

MC-901A		Environmental Sciences						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time	
3	0	0	0	75	25	100	3	
Purpose	To learn the multidisciplinary nature, scope and importance of Environmental sciences.							
Course Outcomes (CO)								
CO1	The students will be able to learn the importance of natural resources.							
CO2	To learn the theoretical and practical aspects of eco system.							
CO3	Will be able to learn the basic concepts of conservation of biodiversity.							
CO4	The students will be able to understand the basic concept of sustainable development.							

Unit-I

The multidisciplinary nature of environmental studies, Definition, Scope and Importance, Need for public awareness, Natural Resources: Renewable and Non-Renewable Resources: Natural resources and associated problems.

- (a) Forest Resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- (b) Water Resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- (c) Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- (d) Food Resources: World Food Problems, changes caused by agriculture and overgazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- (e) Energy Resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.
- (f) Land Resources: Land as a resource, land, degradation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources, Equitable use of resources for sustainable lifestyle.

Unit-II

Ecosystem-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, characteristic features, structure and function of the following ecosystem: (a) Forest Ecosystem, (b) Grassland Ecosystem, (c) Desert Ecosystem and (d) Aquatic Ecosystems (ponds, streams, lakes, rivers, oceans, estuaries

Field Work: Visit to a local area to document Environment assets-river/forest/grassland/hill/mountain, Visit to a local polluted site-Urban /Rural Industrial/Agricultural, Study of common plants, insects and birds, Study of simple ecosystems-pond, river, hill, slopes etc. (Field work equal to 5 lecture hours).

Unit-III

Biodiversity and its conservation: Introduction, Definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity of global, National and local levels. India as a mega-diversity nation Hot spot of Biodiversity, Threats to biodiversity: Habitat loss, poaching of wild life, man-wildlife conflicts, Endangered and endemic species of India, Conservation of Biodiversity- In situ and Ex-Situ conservation of biodiversity.

Environmental Pollution Definition: Cause, effects and control measures of (a) Air Pollution (b) Water Pollution (c) Soil Pollution (d) Marine Pollution (e) Noise Pollution (f) Thermal Pollution (g) Nuclear Hazards Solid waste management- cause, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, Pollution case studies, Disaster management: floods, earthquake, cyclone and landslides

Unit-IV

Social Issues and the Environment: From unsustainable to sustainable development, Urban problems related

of people: Its problems and concerns, Case Studies: Environmental ethics-issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies: Wasteland Reclamation, Consumerism and waste products, Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public Awareness, Human population and the Environment, Population growth, variation among nations, Population explosion-Family Welfare Programme, Environment and human health. Human rights, Value Education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and Human Health, Case Studies, Drugs and their effects; Useful and harmful drugs, Use and abuse of drugs, Stimulant and depression drugs, Concept of drug de-addiction, Legal position on drugs and laws related to drugs.

SUGGESTED BOOKS:

- Environmental Studies- Deswal and Deswal. Dhanpat Rai and Co.
- Environmental Science and Engineering Anandan, P. and Kumaravelan, R. 2009. Scitech Publications (India) Pvt. Ltd., India
- Environmental Studies. Daniels Ranjit R. J. and Krishnaswamy. 2013. Wiley India.
- Environmental Science- Botkin and Keller. 2012. Wiley , India

Note: The Examiner will be given the question paper template to set the question paper.

PC-CS- AIML- 204A	Intelligent Systems					
Lecture	Tutorial	Practical	Major Test	Minor Test	Total	Time
3	0	0	75	25	100	3
Purpose	To impart understanding of the main abstractions and reasoning for intelligent systems.					
Course Outcomes(CO)						
CO1	Understand the basic terminologies in artificial intelligence to develop intelligent systems					
CO2	Apply the random search and heuristic search for intelligent systems.					
CO3	Understand the abstractions and reasoning for intelligent systems					
CO4	Apply the rule based methods in intelligent systems					
CO5	Identify the characteristics and architectures of algorithms of multi agent systems					
CO6	Identify different application areas of Intelligent Systems					

UNIT-I

Introduction: Overview of AI Problems, AI problems as NP, NP-Complete, NP-Hard, Strong and weak, neat and scruffy, symbolic and sub-symbolic, knowledge base and data driven AI.

UNIT-II

Heuristic Search: Best First Search, Hill Climbing, Beam Search, Tabu Search.

