ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)

B. Tech - CSE (Artificial Intelligence & Machine Learning)
(Effective for the batches admitted from 2021-22)

Semester IV (Second year)

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P	C			
1	PC	20APC3308	Software Engineering for AI	3	0	0	3	30	70	100
2	PC	20APC3309	Artificial Intelligence	3	0	0	3	30	70	100
3	PC	20APC3311	Data Mining and Data Warehousing	3	0	0	3	30	70	100
4	PC	20APC3313	Operating Systems	3	0	0	3	30	70	100
5	HS	20AHSMB01	Managerial Economics and Financial Analysis	3	0	0	3	30	70	100
6	HS	20AHS9905	Universal Human Values	3	1	0	3	30	70	100
7	PC Lab	20APC3310	Artificial Intelligence Lab	0	0	3	1.5	30	70	100
8	PC Lab	20APC3312	Data Mining and Data Warehousing Lab	0	0	3	1.5	30	70	100
9	PC Lab	20APC3314	Operating Systems Lab	0	0	3	1.5	30	70	100
10	SOC	20ASC3302	Server Side Scripting	1	0	2	2	100	0	100
			Total credits				**24.5**	**370**	**630**	**1000**

Community Service Project (Mandatory) for 6 weeks duration during summer vacation.
(To visit the selected community to conduct survey (Socio-economic & domain survey) and conduct sensitization/awareness program/activities at the end of IV- semester before commencement of V-semester and complete immersion programme also during V-Semester and submit report in V - semester. Assessment will be done at the end of V-Semester)

Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)	**0**	**0**	**0**	**3**	0	0	0

ANNAMACHARYAINSTITUTEOFTECHNOLOGYANDSCIENCES::TIRUPATI

(AUTONOMOUS)

Year: II	Semester: II		Branch of Study: AI & ML			
COURSECODE	**COURSETITLE**	**L**	**T**	**P**	**CREDITS**	
20APC3308	**Software Engineering for AI** (Common to: AI & ML, AI & DS)	3	0	0	3	

COURSE OBJECTIVES:
- To learn the basic concepts of software engineering and life cycle models
- To explore the issues in software requirements specification and enable to write SRS documents for software development problems
- To elucidate the basic concepts of software design and enable to carry out procedural and object oriented design of software development problems
- To understand the basic concepts of black box and white box software testing and enable to design test cases for unit, integration, and system testing
- To reveal the basic concepts in software project management

COURSE OUTCOMES:
  After completion of the course, students will be able to
  CO1: Understand the methods and issues in software engineering
  CO2: Apply the principles of Artificial Intelligence for Software engineering
  CO3: Design AI based software
  CO4: Apply the algorithms of Machine learning in solving problems
  CO5: Design Expert systems

UNIT – 1: Introduction to Computer Software for AI, AI Problems and Conventional SE Problems, Software Engineering Methodology
Computers and software systems, An introduction to Software engineering, Bridges and buildings versus software systems, the software crisis, A demand for more software power, Responsiveness to human users, Software systems in new types of domains, Responsiveness to dynamic usage environments, Software systems with self-maintenance capabilities, A need for Al systems

What is an AI problem, Ill-defined specifications, correct versus 'good enough' solutions, It's the HOW not the WHAT, the problem of dynamics, the quality of modular approximations, Context-free problems?

Specify and verify—the SAV methodology, the myth of complete specification, what is verifiable, Specify and test—the SAT methodology, testing for reliability, the strengths, the weaknesses, what are the requirements for testing, what's in a specification, Prototyping as a link.

UNIT – 2: An Incremental and Exploratory Methodology, New Paradigms for System Engineering
Classical methodology and AI problems, The RUDE cycle, how do we start, Malleable software, AI muscles on a conventional skeleton How do we proceed, how do we finish, The question of hacking, Conventional paradigms
Automatic programming, Transformational implementation, The "new paradigm" of Blazer, Cheatham and Green, Operational requirements of Kowalski, The POLITE methodology

UNIT –3: Towards a Discipline of Exploratory Programming, Machine Learning: Much Promise, Many Problems
Reverse engineering, Reusable software Design knowledge, Stepwise abstraction, The problem of decompiling, Controlled modification, Structured growth
Self-adaptive software, The promise of increased software power, The threat of increased software problems

UNIT – 4: Machine Learning and Expert Systems
Practical machine learning examples, Multisession inductive programming, Expert Systems: The Success Story, Expert systems as Al software, Engineering expert systems, The lessons of expert
systems for engineering Al software

UNIT – 5: AI into Practical Software
Support environments, Reduction of effective complexity, Moderately stupid assistance, An engineering toolbox, Self-reflective software, Over engineering software, Summary and What the Future Holds

TEXT BOOKS:
1. Derek Partridge, "Artificial Intelligence and Software Engineering", Glenlake Publishing Company, 1998.

