KOLHAPUR INSTITUTE OF TECHNOLOGY'S

COLLEGE OF ENGINEERING

(EMPOWERED AUTONOMOUS)

Gokul Shirgaon, Kolhapur

KOLHAPUR INSTITUTE OF TECHNOLOGY'S
COLLEGE OF ENGINEERING KOLHAPUR
(EMPOWERED AUTONOMOUS)

Curriculum Structure(NEP)

For

Bachelor of Technology (B.Tech) in

Computer Science and Business Systems

(Undergraduate Programme)

Third Year Sem-V & VI

Academic Year 2025-26

Kolhapur Institute of Technology's College of Engineering (Autonomous) Kolhapur
Computer Science Business Systems

Teaching and Evaluation Scheme for Third Year Semester-V											
Sr. No.	**Course Code**	**Cluster**	**Course**	**Teaching Scheme**				**Evaluation Scheme**			
				L	**T**	**P**	**Credits**	**Components**	**Max**	**Min Marks for Pass**	
1	UCBPC0501	PC	Design and Analysis of Algorithms	3	0	0	3	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
2	UCBPC0502	PC	Compiler Design (LEX & YACC)	3	0	0	3	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
3	UCBPE05**	PE	Program Elective-I	3	0	0	3	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
4	UCBOE05**	OE	Open Elective-I	3	0	0	3	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
5	UCBAE0503	AE	Business Communication & Value Science – IV	2	0	0	2	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
6	UCBPC0531	PC	Design and Analysis of Algorithms Laboratory	0	0	2	1	ISE	25	10	
7	UCBPC0532	PC	Compiler Design (LEX & YACC) Laboratory	0	0	2	1	ISE	25	10	
								ESE (POE)	50	20	
8	UCBPC0533	PC	Modern Web Application Laboratory	0	0	2	1	ISE	25	10	
								ESE (POE)	50	20	
9	UCBAE0534	AE	Business Communication & Value Science – IV Laboratory	0	0	2	1	ISE	25	10	
10	UCBVS0535	VS	Certification in Red Hat (Edu skills)	0	0	2	1	ISE	25	10	
11	UCBIL0571	OJT	Mini Project-III	0	0	2	1	ISE	25	10	
12	UCBMM0541	MM	Business Strategies (MM-III)	3	0	0	3	ESE	100	40	
			Total	**17**	**0**	**12**	**23**	**Total**	**850**		
	Total Contact Hours =29, Total Credits =23										

Exit Option: Award of UG Certificate in Major with 135 credits and an additional 8 credits for exit course.

Sr. No	Course Code	Exit Courses	Examination Mode	Credits
1	UCBEX0691	Certification course in AWS	Online Certification	3
2	UCBEX0692	Certification Course in CISA(Certified Information Systems Auditor		3
3	UCBEX0693	Certification Course in Professional Android Developer		2

Program Elective-I		
Sr. No.	**Course Code**	**Course Name**
1	UCBPE0511	Cloud, Microservices & Application
2	UCBPE0512	Artificial Intelligence
3	UCBPE0513	IT Project Management

Program Elective-II		
Sr. No.	**Course Code**	**Course Name**
1	UCBPE0611	Software Design with UML
2	UCBPE0612	Android Application Development
3	UCBPE0613	Financial Management

Open Elective-I		
Sr. No.	**Course Code**	**Course Name**
1	UCBOE0521	Introduction to Data Analytics
2	UCBOE0522	Behavioural Economics
3	UCBOE0523	Introduction Java Programming

Open Elective-II		
Sr. No.	**Course Code**	**Course Name**
1	UCBOE0621	Industry 4.0
2	UCBOE0622	Intellectual Property and Entrepreneurship

Title of the Course: Design and Analysis of Algorithms	**L**	**T**	**P**	**Credit**
Course Code: UCBPC0501	3	0	0	3

Course Pre-Requisite: Basic knowledge of Data Structures and Algorithms.

