, Reduction to Relational Schemas, Data Redundancies, Functional Dependencies. Canonical Cover, The Process of Normalization, First Normal Form, Second Normal Form, Third Normal Form, Boyce-Codd Normal Form, Fourth Normal Form, Fifth Normal Form.	
03	**STRUCTURED QUERY LANGUAGE (SQL)**	**06**
	Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Set Operations, Aggregate Functions, Modification of Databases, Join expression, Views.	

04 DATA STORAGE & INDEXING **06**

Physical storage media, File Organization, Organization of records in File, Data Dictionary Storage, Database Buffer, Basic Concepts indexing & hashing, Ordered Indices, B+ Tree Index files, Multiple-Key Access, Static Hashing, Dynamic Hashing.

05 TRANSACTION MANAGEMENT **06**

Transaction Concept, A Simple Transaction Model, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Lock-Based Protocols, Timestamp-Based Protocols

06 RECOVERY SYSTEM **06**

Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Failure with Loss of Nonvolatile Storage.

TEXT BOOKS:

1. Database System Concepts, A. Silberschatz, H.F Korth, S. Sudarshan, 6th Edition, McGraw Hill Education. (Unit 1, 3,4,5,6)
2. Database Systems - A practical approach to Design, Implementation and Management, Thomos Connolly, Carolyn Begg

Reference Books:

1. Database Systems – Design, Implementation and Management, Rob & Coronel

Minimum 12 -14 Experiments based on the following topics.

1. Draw an E-R Diagram of any organization.
2. Reduce above mentioned E-R Diagram into tables.
3. Normalize any database from first normal form to Boyce-Codd Normal Form (BCNF).
4. Write a program of Database connectivity with any object oriented language.
5. Use DDL Queries to create, alter (add, modify, rename, drop) & drop Tables.
6. Use DML Queries to insert, delete, update & display records of the tables.
7. Create table with integrity constraints like primary key, check, not null and unique.
8. Create table with referential integrity constraints with foreign key, on delete cascade and on delete set null.
9. Display the results of set operations like union, intersections & set difference.
10. Display the results of Join Operations like cross join, self join, inner join, natural join, left outer join, right outer join and full outer join.
11. Display the records using Aggregate functions like min, max, avg, sum & count. Also use group by, having clauses.
12. Display the results using String operations.
13. Create & Update views for any created table.
14. Write java program to implement dense and sparse indexing
15. Write java program to implement B+ tree indexing.
17. Study of NoSql.

SOFTWARE ENGINEERING

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs/Week	**Theory :** ESE 70Marks CIE 30Marks
Tutorial : ---	**Term work:** ---
Practical: ---	**Practical :**---

Course Objectives:

1. To expose the students to basic concepts & principles of software engineering.
2. To make the student aware of the importance of SDLC in their project development work.
3. To expose the students to software testing techniques and software quality management.

Course Outcomes:

1. Comprehend systematic methodologies of SDLC(Software Development Life Cycle)
2. Discriminate competing and feasible system requirements indicating correct real world problemscope and prepare stepwise system conceptual model using stakeholder analysis and requirement validation.
3. Prepare SRS document for a project
4. Apply software design and development techniques
5. Develop a quality software project through effective team-building, planning, scheduling andrisk
6. Understand testing methods at each phase of SDLC

Unit No	Content	No of lectures
01	**The Software Problem**	**06**
	Cost, Schedule & Quality, Scale and Change, Software Processes: Process & Project, Component Software Processes, Software Development process Models, Project Management Process.	
02	**Software Requirements Analysis & specification**	**05**
	Value of Good SRS, Requirement Process, Requirements Specification, Other Approaches for Analysis, Validation.	
03	**Software Planning & Scheduling**	**06**
	Responsibilities of Software Project Manager, Project Planning, Project Scheduling, Project Staffing, People CMM, Risk Management	

04	**Design**	**06**
	Design Concepts, Function Oriented Design, Object Oriented Design, Detail Design, Verification, Metrics	
05	**Coding & Testing**	**07**
	Coding & Code Review, Testing, Unit Testing, Black Box, Testing, White Box Testing, Program Analysis Tools, Integration Testing, System Testing	
06	**Software Reliability &Quality Management**	**06**
	Reliability, Software Quality, Software Quality Management System, ISO 9000, SEI capability Maturity Model, Six Sigma, Agile Software Development & Extreme Programming, Agile Project Management	

TEXT BOOKS:

1. Software Engineering: A precise Approach – Pankaj Jalote (Wiley India) (Unit1,2,4).
2. Fundamentals of Software Engineering – Rajib Mall (3rd Edition)(PHI) (Unit 5,6).
3. Software Engineering by Jan Sommerville (9th Edition) Pearson (Unit 6, 7 &6.8).
4. Software Engineering Principles & Practices by RohitKhuranaITLESL (2nd Edition) Vikas Publishing House Pvt. Ltd. (Unit3).

Reference Books:

1. Software Engineering – Concepts & Practices –Ugrasen Suman (CenageLearning)
2. Software Engineering Fundamentals –Behforooz & Hudson (Oxford: Indian Edition1st)

WEB TECHNOLOGY

TEACHING SCHEME	EXAMINATION SCHEME
Theory: 2 Hrs./Week	**Theory: --**
Tutorial: --	**Term work: 50 Marks**
Practical: 4 Hrs./Week	**POE: 50 Marks**

Pre-requisites: Object oriented Programming, Basics of HTML and CSS.

Course Objectives:

1. Introduce students with front end web designing.
2. Motivate the students to develop web applications using PHP.
3. To introduce emerging Web technology concepts and tools.
4. To learn database access technologies and state management techniques.
5. To expose students to XAMPP web services.