REFERENCES:
  1. " The role of Artificial Intelligence in Software Engineering", K. Nitalksheswara Rao,2020

2. "Farid Meziane &Sunil Vadera, "Artificial Intelligence Applications for Improved Software Engineering Development",
   Information Science Reference, 2009

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2												
CO2	3	3											2	
CO3	3	2	3	2	2								2	2
CO4	3	2	2	2	2								2	2
CO5	3	2	2	2	2								2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

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Year: II	Semester: II	Branch of Study: AI & ML			
COURSECODE	**COURSETITLE**	**L**	**T**	**P**	**CREDITS**
20APC3309	**Artificial Intelligence** (Common to: CSE, CIC, AI & ML, AI & DS)	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:
- Define Artificial Intelligence and establish the cultural background for study
- Understand various learning algorithms
- Explore the searching and optimization techniques for problem solving
- Provide basic knowledge on Natural Language Processing and Robotics

COURSE OUTCOMES:
CO1: Understand the basic concepts of Artificial Intelligence
CO2: Apply searching techniques for solving a problem
CO3: Analyze the concepts of Reinforcement Learning
CO4: Develop Natural Language Interface for Machines
CO5: Understanding the concepts to design a robotics

UNIT -1:
Introduction: What is AI, Foundations of AI, History of AI, The State of Art.
Intelligent Agents: Agents and Environments **Good Behavior:** The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT -2:
Solving Problems by searching: Problem Solving Agents, Example problems, searching for Solutions, Uninformed Search Strategies, Informed search strategies, Heuristic Functions
Beyond Classical Search: Local Search Algorithms and Optimization Problems, Local Search in Continues Spaces, Searching with Nondeterministic Actions, Searching with partial observations, online search agents and unknown environments.

UNIT -3:
Reinforcement Learning: Introduction, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, applications of RL
Natural Language Processing: Language Models, Text Classification, Information Retrieval, Information Extraction.

UNIT -4:
Natural Language for Communication: Phrase structure grammars, Syntactic Analysis, Augmented Grammars and semantic Interpretation, Machine Translation, Speech Recognition
Perception: Image Formation, Early Image Processing Operations, Object Recognition by appearance, Reconstructing the 3D World, Object Recognition from Structural information, Using Vision.

UNIT -5:
Robotics: Introduction, Robot Hardware, Robotic Perception, Planning to move, planning uncertain movements, Moving, Robotic software architectures, application domains
Philosophical foundations: Weak AI, Strong AI, Ethics and Risks of AI, Agent Components, Agent Architectures, Are we going in the right direction, What if AI does succeed.

Text Books:
1. Stuart J. Russell, Peter Norvig, "Artificial Intelligence A Modern Approach", 3rd Edition, Pearson Education, 2019.

Reference Books:
1. Nilsson, Nils J., and Nils Johan Nilsson. Artificial intelligence: a new synthesis. Morgan Kaufmann, 1998.
2. Johnson, Benny G., Fred Phillips, and Linda G. Chase. "An intelligent tutoring system for the accounting cycle: Enhancing textbook homework with artificial intelligence." Journal of Accounting Education 27.1 (2009): 30-39.

Online Learning Resources:
http://peterindia.net/AILinks.html

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2											
CO2	3	3	3	2	3								2	2
CO3	2	2	2	2	2									3
CO4		3	3		3									3
CO5	3	2	1			1		1				1	1	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI

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Year: II	Semester: II			Branch of Study: AI & ML	

COURSECODE	COURSETITLE	L	T	P	CREDITS
20APC3311	Data Mining and Data Warehousing	3	0	0	3

COURSE OBJECTIVES:
- To know the basic concepts and principles of data warehousing and data mining
- Learn pre-processing techniques and data mining functionalities
- Learn and create multidimensional models for data warehousing
- Study and evaluate performance of Frequent Item sets and Association Rules
- Understand and Compare different types of classification and clustering algorithms

COURSE OUTCOMES:
CO1: Understand the basic concepts of Data Warehouse and data Mining
CO2: Apply OLAP technology for Data Warehouse
CO3: Analyze and evaluate performance of Association Rules and classification algorithms
CO4: Evaluate various Clustering algorithms
CO5: Analyze advanced Data Mining techniques

UNIT – 1:
Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining. **Data Preprocessing:** Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT – 2:
Data Warehouse and OLAP Technology for Data Mining: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining. Data Cube Computation and **Data Generalization:** Efficient Methods for Data Cube Computation, Further Development of Data Cube and OLAP Technology, Attribute-Oriented Induction.

UNIT – 3:
Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining, **Classification and Prediction:** Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error measures, Evaluating the accuracy of a Classifier or a Predictor, Ensemble Methods

UNIT – 4:
Cluster Analysis Introduction : Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis.

UNIT – 5:
Mining Streams, Time Series and Sequence Data: Mining Data Streams, Mining Time Series Data, Mining Sequence Patterns in Transactional Databases, Mining Sequence Patterns in Biological Data, Graph Mining, Social Network Analysis and Multi relational Data Mining, Mining Object, Spatial, Multimedia, **Text and Web Data:** Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web.

TEXT BOOKS:

1. Data Mining: Concepts and Techniques, Jiawei Han and Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, Second Edition, 2012.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson Education,2016.