Randomized Search: Simulated Annealing, Genetic Algorithm, Ant Colony Optimization, Particle Swarm Optimization, Basics of probability theory and probability distributions, information theory, Bayesian learning, Gaussian Mixture models and the EM algorithm, Factor analysis, Principal components analysis, Independent Component Analysis.

UNIT-III

Intelligent Systems: Knowledge acquisition, Computational intelligence, Rule-based systems, Forward-chaining (a data-driven strategy), Conflict resolution, Backward chaining (a goal-driven strategy), Sources of uncertainty, Bayesian updating, Certainty theory.

UNIT-IV

Possibility theory: fuzzy sets and fuzzy logic, Object-oriented systems, Data abstraction, Inheritance, Encapsulation, Unified Modeling Language (UML), Dynamic (or late) binding.

Key Application Areas: Expert System, Decision Support Systems, **Deep Learning:** Speech and vision, natural Language processing, Information Retrieval, Semantic Web.

SUGGESTED BOOKS:

1. Artificial Intelligence' RB Mishra, PHI
 2. Introduction to Artificial Intelligence, Charnaik, Pearson.
 3. Artificial Intelligence by Elaine Rich, Kevin Knight and Shivashankar B Nair, Tata McGraw Hill.
 4. Introduction to Artificial Intelligence and Expert Systems by Dan W Patterson, Pearson Education.
 5. Artificial Intelligence : Building Intelligent Systems, KULKARNI, Parag , REPRINT, PHI.
 6. Crina Grosan, Ajith Abraham, "Intelligent Systems: A Modern Approach ",Springer-Verlag, 2011
 7. Bogdan M. Wilamowski, J. David Irwin, "The Industrial Electronics Handbook. Second Edition: Intelligent Systems", CRC Press, 2011
 8. Abraham-Kandel, Gideon-Langholz, "Hybrid-Architectures for Intelligent Systems", CRC-Press, 1992
 9. Augmented Human, PAPAGIANNIS, Helen , ist print, SPD.
 10. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press,
- <http://www.deeplearningbook.org>

PC-CS- AIML- 208A	Internet & Web technology					
Lecture	Tutorial	Practical	Major Test	Minor Test	Total	Time
3	0	0	75	25	100	3
Purpose	To gain a broad understanding of the discipline of Web engineering and its application to the development and management of Web Applications.					
Course Outcomes						
CO1	Learn the basic concepts of information and web architecture.					
CO2	Learn about the skills that will enable to design and build high level web enabled applications.					
CO3	Understand the applicability of Java Script as per current software industry standards.					
CO4	Acquaint the latest programming language for the implementation of object based and procedure based applications using Python.					

Unit-I

Information Architecture: The role of Information Architect, Collaboration and communication, Organizing information, organizational challenges, Organizing web sites and Intranets, Creating cohesive organization systems, designing navigation systems, types of navigation systems, Integrated navigation elements, designing elegant navigation systems, Searching systems, Searching your web site, designing the search interface, Indexing the right stuff, To search or not to search grouping content, conceptual design, High level Architecture Blueprint. Architectural Page Mockups, Design Sketches.

Unit-II

Introduction to XHTML and HTML5: Origins and Evolution of HTML and XHTML, Basic Syntax, Standard XHTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms, HTML5, Syntactic Differences between HTML and XHTML.

Cascading Style Sheets: Introduction, Levels of Style Sheets, Style Specification Formats, Selector Forms, Property Value Forms, Font Properties, List Properties, Color, Alignment of Text, Box Model, Background Images, Conflict Resolution.

Unit -III

Java Script: Overview of JavaScript, Object Orientation and JavaScript, General Syntactic Characteristics, Primitives, Operations, and Expressions, Screen Output and Keyboard Input, Control Statements, Object Creation and Modification, Arrays, Functions, Constructors, Pattern Matching Using Regular Expressions, Errors in Scripts

Unit -IV

Python: Introduction to Python, Data Types and Expressions, Control Statements, Strings and Text Files, Lists and Dictionaries, Design with Functions, Design with Classes

Suggested Books:

1. By Peter Morville, Louis Rosenfeld, "Information Architecture on the World Wide Web", O'Reilly Media, 2006.
2. Robert W. Sebesta, "Programming The World Wide Web", Eight Edition, Pearson India, 2015.
3. Kenneth A. Lambert, "The Fundamentals of Python: First Programs", 2011, Cengage Learning.
4. Thomas A Powell, "HTML The Complete Reference", Tata McGraw Hill Publications.