Course Description: This course introduces the concept of algorithm as a precise mathematical concept, and studies how to design algorithms, establish their correctness, and study their efficiency and memory needs.

Course Learning Objectives:

1. To demonstrate the performance of algorithms for time and space complexity.
2. To explain graph and tree traversals.
3. To use and apply standard algorithm design techniques.
4. To familiarize oneself with the concepts of deterministic and non-deterministic algorithms.

Course Outcomes:

CO	**After the completion of the course, the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Understand basic concepts of algorithms and measure the efficiency of any algorithm.	2	Understand
CO2	Make use of standard design techniques such as divide and conquer, greedy algorithms, dynamic programming, backtracking to solve real life problems.	3	Apply
CO3	Compare the analysis of the performance of various algorithms.	4	Analyze
CO4	Analyze the polynomial and nonpolynomial Algorithms.	4	Analyze

CO-PO Mapping:

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

Assessments:

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	10
MSE	30
ISE-2	10
ESE	50

ISE-1 and ISE-2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1: Introduction	**CO1**	**8 Hours**

What is an Algorithm? Algorithm Specification: Pseudocode Conventions, Recursive Algorithm Performance Analysis: Space complexity, Time complexity. Asymptotic Notations: Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ), and Little-Oh notation (o). Performance Measurement Recurrences: The substitution method, recursion tree method, Important Problem Types: Sorting, Searching, String processing, Graph Problems.

Unit 2: Algorithm Design and Analysis Techniques – I:	**CO2, CO3**	**8 Hours**

Divide and conquer General method, Binary search, Recurrence equation for divide and conquer, Finding the maximum and minimum, Merge sort analysis of these algorithms. Decrease and Conquer Approach: Topological Sort. Transform and Conquer Approach: Heaps and Heap Sort.

Unit 3: Greedy Method	**CO2, CO3**	**7 Hours**

General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines. Optimal storage on tapes, Optimal merge patterns, Huffman codes.

Unit 4 : Algorithm Design and Analysis Techniques – II:	**CO2, CO3**	**8 Hours**

Dynamic Programming

The general method, Multistage graphs, Optimal binary search trees, 0/1 knapsack, Reliability design, Traveling Salesperson problem.

Backtracking: The general method, 8-queen problem, Sum of subsets, Graph Coloring, Knapsack Problem, Branch & Bound Algorithms.

Unit 5: Graph Algorithms: Elementary Graph Algorithms	**CO2, CO3**	**8 Hours**

Representations of graphs, Breadth-first search, Depth first search

Minimum Spanning Trees: minimum spanning tree, The algorithms of Kruskal and Prim

Single-Source Shortest Paths: The Bellman-Ford algorithm, Single-source shortest paths in directed acyclic graphs, Dijkstra's algorithm, The Floyd-Warshall algorithm

Unit 6: Complexity classes :P & NP-Complete:	**CO4**	**6 Hours**

Basic concepts, non-deterministic algorithms, Polynomial time, and polynomial time verification, NP completeness and reducibility, NP-complete problems, Importance of NP-completeness, P, NP, NP Complete and NP hard problems. case studies

Textbooks:

1. Thomas Cormen, Charles Leiserson, Ronald Rivest and Cliford Stein, "Introduction to Algorithms", PHI

2. Fundamentals of Computer Algorithms - Ellis Horowitz, Satraj Sahani, Saguthevar Rajasejaran, Universities Press, Second Edition.

References:

1. Fundamentals of Algorithmics – Gilles Brassard, Paul Bratley (Pearson Education).

2. Mastering Algorithms with C – Kyle Loudon (SPD O'Reilly).

3. Computer Algorithms- Introduction to Design and Analysis – Sara Baase, Allen Van Gelder (Pearson Education).

Title of the Course: Compiler Design (LEX and YACC)	**L**	**T**	**P**	**Credit**
Course Code: UCBPC0502	3	0	0	3

Course Prerequisite: System Programming and Finite automata & Formal Languages

Course Description: This course is designed to understand the various system software and also study in detail about design of compiler.