REFERENCES:

1. Data Mining Techniques, Arun K Pujari, Second Edition, Universities Press.
2. Data Warehousing in the Real World, Sam Aanhory& Dennis Murray Pearson EdnAsia.
3. Insight into Data Mining, K.P.Soman, S.Diwakar,V.Ajay, PHI,2008.

Online Learning Resources:
https://www.youtube.com/watch?v=ykZ-_UGcYWg&list=PLLspfyoOYoQcI6Nno3gPkq0h5YSe81hsc

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3										1	1	1
CO2	2	3	2										1	
CO3	2	3	2	2	3	2								2
CO4	2	2	3	2	2	3						2	1	
CO5	2	2	3	2	2	3						2	1	1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Year: II	Semester: II			Branch of Study: AI & ML	
COURSECODE	COURSETITLE	L	T	P	CREDITS
20APC3313	Operating Systems (Common to : CSE, CIC, AI & ML, AI & DS)	3	0	0	3

COURSE OBJECTIVES:

The course is designed to

- Understand basic concepts and functions of operating systems
- Understand the processes, threads and scheduling algorithms.
- Provide good insight on various memory management techniques
- Expose the students with different techniques of handling deadlocks
- Explore the concept of file-system and its implementation issues
- Familiarize with the basics of the Linux operating system
- Implement various schemes for achieving system protection and security

COURSE OUTCOMES:

After completion of the course, students will be able to

CO1: Distinguish between the different types of operating system environments.
CO2: Apply the concepts of process synchronization & CPU scheduling
CO3: Develop solutions to deadlock and memory management
CO4: Analyze various disk scheduling algorithms and file system interfaces
CO5: Analyze the various security issues and goals of protection

UNIT - 1:

Operating Systems Overview: Operating system functions, Operating system structure, operating systems Operations, protection and security, Computing Environments, Open- Source Operating Systems

System Structures: Operating System Services, User and Operating-System Interface, systems calls, Typesof System Calls, system programs, operating system structure, operating system debugging, System Boot.

Processes: Process concept, process Scheduling, Operations on processes, Inter process Communication, Examples of IPC systems.

UNIT - 2:

Threads: overview, Multicore Programming, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues.

Process Synchronization: The critical-section problem, Peterson_s Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic problems of synchronization, Monitors, Synchronization examples, Alternative approaches.

CPU Scheduling: Scheduling-Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling, Algorithm Evaluation.

UNIT - 3:

Memory Management: Swapping, contiguous memory allocation, segmentation, paging, structure of the page table.

Virtual memory: Demand paging, page-replacement, Allocation of frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory

Deadlocks: System Model, deadlock characterization, Methods of handling Deadlocks, Deadlock prevention, Detection and Avoidance, Recovery from deadlock.

UNIT - 4:

Mass-storage structure: Overview of Mass-storage structure, Disk structure, Disk attachment, Disk scheduling, Swap-space management, RAID structure, Stable-storage implementation.

File system Interface: The concept of a file, Access Methods, Directory and Disk structure, File system mounting, File sharing, Protection.

File system Implementation: File-system structure, File-system Implementation, Directory Implementation, Allocation Methods, Free-Space management.

UNIT - 5:

I/O systems: I/O Hardware, Application I/O interface, Kernel I/O subsystem, Transforming I/O requests

to Hardware operations.

Protection: Goals of Protection, Principles of Protection, Domain of protection, Access Matrix, Implementation of Access Matrix, Access control, Revocation of Access Rights, Capability- Based systems, Language – Based Protection

Security: The Security problem, Program threats, System and Network threats, Cryptography as a security tool, User authentication, Implementing security defenses, Firewalling to protect systems and networks, Computer–security classifications.

Text Books:

1. Operating System Concepts, Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Wiley, EightEdition, 2018.
2. Modern Operating Systems, Andrew S Tanenbaum, Second Edition, PHI, 2001.

Reference Books:

1. Operating systems by A K Sharma, Universities Press,
2. Operating Systems, S.Haldar, A.A.Aravind, Pearson Education.
3. Operating Systems, A.S.Godbole, Second Edition, TMH.
4. An Introduction to Operating Systems, P.C.P. Bhatt, PHI.
5. Operating Systems, G.Nutt, N.Chaki and S.Neogy, Third Edition, Pearson Education.
6. Operating Systems, R.Elmasri, A,G.Carrick and D.Levine, Mc Graw Hill.
7. Principles of Operating Systems, B.L.Stuart, Cengage learning, India Edition.
8. Operating System Desgin, Douglas Comer, CRC Press, 2nd Edition.