Course Outcomes:

Upon successful completion of this course, the students will be able to:

1. Apply knowledge of client-side scripting.
2. Develop web application using PHP.
3. Design web application using MVC and Angular JS.
4. Demonstrate use of server-side technologies.
5. Explore newer tools for web development.

Unit No	Content	No of lectures
01	**Front End Web Designing HTML** HTML Design Patterns: HTML Structure, XHTML, DOCTYPE, Header Elements, Conditional Style Sheet, Structural Block Elements, Terminal Block Elements, Multipurpose Block Elements, Inline Elements, Class and ID Attributes, HTML Whitespaces	**04**
02	**Cascading Stylesheet (CSS):** CSS Selector and Inheritance: Type, Class and ID Selector, Position and Group Selectors, Attribute Selectors, Pseudo-element Selectors, Pseudo-class Selectors, Subclass Selector, Inheritance, Visual Inheritance, and Bootstrap	**05**
03	**JavaScript Basics:** Introduction to JavaScript, Basic program of JavaScript, variables, functions, conditions, loops and repetition, Function, Arrays – DOM, Built-in Objects, Regular Expression, Exceptions, Event handling In	**04**

JavaScript, Validating HTML form data using javascript, Validation-AJAX – Jquery

04 PHP basic: 04

Embedding PHP code in Your Web Pages, commenting your Code, Outputting Data to the Browser, PHP supported Data Types, Identifiers, Variables, Constants, Expressions, String Interpolation, and Control Structures

05 Arrays & Functions in PHP: 03

Array: What is Array?, Creating an array, outputting an Array, Merging, slicing, splicing and Dissecting Arrays, Other useful Array, Functions. Functions: Invoking a Function, Creating a Function, Function Libraries

06 PHP Database and small app using Bootstrap and Code to generate 04

Installation Prerequisites, Using the MySqli Extension, Interacting with the Database, Executing Database Transactions

TEXT BOOKS:

1. Pro HTML5 andCSS3 Design Patterns, Michael Bowers, Dionysios Synodinos and Victor Sumner ((Unit I & II, III))
2. Beginning PHP andMySQL: From Novice to Professional, W. Jason Gilmore, (Unit IV to VI)
3. http://www.php.net

Term Work

- Minimum of 15 Experiments to be performed from the above topics.
- 25 marks for performance in practical and experiments as part of continuous evaluation
- 25 marks for Practical Test and oral to be conducted.

ENVIORMENT STUDIES (For Sem III & IV)

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 2 Hrs/Week	ESE (For 4th Sem) – 70marks
Tutorial :--	(For 4th Sem) Environmental Project Report 30 marks

Unit No	Content	No of lectures
01	**Nature of Environmental Studies:** Definition, scope and importance. Multidisciplinary nature of environmental studies Need for public awareness. Concept of sustainability. Sustainable development and it's goals with Indian context.	**03**
02	**Ecosystems:** Concept of an ecosystem, Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem, Ecological succession. Food chains, food webs and ecological pyramids, Introduction, types, characteristics features, structure and function of the following ecosystem: Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d)Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) Degradation of the ecosystems and it's impacts.	**09**
03	**Natural Resources and Associated Problems** **Forest resources**: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. **Water resources**: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. **Mineral resources**: Usage and exploitation. Environmental effects of extracting and using mineral resources. **Food resources**: World food problem, changes caused by agriculture, effect of modern agriculture, fertilizer-pesticide problems.	**08**

Energy resources: Growing energy needs, renewable and non- renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, nuclear energy,

Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Consumerism, ecological foot prints, carbon foot prints, carbon credits.

Role of an individuals in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

04 Biodiversity and its Conservation **08**

Introduction- Definition: genetic, species and ecosystem diversity.

Bio-geographical classification of India.

Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values., India as a mega- diversity nation, Western Ghat as a biodiversity region, Hot-spots of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man- wildlife conflicts, Endangered and endemic species of India,

Conservation of biodiversity: In-situ and Ex- situ conservation of biodiversity. Convention on Biological Diversity.

05 Environmental Pollution: **08**

Definition: Causes, effects and control measures of:

Air pollution, Water pollution, Soil pollution, Marine pollution Noise pollution

Thermal pollution, nuclear hazards, Global Level Environmental Problems like Global warming, acid rain, ozone layer depletion, Nuclear accidents and holocaust.

Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Solid waste management control rules, Role of an individual in prevention of pollution.

06 Social Issues and the Environment **04**

Human population growth, impact on environment.Human Health and welfare, Environmental ethics: Role of Indian religious traditions and culture in conservation of the environment.

Environmental movements- Chipko Movement, Appiko Movement, Silent Valley. Resettlement and rehabilitation of people; its problems and concerns.

Water conservation, rain water harvesting, watershed management. Water conservation by Dr.Rajendra Singh, Anna Hazare etc.

Disaster management: floods, earthquake, cyclone, tsunami and landslides. Wasteland reclamation, Environmental communication and public awareness, case studies.

07 Environmental Protection- Policies and practices **05**

Air (Prevention and Control of Pollution)
Act.1981

Water (Prevention and control of Pollution)
Act - 1974

Wildlife Protection Act-1972

Forest Conservation Act-1980

National and International conventions and agreements on environment

08 Field Work (Environmental Project Report) **10**

Visit to a local area to document environmental assets-River/forest/grassland/hill/mountain, or Visit to a local polluted ite/Industry, or Urban/Rural/Industrial/Agricultural or Study of common plants, insects, birds.or Study of simple ecosystems - ponds, river, hill slopes, etc. (Field work is equal to 10 lecture hours)

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Survey of the Environment, The Hindu (M)

Townsend C., Harper, J. and Michael Begon, Essentials of Ecology, Blackwell Science (TB)

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