Course Learning Objectives:

1: Students will be able to understand fundamentals of system software and compilation steps

2: Students will be able to understand lexical and parsing techniques of the compiler.

3: Students will be able to understand code generation and optimization in compilation process

4: Students will be able analyze parsing algorithms using program applications

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO-1	To understand the concept of symbol table and to use various code optimization techniques	2	Understand
CO-2	Able to apply the knowledge of LEX tool and YACC tool to develop a scanner and Parser.	3	Apply
CO-3	Able to design syntax tree and intermediate code generator	3	Apply
CO-4	Analyze and implement code optimization and code generation techniques to create target code	4	Analyze

CO-PO Mapping:

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

Assessments:

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	10
MSE	30
ISE-2	10
ESE	50

ISE-1 and ISE-2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1: Introduction	**CO-1**	**7-Hours**

Introduction, Language processing system, Language processor, Structure of compiler, Cousins of Compiler.

Unit 2: Lexical Analysis	**CO-2**	**8-Hours**

Lexical Analysis: Role of Lexical Analyzer, Lexical Errors, Lexeme, Tokens and Patterns, Input Buffering, Specification and Recognition of Tokens, Transition Diagram, Finite Automata, Lexical Analyzer Generator: LEX

Unit 3: Syntax Analysis	**CO-2**	**8-Hours**

Introduction, Context Free Grammar (CFG), Top-Down Parsing: Recursive Descent Parsing Technique and Predictive Parsing Technique: First set and Follow set, LL (1), Bottom-up Parsing: SR-Parsing Technique, LR (0), SLR (1), CLR (1), LALR (1), Yacc.

Unit 4: Syntax Directed Translation	**CO-3**	**8-Hours**

Syntax directed translation: Introduction, SDD, SDT, Synthesized attributes, Inherited attributes, S-Attributed definition, L-Attributed definition, Annotated Parse Tree.

Unit 5: Intermediate code generation	**CO-3**	**8-Hours**
Introduction, Postfix notation, Triple and Quadruples, Three Address Instructions, Three Address Code for Boolean expression, and Assignment Statements		
Unit 6: Code Optimization and Code Generation	**CO-4**	**6-Hours**
Introduction to Code Optimization, Principle Sources of Optimization, Peephole Optimization, Introduction to code generation, Issues in code generation		

Textbooks:

1. Compilers: Principles, Techniques and Tools, Jeffery D. Ullman, Alfred V Aho, Ravi Sethi Pearson Education India.
2. System Programming and Operating System, D. M. Dhamadhere, 2nd Edition-McGraw Hill Education India.

References:

1. Compiler Construction, D.M. Dhamdare, Mc-Millan.
2. A Guide to Design and Analysis of Algorithms - Soubhik Chakraborty / prashant pranav / khatton / Dutta.

Title of the Course: Cloud, Microservices & Application **Course Code:** UCBPE0511	**L**	**T**	**P**	**Credit**
	3	**0**	**0**	3

Course Pre-Requisite: Basic Computer Science concepts like networking, database, OS etc.

Course Description: This course intends to introduce students to the fundamentals of Cloud, Microservices and its applications in public clouds such as AWS, AZURE and GOOGLE (GCP).

Course Learning Objectives:

1. To Understand the fundamentals of Cloud concepts such as Cloud services, Applications and Public Cloud Platform.
2. To Illustrate the fundamentals of microservices and API to solve a problem in Cloud.
3. To Interpret the DevOps fundamentals and Containerization process and application.
4. To Apply the Cloud services to design and develop the solution by using Kubernetes, Cloud security and monitoring tools.