Online Learning Resources:

https://nptel.ac.in/courses/106/106/106106144/ http://peterindia.net/OperatingSystems.html

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2											1	1
CO2	2												1	1
CO3	3	3	3										2	2
CO4			2	2									2	2
CO5	2	2										1	2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

ANNAMACHARYAINSTITUTEOFTECHNOLOGYANDSCIENCES::TIRUPATI

(AUTONOMOUS)

Year: II	Semester: II		Branch of Study: AI & ML			
COURSECODE	**COURSETITLE**			**L**	**T**	**P**	**CREDITS**
20AHSMB01	**Managerial Economics And Financial Analysis** (Common to : CSE, CIC, AI & ML, AI & DS)	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:
- To understand the concepts of managerial economics and financial analysis this helps in optimal decision making in business environment.
- To be familiar with demand concepts, types of methods or techniques of demand those are used by the entrepreneur or producer.
- To have a thorough knowledge on the production theories and cost while dealing with the production and factors of production.
- To introduce the concepts of cost and significance, limitation of Break even analysis.
- To provide the optimal decisions acquiring the knowledge on financial accounting and its analysis

COURSE OUTCOMES (CO):
CO1: Understand the fundamentals of Economics and Managerial economics viz., Demand, Production, cost, revenue and markets.
CO2: Apply the Concept of Production cost and revenues for effective Business decision
CO3: Analyze how to invest their capital and maximize returns.
CO4: Evaluate the capital budgeting techniques.
CO5: Define the concepts related to financial accounting and management and able to develop the Accounting statements and evaluate the financial performance of business entity.

UNIT - 1: MANAGERIAL ECONOMICS
Introduction – meaning, nature, significance, functions, and advantages, ME and its role in other fields. Demand - Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing forecasting, Methods.

UNITI - 2: PRODUCTION AND COST ANALYSIS
Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and Long run Production Function- Isoquants and Isocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale. Cost & Break-Even Analysis - Cost concepts and Cost behavior- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis.

UNIT - 3: BUSINESS ORGANIZATIONS AND MARKETS
Introduction – Nature, meaning, significance, functions and advantages. Forms of Business Organizations-Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies.

UNIT - 4: CAPITAL BUDGETING
Introduction to Capital, Sources of Capital. Short-term and Long-term Capital : Working capital, types, Estimating Working capital requirements. Capital Budgeting – Features, Proposals, Time value of money. Methods and Evaluation of Projects – Pay Back Method, Accounting Rate of Return (ARR), Net Present Value (NPV), and Internal Rate Return (IRR) Method (simple problems).

UNIT - 5: FINANCIAL ACCOUNTING AND ANALYSIS
Introduction – Nature, meaning, significance, functions and advantages. Concepts and Conventions-Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

TEXTBOOKS:
1. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019

REFERENCES

1. Ahuja Hl Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, NewDelhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013.

Online Learning Resources:

https://www.slideshare.net/123ps/managerial-economics-ppt
https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-
19917607 https://www.slideshare.net/balarajbl/market-and-
classification-of-market https://www.slideshare.net/ruchi101/capital-
budgeting-ppt-59565396
https://www.slideshare.net/ashu1983/financial-accounting.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3						1				1			
CO2	1	2												
CO3	2					1								
CO4											3			
CO5				2							2			

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Year: II	Semester: II		Branch of Study: AI & ML			
COURSECODE	**COURSETITLE**			**L**	**T**	**P**	**CREDITS**
20AHS9905	**Universal Human Values**			**3**	**1**	**0**	**3**

COURSE OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human being),family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society andnature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

COURSE OUTCOMES (CO):

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

CO1: Students are expected to become more aware of themselves, and their surroundings (family, society, nature)

CO2: They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

CO3: They would have better critical ability.

CO4: They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).

CO5: It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

UNIT – 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; _Natural Acceptance' and Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment ofaspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current. scenario
- Method to fulfill the above human aspirations: understanding and living in harmony at variouslevels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT II: Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding human being as a co-existence of the sentient _I' and the material _Body'
- Understanding the needs of Self (_I') and _Body' - happiness and physical facility
- Understanding the Body as an instrument of _I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of _I' and harmony in _I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physicalneeds, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

UNIT III: Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship.

- Understanding values in human-human relationship; meaning of Justice (nine universal values in

relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship

- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order-fromfamily to world family

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

UNIT IV: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence
- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all- pervasive space
- Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film -Home‖ can be used), pollution, depletion of resources and role of technology etc.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can beused), pollution, depletion of resources and role of technology etc.

UNIT- V: Implications of the above Holistic Understanding of Harmony on Professional Ethics.
- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco- friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order: a. At the level of individual:as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
- Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discussthe conduct as an engineer or scientist etc.

TEXT BOOKS
1. R R Gaur, R Asthana, G P Bagaria, -A Foundation Course in Human Values and Professional Ethics‖, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, -Teachers' Manual for A Foundation Course in Human Values and Professional Ethics‖, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

REFERENCE BOOKS

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. N. Tripathi, ―Human Values‖, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi ―The Story of My Experiments with Truth‖
5. E. FSchumacher. -Small is Beautiful‖
6. Slow is Beautiful –Cecile Andrews
7. J C Kumarappa -Economy of Permanence‖
8. Pandit Sunderlal ―Bharat Mein Angreji Raj‖
9. Dharampal, -Rediscovering India‖
10. Mohandas K. Gandhi, -Hind Swaraj or Indian Home Rule‖
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland(English)
13. Gandhi - Romain Rolland (English)