BS-CS-AIML 202M	Mathematics for Machine Learning					
Lecture	Tutorial	Practical	Major Test	Minor Test	Total	Time
3	0	0	75	25	100	3
Purpose	To understand and learn the core concepts of the prerequisite mathematics for applications in data science and machine learning					
Course Outcomes(CO)						
CO1	To understand the basic concepts of data science & machine learning Concepts and their application in modern context					
CO2	To apply the basic statistical concepts for solving various problems					
CO3	To distinguish between various probability distributions and apply the concepts for the solution of related problems					
CO4	To learn the essential tools of matrices and linear algebra including linear transformations, eigen values, diagonalisation, orthogonalization and factorization					
CO5	To learn mathematical modelling, types of matrixs					
CO6	To Implement mathematical concepts using real-world data					

UNIT – I

Overview of Data Science & Machine Learning: Introduction and history of Data Science, Introduction and history of Machine Learning, Overlap between Data Science, Machine Learning and Artificial Intelligence, Applications of Data Science & Machine Learning in the modern context, Types of data, Basic Statistical Concepts: Scale of Measurements (Nominal, Ordinal, Ratio and Interval), Measures of Location, Measures of Variability/Spread, Measures of Shape.

Case Studies: Bollywood Dataset, coronary heart disease dataset.

UNIT – II

Probability Theory: Principle of counting, definitions of probability theory, independent events, mutually exclusive events, collectively exhaustive events, conditional probability, Bayes Theorem, Discrete probability distribution (Discrete Uniform Distribution, Poisson Distribution, Bernoulli Distribution and Binomial Distribution), covariance, correlation, Continuous probability distribution, normal distribution, Central Limit Theorem, Binomial Distribution, Continuous Uniform Distribution, Exponential Distribution, P-Value, T-Value, Confidence Interval, t distribution and chi square distribution

UNIT – III

Linear Algebra: Introduction to linear algebra, notations and definitions, Elementary transformations, Elementary matrices, inverse using elementary transformations, Rank of a matrix, Normal form of a matrix, Linear dependence and independence of vectors, Consistency of linear system of equations, Eigen Values and Eigen vectors, Properties of Eigen values, Cayley Hamilton theorem, Linear Transformation, Orthogonal transformation

UNIT – IV

Mathematical modelling: Similar matrices, Diagonalisation of a matrix Operations on matrices - additions, subtraction, multiplication, scalar multiplication, vector multiplication, Orthogonal Matrix, Singularity of Matrix, Matrix factorization, decomposition such as LU, QR and SVD, Conceptualizing a mathematical model/curve form first principles, concept of boundary conditions

SUGGESTED BOOKS:

Operating System							
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
3	0	0	3	75	25	100	3
Purpose	To familiarize the students with the basics of Operating Systems.						
Course Outcomes (CO)							
CO1	To understand the structure and functions of Operating system.						
CO2	To learn about processes, threads and scheduling algorithms.						
CO3	To understand the principle of concurrency and the concept of deadlocks.						
CO4	To understand various memory management scheme and to study I/O management and file systems.						

Unit-I

Introduction: Introduction to OS. Operating system functions, Different types of O.S.: batch process, multi-programmed, time-sharing, real-time, distributed, parallel.

System Structure: Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, system calls.

Unit-II

CPU scheduling: scheduling criteria, preemptive and non-preemptive scheduling, scheduling algorithms, algorithm evaluation, multi-processor scheduling.

Threads: overview, benefits of threads, user and kernel threads.

Process Management: Concept of processes, process states, process control, co-operating processes, inter-process communication.

Process Synchronization: background, critical section problem, critical region, synchronization hardware, Classical problems of synchronization, semaphores.

Unit-III

Deadlocks: Concept of deadlock, deadlock characterization, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

Memory Management: background, logical vs. physical address space, contiguous memory allocation, paging, segmentation, segmentation with paging. Concept of fragmentation.

Virtual Memory: background, demand paging, concept of page replacement, page replacement algorithms, allocation of frames, thrashing.

Unit-IV

File Systems: file concept, file organization and access methods, allocation methods, directory structure, free-space management

I/O Management: I/O hardware, polling, interrupts, DMA, kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation)

Disk Management: disk structure, disk scheduling (FCFS, SSTF, SCAN,C-SCAN) , disk reliability, disk Performance parameters

Protection and Security:

Goals of protection and security, security attacks, authentication, program threats, system threats, threat monitoring.