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Understand the fundamentals of Cloud concepts such as Cloud services, Applications and Public Cloud Platform.	2	Understand
CO2	Illustrate the fundamentals of microservices and API to solve a problem in Cloud.	2	Understand
CO3	Interpret the DevOps fundamentals and Containerization process and application.	2	Understand
CO4	Apply the Cloud services to design and develop the solution by using Kubernetes, Cloud security and monitoring tools.	3	Apply

CO-PO Mapping:

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

Assessments:

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	10
MSE	30
ISE-2	10
ESE	50

ISE-1 and ISE-2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1: Cloud Fundamentals	**CO1**	**08 Hrs.**
Cloud Service Components, Cloud Service/Deployment models, Cloud Components Guiding Principles with respect to Utilization/Security/Pricing, Applications of Cloud, Public Cloud Platforms overview and their usages.		
Unit 2: Microservices and API Fundamentals	**CO1,CO2**	**08 Hrs.**
Application Architectures : Monolithic & Distributed Architecture, Microservice fundamental and design approach, Spring Boot fundamentals and Design of Microservices, Cloud Native applications-12 Factors App. Application integration process/Apification Process, API Fundamental, API management, API tools. Developer Portal. Applications of APIFICATION.		
Unit 3: DevOps Fundamentals and Containerization:	**CO3**	**07 Hrs.**
Tools and Applications, Containerization Process and application.		
Unit 4: Design and Developing Solutions:	**CO3**	**08 Hrs.**
Instructions briefing for steps involved in Cloud Application Development/Deployment/Execution. Using containers, containerization of application and deployment using Kubernetes.		

Unit 5: Cloud Security and Monitoring:	**CO3**	**08 Hrs.**
Cloud Security and Monitoring Tools.		
Unit 6: Use Cases:	**CO4**	**06 Hrs.**
Project use cases for different Cloud Services. AWS : features use cases -ex, Lambda Functions. Azure features use cases. GCP features use cases.		

Textbooks:

1. A First Course on Cloud-Based Microservices: A Competency by Arshdeep Bahga, Vijay Madisetti
2. Cloud Computing: A Hands-On Approach.

References:

1. Cloud native microservices with spring and kubernetes : Design and build modern cloud native applications using spring and kubernetes, Srivastava, Rajiv, Bpb publication 2021
2. Building Microservices 2nd Edition by Sam Newman O'Reilly.

Title of the Course: Artificial Intelligence **Course Code:** UCBPE0512	**L**	**T**	**P**	**Credit**
	3	**0**	**0**	3

Course Pre-Requisite: Basic Computer Science concepts

Course Description: This course is about to understand the basic Principles of Artificial Intelligence

Course Learning Objectives:

1. To Understand the fundamentals of AI concepts such as searching based analysis.
2. To Illustrate the constraint and knowledge reasoning based approach to solve a problem in AI.
3. To Interpret the probabilistic reasoning based solution in AI and understand the expert system, also apply the knowledge of AI techniques to solve a problem.
4. To apply the AI techniques to the real world problems

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Understand the fundamentals of AI concepts such as searching based analysis.	2	Understand
CO2	Illustrate the constraint and knowledge reasoning based approach to solve a problem in AI.	2	Understand
CO3	Interpret the probabilistic reasoning based solution in AI and understand the expert system.	2	Understand
CO4	Apply the AI techniques to solve problems	3	Apply

CO-PO Mapping:

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

Assessments:

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	10
MSE	30
ISE-2	10
ESE	50

ISE-1 and ISE-2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1: Introduction and Overview of Artificial intelligence:	**CO1**	**08 Hrs.**
Problems of AI, AI technique, Tic - Tac - Toe problem. Intelligent Agents, Agents & environment, nature of environment, structure of agents, goal-based agents, utility-based agents, learning agents		
Unit 2: Problem Solving & Search Technique:	**CO2**	**08 Hrs.**
Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs. Search Technique: Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, Heuristic search strategies Greedy best-first search, A* search, AO* search, Hill climbing search.		
Unit 3: Constraint satisfaction problems:	**CO2**	**07 Hrs.**
Local search for constraint satisfaction problems. Adversarial search, Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.		
Unit 4: Knowledge & reasoning:	**CO3**	**08 Hrs.**
Knowledge representation issues, representation & mapping, approaches to knowledge representation. Using predicate logic, representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction. Representing		

knowledge using rules, Procedural versus declarative knowledge, logic programming, forward versus backward reasoning, matching, control knowledge.		
Unit 5: Probabilistic reasoning:	**CO3**	**08 Hrs.**
Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Planning Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques.		
Unit 6: Expert Systems	**CO4**	**06 Hrs.**
Representing and using domain knowledge, expert system shells, and knowledge acquisition.		
Textbooks:		
1. Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig. **2.** Artificial Intelligence by Russel. Pearson.		
References:		
1. Artificial Intelligence by Ritch & Knight,TMH. **2.** Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI. **3.** Logic & Prolog Programming, Saroj Kaushik, New Age International		

Title of the Course: IT Project Management	L	T	P	Credit
Course Code: UCBPE0513	2	-	-	2

Course Prerequisite: A basic understanding of computer science concepts, project management principles, and information systems, or business administration.

Course Description: The IT Project Management course provides students with the knowledge and skills to plan, execute, and manage IT projects effectively. It covers key concepts such as project life cycle, risk management, scheduling, budgeting, and team coordination. The course also emphasizes communication, quality management, and handling organizational change to ensure successful project outcomes.

Course Learning Objectives:

1. Students will be able to understand basic project management principles, including project planning, risk management, and team collaboration.
2. Students will be able to apply comprehensive project plans, incorporating project scheduling, and resource allocation.
3. Students will be able to analyze security risk assessments and propose mitigation strategies based on security engineering principles.
4. Students will be able to manage teams and communication, quality, and organizational change.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Understand the fundamental concepts of IT project management & project planning	2	Understand
CO2	Implement effective risk, quality, and change management strategies	3	Apply
CO3	Manage teams and communication, quality, and organizational change.	4	Analyze

CO-PO Mapping:

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

Assessments:

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	10
MSE	30
ISE-2	10
ESE	50

ISE-1 and ISE-2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1: The Nature of Information Technology Projects	**CO1**	**6 Hours**

Introduction, The Software Crisis, The Context of Project Management, The Project Life Cycle and IT Development, The Project Management Body of Knowledge.

Conceptualizing and Initializing the IT Project: An Information Technology Project Methodology (ITPM), The Business Case, Project Selection and Approval

Unit 2: Developing the Project Charter and Baseline Project Plan	**CO1**	**5 Hours**

Project Management Processes, Project Integration Management, The Project Charter, Project Planning Framework. The Human Side of Project Management: Organization and Project Planning, The Project Team.

Unit 3: Defining and Managing Project Scope	**CO2**	**6 Hours**

Project Scope Management Processes, Project Scope Initiation, Project Scope Definition, Project Scope Verification, The Work Breakdown Structure and Project Estimation: The Work Breakdown Structure (WBS), Project Estimation.

Unit 4: The Project Schedule and Budget	**CO2**	**5 Hours**
Developing the Project Schedule, Project Management Software Tools, Developing the Project Budget, Finalizing the Project Schedule and Budget Managing Project Risk: IT Project Risk Management Planning Process, Identifying IT Project Risks, Risk Analysis and Assessment.		
Unit 5: Project Communication, Tracking, and Reporting	**CO3**	**4 Hours**
Introduction, Monitoring and Controlling the Project, The Project Communications Plan, Project Metrics IT Project Quality Management: Quality Systems, The IT Project Quality Plan.		
Unit 6: Managing Organizational Change, Resistance, and Conflict	**CO3**	**4 Hours**
The Nature of Change, The Change Management Plan, Develop or Adopt a Strategy for Change Project Implementation, Closure, and Evaluation: Project Implementation, Administrative Closure, Project Evaluation IT Project Case Studies- Banking project, ERP management system		
Textbooks:		
"INFORMATION TECHNOLOGY PROJECT MANAGEMENT Providing Measurable Organizational Value "Jack T. Marchewka Northern Illinois University, by Willey publication		
References:		
"INFORMATION TECHNOLOGY PROJECT MANAGEMENT" Kathy Schwalbe, Ph.D., PMP Augsburg College, Seventh Edition		