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2				2				2		2		
CO2	3	2				2				2		2		
CO3	3											1		
CO4	3											1		
CO5	3	2				3				2		2		

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Year: II	Semester: II			Branch of Study: AI & ML	

COURSECODE	COURSETITLE	L	T	P	CREDITS
20APC3310	**Artificial Intelligence Lab** **(Common to: CSE, CIC, AI & ML, AI & DS)**	**0**	**0**	**3**	**1.5**

COURSE OBJECTIVES:

This course is designed to:
- Explore the methods of implementing algorithms using artificial intelligence techniques
- Illustrate search algorithms
- Demonstrate building of intelligent agents

COURSE OUTCOMES:

Upon the completion of Course, The student will be able to

CO1: Implement search algorithms

CO2: Solve Artificial Intelligence Problems

CO3: Develop the solutions using Backtracking

CO4: Design Chatbot

CO5: Implement basic problems by using NLTK(Natural Language Tool Kit)

List of Tasks

1. Write a Program to Implement BFS and DFS.
2. Write a Program to find the solution for travelling sales person problem.
3. Write a program to implement simulated annealing Algorithm.
4. Write a Program to Implement Tic-Tac-Toe game.
5. Write a Program to Implement 8-Puzzle problem.
6. Write a program to implement Towers of Hanoi problem.
7. Write a program to implement A* Algorithm.
8. Write a Program to Implement Water-Jug problem.
9. Write a program to implement Hangman game.
10. Write a program to solve N Queen problem using backtracking.
11. Generate Calendar for the given month and year using a python program.
12. Write a program to implement simple Chatbot.
13. Write a program to remove stop words for a given passage from a text file using NLTK.
14. Write a program to implement stemming for a given sentence using NLTK.
15. Write a program to POS (Parts of Speech) tagging for the give sentence using NLTK.
16. Write a program to implement Lemmatization using NLTK.

Reference Books:

1. Tensorflow: https://www.tensorflow.org/
2. Pytorch: https://pytorch.org/,
3. https://github.com/pytorch
4. Theano: http://deeplearning.net/software/theano/ https://github.com/Theano/Theano
5. https://www.nltk.org/

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		3									3		3
CO2	3	3	2	2								3		3
CO3	3	2	3		3	3						3	2	3
CO4	3	2	3		3	3						3		3
CO5	3	3	3	3									3	3

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Year: II	Semester: II		Branch of Study: AI & ML		
COURSECODE	**COURSETITLE**	**L**	**T**	**P**	**CREDITS**
20APC3312	**Data Mining and Data Warehousing Lab**	**0**	**0**	**3**	**1.5**

COURSE OUTCOMES:

Upon the completion of Data warehousing and Mining practical course, the student will be able to:

CO1: Learn how to use different data mining tools.

CO2: Learn to execute data mining tasks using a data mining toolkit (Orange data mining tool kit) andvisualize the results.

CO3: Understanding linear regression model in the orange environment.

CO4: Demonstrate the working of algorithms for data mining tasks such association rule mining, classificationand clustering.

CO5: Demonstrate the usage of Silhouettes.

Data Mining Experiments:

Weka Programs:

1. Create data in .csv and .arff formats to import in weka
2. Perform Data Proprocessing on a sample dataset - Discretization, Dimensionality Reduction, DataTransformation, Data Normalization
3. Perform Association Rule Mining and generate top 10 rules for supermarket.arff
4. Build a tree classifier on weather data to decide on the playing conditions.
5. Build a Naïve Bayes classifier on weather data to decide on the playing conditions.
6. Evaluate the performance of a classifier in knowledge flow environment.
7. Perform Clustering on any sample dataset on different algorithms and compare the results.
8. Using Experimenter in Simple mode, compare different classifiers with respect to the results generatedfor iris.arff.
9. Using Experimenter in advanced mode, demonstrate how to analyze the results from an experiment andthe importance of statistical significance when interpreting results.
10. Plot Multiple ROC curves on a dataset using J48 and Random Forest Classifiers.
11. Perform training and testing of Naive Bayes incrementally. The results are sent to a TextViewer andpredictions are plotted by a StripChart component.
12. Demonstrate how to Access a database using WEKA tool.
13. Use Knowledge flow canvas and develop a directed graph for C4.5 execution.

Data Warehousing Experiments:
Build Data Warehouse and Explore WEKA

A. **Build a Data Warehouse/Data Mart (using open source tools like Pentaho Data Integration tool, Pentoaho Business Analytics; or other data warehouse tools like Microsoft-SSIS, Informatica, Business Objects, etc.).**
(i).   Identify source tables and populate sample data
(ii).   Design multi-dimensional data models namely Star, snowflake and Fact constellation schemas forany one enterprise (ex. Banking, Insurance, Finance, Healthcare, Manufacturing, Automobile, etc.).
(iii).   Write ETL scripts and implement using data warehouse tools
(iv).   Perform various OLAP operations such slice, dice, roll up, drill up and pivot (v). Explore visualization features of the tool for analysis like identifying trends
etc.