Case studies: UNIX file system, Windows file system

Suggested Books:

- “Operating System Concepts”, Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, Wiley
- “Operating systems: a concept based approach”, Dhananjay M. Dhamdhere, McGraw Hill .
- “Operating Systems : Internals and Design Principles, William Stallings, Pearson
- “Operating Systems Design and Implementation” ,(Prentice Hall Software Series) Andrew S Tanenbaum and Albert S Woodhull.
- Taub and Schilling, Principles of Communication Systems, TMH.
- Mithal G K, Radio Engineering, Khanna Pub.
- Sirnon Haykin, Communication Systems, John Wiley.

PC-CS-AIML-212A	Software Engineering						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
3	0	0	3	75	25	100	3
Purpose	To gain a broad understanding of the discipline of software engineering and its application to the development and management of software process.						
Course Outcomes(CO)							
CO1	To understand the basic concepts of Software Engineering.						
CO2	To understand the fundamental concept of requirements engineering and Analysis Modelling.						
CO3	To understand the different design techniques and their implementation.						
CO4	To learn about software testing and maintenance measures.						

Unit-I

Introduction: Introduction to Software Engineering, Software Characteristics, Software Crisis, The Evolving role of Software, Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models, RAD, V Model.

Unit-II

Software Requirement Specification: Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Data Flow Diagrams, Decision Tables, SRS Document, IEEE Standard for SRS.

Software Quality: Software Quality, Concept of Software Quality Assurance (SQA), SEI-CMM Model. Introduction to Software Risk Management and Software Configuration Management

Unit-III

Software Design: Basic Concept of Software Design, Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion.

Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design.

Software Measurement and Metrics: Various Size Oriented Measures: Halstead's Software Science, Function Point (FP) Based Measures, COCOMO, Cyclomatic Complexity Measures: Control Flow Graphs.

Unit-IV

Software Construction: Software construction fundamentals, minimizing complexity, Top-Down and Bottom -Up programming, structured programming, Compliance with Design and Coding Standards.

Testing: Testing Objectives, Unit Testing, Integration Testing, system testing, Acceptance Testing, Regression Testing, Structural Testing, Functional Testing, debugging.

Maintenance: key issues, Types of software Maintenance, Cost of Maintenance, Software Re-Engineering.

Suggested Books:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.\
3. Pankaj Jalote, Software Engineering, Wiley India.
4. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
5. Ian Sommerville, Software Engineering, Addison Wesley.

PC-CS-AIML- 216A	Database Management Systems Lab							
L	T	P	Credit	Practical	Minor Test	Total	Time	
0	0	2	1	60	40	100	2	
Purpose	To implement practically the various concepts of DBMS							
	Course Outcomes							
CO1	To understand & Implement basic DDL commands.							
CO2	To learn & Implement DML and DCL commands.							
CO3	To understand the SQL queries using SQL operators.							
CO4	To understand the concept of relational algebra and implement using examples.							

LIST OF PRACTICALS

1. Create a database and write the programs to carry out the following operation:
 - Add , Delete and modify a record in the database
 - Generate queries
 - Data operations
 - List all the records of database in ascending order.
2. To perform various integrity constraints on relational database.
3. Create a database and perform the following operations:-
 1. Arithmetic and Relational operations
 2. Group by & having clauses
 3. Like predicate for pattern matching in database
4. Create a view to display details of employees working on more than one project.
5. Create a view to display details of employees not working on any project.
6. Using two tables create a view which shall perform natural join, equi join, outer joins.
7. Write a procedure to give incentive to employees working on all projects. If no such employee found give app. Message.
8. Write a procedure for computing amount telephone bill on the basis of following conditions.
 1. telephone rent Rs. 205 including first 105 free units.
 2. if extra units>0 but <500 then rate is 80 paise per unit.
 3. if extra units>500 then rate is Rs. 1.20 per unit.

For this purpose create a table with name, Phone No., No. of units consumed, bill amount of a customer.
9. Write a procedure for computing income tax of employee on the basis of following conditions:-
 1. if gross pay<=40,000 then I.T rate is 0%.
 2. if gross pay>40,000 but <60000 then I.T rate is 10%.
 3. if gross pay>60,000 but <1,00,0000 then I.T rate is 20%.
 4. if gross pay>1,00,0000 then I.T rate is 30%.