Title of the Course: Introduction to Data Analytics	**L**	**T**	**P**	**Credit**
Course Code: UCBOE0521	3	0	0	3

Course Prerequisite: Basic mathematics, statistics, programming, critical thinking, basic machine learning

Course Description: This course provides an opportunity to discover the power of data analytics and learn how to extract meaningful insights from raw data. Gain hands-on experience in data collection, preprocessing, statistical analysis, and visualization using industry-standard tools and techniques.

Course Learning Objectives:

1: Students will be able to understand fundamentals of system software and compilation steps

2: Students will be able to understand lexical and parsing techniques of the compiler.

3: Students will be able to understand code generation and optimization in compilation process

4: Students will be able analyze parsing algorithms using program applications

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Explain various concepts and terminology used in data analytics.	2	Understand
CO2	Analyze statistical data analysis techniques for data preparation and exploration.	2	Understand
CO3	Apply appropriate tools for data acquisition, preprocessing, analysis, and visualization.	3	Apply
CO4	Identify the appropriate methods and tools to solve business problems using data analytics.	4	Analyze

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO	2	1											1
CO2	2	2		2	3							3	1
CO3	2	2		2	3							3	1
CO4	2	2		1	3							3	1

Assessments:

Teacher Assessment:

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ISE-1	10
MSE	30
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ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1: Introduction	**CO1, CO3**	**07 Hrs**

Overview of data analytics, Applications, Data analytics process, Types of data analytics, Business intelligence, Decision support system, Data mining.

Unit 2: Data Collection and Preprocessing	**CO3**	**08 Hrs.**

Data acquisition methods and sources, Exploratory data analysis (EDA) techniques, Data cleaning techniques: handling missing values, outliers, and noise, Data validation, Data transformation, Data reduction, Normalization Techniques.

Unit 3: Statistical Analysis: Descriptive statistics	**CO2**	**08 Hrs.**
Descriptive statistics: measures of central tendency, variability, and correlation, Measures of central tendency – mean, median and mode, Measures of dispersion – standard deviation, variance, range, IQR (interquartile range), Measure of symmetricity/ shape – skewness and kurtosis, Data visualization principles and techniques.		
Unit 4: Statistical Analysis: Inferential Statistics	**CO2**	**08 Hrs.**
Hypothesis testing, parametric and nonparametric, Parametric tests: t-test, z-test, f-test, ANOVA, regression, non-parametric tests: Chi-square test.		
Unit 5: Data Analytics Tools	**CO4**	**08 Hrs.**
Understanding application scenarios and visualization with DA tools – Microsoft Excel, Python, R, SQL, Microsoft Power BI, Tableau.		
Unit 6: Case Studies	**CO4**	**06 Hrs.**
Five to ten case studies to be discussed. Sample case studies areas – retail, entertainment industry, travel industry, social media, healthcare, etc. Ethics in data analytics.		

Textbooks:

1. Runkler, Thomas A. Data analytics. Wiesbaden: Springer Fachmedien Wiesbaden, 2020.
2. Python for Data Analysis, By Wes McKinney, 2017

References:

1. Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", Morgan Kaufmann Publishers
2. The Elements of Statistical Learning, Data Mining, Inference, and Prediction (2nd Edn.), Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer, 2014.
3. Spiegelhalter, D. (2019). The art of statistics: Learning from data. Penguin UK.
4. Kothari, C. "Research methodology methods and techniques" Published by New Age International (P) Ltd., Publishers 91 (2017).