B. **Explore WEKA Data Mining/Machine Learning Toolkit**
(i).   Downloading and/or installation of WEKA data mining toolkit,
(ii).   Understand the features of WEKA toolkit such as Explorer, Knowledge Flow interface, Experimenter, command-line interface.
(iii).   Navigate the options available in the WEKA (ex. Select attributes panel, Preprocess panel, Classifypanel, Cluster panel, Associate panel and Visualize panel)
(iv).   Study the arff file format
(v).   Explore the available data sets in WEKA.
(vi).   Load a data set (ex. Weather dataset, Iris
dataset, etc.)(vii). Load each dataset and observe the
following:
  i.   List the attribute names and they types
  ii.   Number of records in each dataset
  iii. Identify the class attribute (if any)
  iv.   Plot Histogram
  v.   Determine the number of records for each class.
  vi.   Visualize the data in various dimensions

Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets

A.   Explore various options available in Weka for preprocessing data and apply (like Discretization Filters, Resample filter, etc.) on each dataset
B.   Load each dataset into Weka and run Aprori algorithm with different support and confidence values. Study the rules generated.
C.   Apply different discretization filters on numerical attributes and run the Apriori association rule algorithm. Study the rules generated. Derive interesting insights and observe the effect of discretization in the rule generation process.

Demonstrate performing classification on data sets

A.   Load each dataset into Weka and run Id3, J48 classification algorithm. Study the classifier output. Compute entropy values, Kappa statistic.
B.   Extract if-then rules from the decision tree generated by the classifier, Observe the confusion matrix and derive Accuracy, F-measure, TPrate, FPrate, Precision and Recall values. Apply cross-validation strategy with various fold levels and compare the accuracy results.
C.   Load each dataset into Weka and perform Naïve-bayes classification and k- Nearest Neighbour classification. Interpret the results obtained.
D.   Plot RoC Curves
E.   Compare classification results of ID3, J48, Naïve-Bayes and k-NN classifiers for each dataset, and deduce which classifier is performing best and poor for each dataset and justify.

Demonstrate performing clustering on data sets

A.   Load each dataset into Weka and run simple k-means clustering algorithm with different values of k (number of desired clusters). Study the clusters formed. Observe the sum of squared errors and centroids, and derive insights.
B.   Explore other clustering techniques available in Weka.

C.   Explore visualization features of Weka to visualize the clusters. Derive interesting insights and explain.

Demonstrate performing Regression on data sets

A.   Load each dataset into Weka and build Linear Regression model. Study the clusters formed. Use Training set option. Interpret the regression model and derive patterns and conclusions from the regression results.
B.   Use options cross-validation and percentage split and repeat running the Linear Regression Model. Observe the results and derive meaningful results.
C.   Explore Simple linear regression technique that only looks at one variable

Resource Sites:
1.   http://www.pentaho.com/
2.   http://www.cs.waikato.ac.nz/ml/weka/

Orange Programs
 Datasets to be used: (but not limited to)
1. brownselected.tab
2. heartdisease.tab
3. housing.tab
4. iris.tab
5. titanic.tab
6. zoo.tab

1. Installation of Orange Data mining Tool kit in Windows/Linux environment and creating basic workflows to read, process, and visualize the data. The visualization includes data table and scatter plots. Apply the task for all the 6 datasets and compare the results.

 2. Demonstrate the usage of workflows in orange tool kit using widgets. Apply the task for all the 6 datasets and compare the results.

3. Demonstrate the visualization of widgets Box plot, Linear projection, and the data distributions by reading iris and heart disease datasets. Apply the task for all the other 4 datasets and compare the results.

4. Demonstrate the visualization of widgets scatter plot, line plot, bar plot by reading iris and heart disease datasets. Apply the task for all the other 4 datasets and compare the results.

5. Data Exploration using various widgets, understanding the data distributions and saving the results asHTML or PDF, or to a file that includes all workflows that are related to the report items and which you can later open in Orange. Apply the task for all the 6 datasets and compare the results.

6. Demonstrate the usage of loading the spreadsheets from the local computer and applying Data filtering and pre-processing to the given data. Apply the task for all the 6datasets and compare the results.

7. Loading the spreadsheets from the local computer and applying the classification model to the given data. Apply the task for all the 6 datasets and compare the results.

8. Demonstrate the usage of classification by reading heart disease data, and predict which persons have clogged arteries and visualize the results using tree viewer. Observe the information gain, information gain ratio and gini decrease measures.

9. Load a sailing.tab dataset that records the conditions under which a friend skipper went sailing, build a tree and visualize it in the Tree Viewer.

10. Demonstrate the usage of combination of classification tree viewer and scatter plot. Identity the best visualization of iris dataset, that is the one best separates the instances from different classes, then connect the tree viewer with scatter plot and visualize the results. Apply the task for all the other datasets and compare the results.

11. Apply principal component analysis on the given dataset as a pre-processing and compare the results. Applythe task for all the 6 datasets and compare the results.

12. Understanding the quality of the models by analysing the prediction results using classification accuracy. Apply the task for all the 6 datasets and compare the results.