For this purpose create a table with name, ssn, gross salary and income tax of the employee.
10. Write trigger for before and after insertion, deletion and updation process.

NOTE: A student has to perform at least ten experiments. Seven experiments should be performed from the above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

PC-CS-AIML- 218A	Internet and Web Technology Lab						
L	T	P	Credit	Practical	Minor Test	Total	Time
0	0	2	1	60	40	100	2
Purpose	To introduce the concepts of HTML5, JavaScript and Python.						
Course Outcomes (CO)							
CO1	Design webpages using HTML, JavaScript and CSS.						
CO2	Design and test simple function/program to implement Searching and sorting techniques using Python.						
CO3	Develop program in Java Script for pattern matching using regular expressions and errors in scripts.						
CO4	Design client-server based web applications.						

LIST OF PRACTCALS

1. Create your own page with your favorite hobbies using HTML, JavaScript and CSS.
2. Create a frameset in HTML that is divided into three sections. The frameset should have three zones.
 - a. The Topmost section of the frameset should take up about just 15% of the browser window. Name this frame title.
 - b. The middle section should be 75% of the browser window. Name this frame title.
 - c. The lower section should be 10% of the browser window. Name this frame menu.
3. Create pages for each section. For the lowermost section, create page that loads the content into the middle section. The topmost section should contain a page describing the web page itself.
4. Create a web page, which displays the map of your country Link, each city /state on the image map, such that the respective HTML page of the city/state is displayed when the user selects an area.
5. Add the tickertape applet to your page by customizing it for the following settings:
 - a. Increase the count by one.
 - b. Accordingly update the message count.
 - c. Change the text color to (237,192,171)
 - d. Experiment with changing the scrolling speed.
 - e. Customize the message text as per your page requirement.
6. Incorporate a quest book into the Diary Food Webpage and use Java Script to build validations into the form.
7. Use Cascading Style sheets (CSS) to modify the following:
 - a. Change background.
 - b. Change font type, face and color.
 - c. Align Text.
 - d. Remove underlines from hyperlinks.
8. Write the program for using JavaScript by using for – loops (through a block of code a number of times), for/in - loops (through the properties of an object), while - loops (through a block of code while a specified condition is true), do/while - loops (through a block of code while a specified condition is true).
9. Write a program in Java Script for the following:
 - a. Copying, passing, and comparing by value
 - b. Copying, passing, and comparing by reference
 - c. References themselves are passed by value
10. Write program in Java Script for pattern matching using regular expressions and errors in scripts.
11. Write a Python function/program that accepts the lengths of three sides of a triangle as inputs. The program output should indicate whether or not the triangle is an equilateral triangle.
12. Write the Python functions for linear search, binary search, selection sort, Bubble Sort, Insertion Sort and converting Fibonacci to a linear algorithm.
13. Write program in Python using Lists and dictionaries, Control statements and Strings and text files.

PC-CS- AIML- 220A	Python Lab-II					
Lecture	Tutorial	Practical	Minor Test	Practical	Total	Time
0	0	2	40	60	100	2
Purpose	To gain a broad understanding of the discipline of machine Learning and its implementation using different libraries.					
Course Outcomes						
CO1	To understand the basic concepts of Python libraries					
CO2	To learn and apply concepts of data manipulation in machine Learning .					
CO3	To learn and apply descriptive analysis concepts.					
CO4	To understand the fundamentals of knowledge representation.					
CO5	To learn and apply concepts of distribution and hypothesis.					
CO6	To understand and implement various data visualization concepts.					

LIST OF PRACTICALS:

1. Write a program to implement of Basic Python Libraries-numpy, scipy.
2. Write a program to implement of Basic Python Libraries-matplotlib, pandas, Scikitlearn.
3. Write a program to create samples from population.
4. Write a program to evaluate Mean, Median, Mode of dataset.
5. Write a program to implement Central Limit Theorem in dataset.
6. Write a program to implement Measure of Spread in dataset.
7. Write a program to implement program to differentiate between descriptive and inferential statistics.
8. Write a program to implement pmf, pdf and cdf.
9. Write a program to implement different visualization techniques on sample dataset.
10. Write a program to implement different hypothesis test on sample dataset.

NOTE: A student has to perform at least ten experiments. Seven experiments should be performed from the above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.