Title of the Course: Behavioral Economics Course Code: UCBOE0522	L	T	P	Credit
	3	-	-	3

Course Pre-Requisite: Basic knowledge of Economics.

To impart knowledge on current ideas and concepts regarding decision making in Economics, particularly from a behavioral science perspective, which can affect choices and behavior of firms, households and other economics entities.

Course Learning Objectives:

1. To understand the concept and theory of economics.
2. To acquire knowledge on the choices and behavior of firms, households and other economics entities.
3. To learn the behavioral science perspective in economics.
4. To know the current ideas and concepts regarding decision making in economics.
5. To study the intertemporal choice in economics.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Explore the knowledge on behavioral science perspective in Economics.	1	Remember
CO2	Explain and apply various concepts in traditional and modern Microeconomics.	2	Understanding
CO3	Understand current ideas and concepts regarding decision making in Economics and intertemporal choice in Economics	2	Understanding
CO4	Focus on decision making, and develop a holistic understanding of these concepts and their interconnections.	3	Applying

CO-PO Mapping:

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

Assessments:

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	10
MSE	30
ISE-2	10
ESE	50

ISE-1 and ISE-2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

UNIT 1: Introduction	**CO1**	**08 Hours**

The neoclassical/standard model and behavioral economics in contrast; historical background; behavioral economics and other social sciences; theory and evidence in the social sciences and in behavioral economics; applications – gains and losses, money illusion, charitable donation.

UNIT 2: Basics of choice theory	**CO2**	**08 Hours**

Revisiting the neoclassical model; utility in economics and psychology; models of rationality; connections with evolutionary biology and cognitive neuroscience; policy analysis – consumption and addiction, environmental protection, retail therapy; applications – pricing, valuation, public goods, choice anomalies,Revisiting rationality; causal aspects of irrationality; different kinds of biases and beliefs; self-evaluation and self-projection; inconsistent and biased beliefs; probability estimation; trading applications – trade in counterfeit goods, financial trading behavior, trade in memorabilia

UNIT 3: Micro Environment and Macro Environment	**CO1**	**07 Hours**

Micro Environment Factors-customer, supplier, reseller,competitors, general public, Macro Environment factors-economic factors, demographic factors, technical factors,natural and physical forces, political and legal forces, social factors and cultural forces.

UNIT 4: Choice under uncertainty	CO3	08 Hours
Background and expected utility theory; prospect theory and other theories; reference points; loss aversion; marginal utility; decision and probability weighting; applications – ownership and trade, income and consumption, performance in sports.		
UNIT 5: Intertemporal choice	**CO3**	**08 Hours**
Geometric discounting; preferences over time; anomalies of inter-temporal decisions; hyperbolic discounting; instantaneous utility; alternative concepts – future projection, mental accounts, heterogeneous selves, procedural choice; policy analysis – mobile calls, credit cards, organization of government; applications – consumption and savings, clubs and membership, consumption planning		
UNIT 6: Strategic choice	**CO4**	**06 Hours**
Review of game theory and Nash equilibrium – strategies, information, equilibrium in pure and mixed strategies, iterated games, bargaining, signaling, learning; applications – competitive sports, bargaining and negotiation, monopoly and market entry		

Textbooks:

An Introduction to Behavioral Economics, by N. Wilkinson and M. Klaes
N. Wilkinson and M. Klaes , ―An Introduction to Behavioral Economics‖, 2017.
Paul A. Samuelson, William D. Nordhaus, Sudip Chaudhuri and AnindyaSen, ―Economics‖, 19th edition, Tata McGraw Hill, 2010.
M.L.Trivedi, ―Managerial Economics:Theory & Applications‖, Tata McGraw-Hill Education, 4 th Edition, 2002.
Robert H. Frank, 2014, ―Microeconomics and Behaviour‖, McGraw-Hill, 9 th Edition, 2014.
Philip Corr, Anke Plagnol, ―Behavioral Economics: The Basic‖, Routledge; 1st edition, 2018.