13. Increasing the robustness of the models by splitting the dataset using cross-validation through the Test &Score widget. Apply the task for all the 6 datasets and compare the results.

References:
1.   Zupan, Demsar,: Introduction to Data Mining; Introduction to Data Mining Working notes for the hands-on course with Orange Data Mining, May 2018
2. Orange Data Mining Library Documentation Release 3 – Orange Data mining

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2														
CO3														
CO4														
CO5														

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Year: II		Semester: II		Branch of Study: AI & ML		
COURSECODE	**COURSETITLE**		**L**	**T**	**P**	**CREDITS**
20APC3314	**Operating Systems Lab** (Common to : CSE, CIC, AI & ML, AI & DS)		**0**	**0**	**3**	**1.5**

COURSE OBJECTIVES:
- To understand the design aspects of operating system
- To solve various synchronization problems

COURSE OUTCOMES:
   CO1: Ensure the development of applied skills in operating systems related areas.
   CO2: Able to write software routines modules or implementing various concepts of operating system.

List of Tasks

1. Practicing of Basic UNIX Commands.
2. Write programs using the following UNIX operating system calls Fork, exec, getpid,exit, wait, close, stat, opendir and readdir
3. Simulate UNIX commands like cp, ls, grep, etc.,
4. Simulate the following CPU scheduling algorithms
      a) Round Robin b) SJF c) FCFS d) Priority
5. Simulate all file allocation strategies
      a) Sequential b) Indexed c) Linked
6. Simulate MVT and MFT
7. Simulate all File Organization Techniques
      a) Single level directory b) Two level c) Hierarchical d) DAG
8. Simulate Bankers Algorithm for Dead Lock Avoidance
9. Simulate Bankers Algorithm for Dead Lock Prevention
10. Simulate all page replacement algorithms
      a) FIFO b) LRU c) LFU Etc. …
11. Simulate Paging Technique of memory management
12. Control the number of ports opened by the operating system with
      a) Semaphore b) monitors
13. Simulate how parent and child processes use shared memory and address space
14. Simulate sleeping barber problem
15. Simulate dining philosopher's problem
16. Simulate producer and consumer problem using threads (use java)
17. Simulate little's formula to predict next burst time of a process for SJF scheduling algorithm.
18. Develop a code to detect a cycle in wait-for graph
19. Develop a code to convert virtual address to physical address
20. Simulate how operating system allocates frame to process
21. Simulate the prediction of deadlock in operating system when all the processes announce their resourcerequirement in advance.

Reference Books:
1. ‑Operating System Concepts‖, Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Eighth edition, John Wiley, 2018.
2. ‑Operating Systems: Internals and Design Principles‖, Stallings, Sixth Edition– 2009,Pearson Education
3. ‑Modern Operating Systems‖, Andrew S Tanenbaum, Second Edition, PHI.
4. ‑Operating Systems‖, S.Haldar, A.A.Aravind, Pearson Education.
5. ‑Principles of Operating Systems‖, B.L.Stuart, Cengage learning, India Edition.2013-2014
6. ‑Operating Systems‖, A.S.Godbole, Second Edition, TMH.
7. ‑An Introduction to Operating Systems‖, P.C.P. Bhatt, PHI.

Online Learning Resources/Virtual Labs:

https://www.cse.iitb.ac.in/~mythili/os/
http://peterindia.net/OperatingSystems.html

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2									2	
CO2		3	3	3									2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Year: II	Semester: II		Branch of Study: AI & ML			
COURSE CODE	**COURSETITLE**		**L**	**T**	**P**	**CREDITS**
20ASC3302	**Server Side Scripting** (Common to : CSE, CIC, AI & ML, AI & DS)		**1**	**0**	**2**	**2**

COURSE OBJECTIVES:
- To learn about Java, HTML, DHTML concepts.
- To know about server side programming
- To gain the Knowledge of XML and its applications

COURSE OUTCOMES:

CO1: Learn the installation guide of MYSQL, XAMPP5, APACHE and PHP

CO2: Able to design code for simple dynamic web pages

CO3: Design PHP and SQL/MySQL Integration.

CO4: Design Basic Projects

CO5: Able to provide protection to web server

UNIT-1: Getting Up and Running, PHP Language Structure

Getting Up and Running: Installation Quick Start Guide with XAMPP5 - Installing and Configuring MySQL - Installing and Configuring Apache - Installing and Configuring PHP -

PHP Language Structure: The Building Blocks of PHP - Flow Control Functions in PHP - Working with Functions - Working with Arrays - Working with Objects

1. Installation of XAMPP server
2. Write PHP code to print Hello World program
3. Demonstrate 8 basic data types in PHP.
4. Demonstrate the scope of variables declared in PHP code.
5. Demonstrate Arithmetic, Comparison, Logical (or Relational), Assignment and Conditional (or ternary) Operators.
6. Demonstrate if, elseif ...else and switch statements.
7. Demonstrate for, while, do – while, and for each loop.
8. Write code to create and access numeric arrays.
9. Demonstrate the usage of associative arrays.
10. Implement Multi-dimensional arrays
11. Create a multidimensional array of movies organized by genre. This should take the form of an associative array with genres as keys, such as Science Fiction, Action, Adventure, and so forth. Each of the array's elements should be an array containing movie names, such as Alien, Terminator 3, Star Wars, and so on. After creating your arrays, loop through them, printing the name of each genre and its associated movies.
12. Create a function that accepts four string variables and returns a string that contains an HTML table element, enclosing each of the variables in its own cell.
13. Create a class called baseCalc() that stores two numbers as properties. Next, create a calculate() method that prints the numbers to the browser.
14. Create classes called addCalc(), subCalc(), mulCalc(), and divCalc() that inherit functionality from baseCalc() but override the calculate() method and print appropriate totals to the browser.

UNIT -2: Getting Involved with the Code,

Working with Strings, Dates, and Time - Working with Forms - Working with Cookies and User Sessions -Working with Files and Directories - Working with Images

1. Create a feedback form that accepts a user's full name and an email address. Use case-conversion functions to capitalize the first letter of each name the user submits and print the result back to the browser. Check that the user's email address contains the @ symbol and print a warning otherwise.
2. Create an array of doubles and integers. Loop through the array, converting each element to a floating-point number with a precision of 2. Right-align the output within a field of 20 characters.
3. Create a birthday countdown script. Given form input of month, day, and year, output a message that

tells the user how many days, hours, minutes, and seconds until the big day.

4. Create a calculator script that enables the user to submit two numbers and choose an operation (addition, multiplication, division, or subtraction) to perform on them.

5. Use hidden fields with the script you created in activity 1 to store and display the number of requests that the user submitted.

6. Create a script that uses session functions to track which pages in your environment the user has visited.

7. Create a new script that will list for the user all the pages he/she has visited within your environment, and when.

8. Create a form that accepts a user's first and second name. Create a script that saves this data to a file.

9. Create a script that reads the data file you created in the first activity. In addition to writing its contents to the browser (adding a tag to each line), print a summary that includes the number of lines in the file and the file's size.

10. Draw a New Image, shapes and lines.

11. Create a New Image with Color Fills.

12. Draw A Basic Pie Chart and 3D Pie Chart

13. Creating a New Image from an Existing Image.

14. Creating an Image from User Input.

15. Creating an Image with Custom Font and Text

UNIT -3: PHP with database connectivity

Understanding the Database Design Process - Learning Basic SQL Commands - Using Transactions andStored Procedures in MySQL - Interacting with MySQL Using PHP

1. to open and close a database connection.

2. to select a database. to select a database.

3. to create a table

4. to drop a database.

5. to drop a table

6. to insert record into employee table.

7. take input using HTML Form and insert records into table.

8. to display all the records from employee table.

9. to display all the records from employee table using mysql_fetch_assoc() function.

10. to display all the records from employee table using MYSQL_NUM argument.

11. to release cursor memory at the end of SELECT statement.

12. to display 10 records per page.

13. to take user input of employee ID and update employee salary.

14. to take user input of employee ID and delete an employee record from employee table.

15. Use SELECT INTO OUTFILE query for creating table backup.

UNIT -4: Basic Projects

Managing a Simple Mailing List - Creating an Online Address Book - Creating a Simple Discussion Forum
- Creating an Online Storefront - Creating a Shopping Cart Mechanism - Creating a Simple Calendar - Restricting Access to Your Applications - Logging and Monitoring Web Server Activity - Application Localization - Working with XML and JSON

1. Common Functions in an Included File

2. Subscribe and Unsubscribe with manage.php

3. Send Mail to Your List of Subscribers

4. Modify the manage.php script to display the user's email as part of the response message for any action that is taken.

5. Modify the sendmymail.php script to add additional form fields that will correspond to section headings in the message string itself. Remember that when the form is submitted, those strings will have to be concatenated into one message string that is sent to the mail() function.

UNIT -5: Administration and Fine-Tuning

Apache Performance Tuning and Virtual Hosting - Setting Up a Secure Web Server - Optimizing andTuning MySQL - Performing Software Upgrades - Using Application Frameworks

Text Books:

1. Sams Teach Yourself PHP, MySQL and Apache All in One, by Julie C. Meloni, Pearson Education, Inc

© 2012.

2. Beginning PHP6, Apache, MySQL Web Development, by Timothy Boronczyk, Elizabeth Naramore,

Reference Books:

1. Jason Gerner, Yann Le Scouarnec, Jeremy Stolz, Michael K. Glass, Wiley Publishing, Inc © 2009
2. PHP 6 and MySQL 6 Bible, by Steve Suehring, Tim Converse, Joyce Park, Wiley Publishing, Inc ©2009.
3. PHP & MySQL Web Development All-in-One Desk Reference For Dummies, by Janet Valade withTricia Ballad and Bill Ballad, Wiley Publishing, Inc © 2008.

Online Learning Resources:

www.nptelvideos.com, https://www.tutorialspoint.com/php/

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1													
CO2	1													
CO3	1		2		2				2	1	2	3		2
CO4	1													
CO5	1													

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)