References:

William Boyes and Michael Melvin, ―Textbook of Economics‖, DTECH, 6th Edition, 2004.
N. Gregory Mankiw, ―Principles of Economics‖, Thomson learning, 3rd Edition, 2003.
Richard Lipsey and Alec Charystal, ―Economics‖, Oxford, University Press, 12th Edition, 2011.

Title of the Course: Introduction Java Programming Course Code: UCBOE0523	L	T	P	Credits
	3	-	-	3

Course Pre-Requisite: Knowledge of basic Programming languages like C, C++

Course Description: The course aims to provide knowledge about Object Oriented Programming Design and concepts by using JAVA language.

Course Learning Objectives:

1. To expose the students to concepts of Object-Oriented Paradigm.
2. To demonstrate the fundamental and object-oriented concepts of Java.
3. To describe different concepts of OOPs use for solving basic problems.
4. To showcase the knowledge of exception handling and file handling in design of applications.

Course Outcomes:

COs	After the completion of the course the student will be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Interpret the fundamentals of OOPs concept in Java programming	2	Understand
CO2	Describe the use of different concept in OOPs for solving basic problem.	2	Understand
CO3	Apply knowledge of various OOPs concept designing the application.	3	Apply
CO4	Apply the knowledge of exception handling and file handling in design of application.	3	Apply

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	1	-	-	3	-	-	-	-	-	-	2	1
CO2	1	2	2	-	3	-	-	-	-	-	1	3	2
CO3	-	2	2	-	3	-	-	-	-	-	1	3	2

Assessment Scheme:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	10
MSE	30
ISE-2	10
ESE	50

ISE-1 and ISE-2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1: Introduction to Object Oriented Design	**CO1**	**8 Hours.**

Introduction to Java: Introduction to procedural & object-oriented programming, Limitations of procedural programming, need of object-oriented programming, Fundamentals of object-oriented programming: object, class, data members, methods, data encapsulation.

Unit 2: Basics of Core Java Programming	**CO2**	**8 Hours.**

The Java Programming Environment- JVM, JIT Compiler, Byte Code Concept, A Simple Java Program, Source File Declaration Rules, Comments, Data Types, Variables, Operators, Strings, Input and Output, Control Flow statements, Arrays, Jagged Array.

Unit 3: Object Oriented Design in Java	**CO3**	**7 Hours.**

Objects and Classes: Object Oriented Programming Concepts, Declaring Classes, Declaring Member Variables, Defining Methods, Constructor, Types of Constructor, Creating and using objects, Static Fields and Methods, this keyword.

Unit 4: Interface , Inheritance and Polymorphism	**CO3**	**8 Hours.**

Inheritance: Definition, Types of inheritance, Implementing an Interface, Interface Methods, Polymorphism: Method overloading and overriding, Super keyword, final keyword, Abstract Classes and Methods, casting, finalization, and garbage collection.

Unit 5: Package and Exception handling	**CO4**	**8 Hours.**

Packages: Class importing, creating a Package, naming a Package, Using Package Members, Developing and deploying (executable) Jar File, Exception: Definition, Dealing with Errors, The Classification of Exceptions, try, catch, throw, throws to handle exception, finally, Creating user defined Exception.

Unit 6: I/O Streams	**CO4**	**6 Hours.**
I/O Streams: Byte Stream – Input Stream, Output Stream, File ,DataInputStream, DataOutputStream, FileInputStream, FileOutputStream, Character Streams, BufferedStream, RandomAccesFile.		

Textbooks:

1. Core Java Volume I Fundamentals. Edition 8. by Cay Horstmann and Gary Cornell. Pearson
2. Core Java- Volume II Advanced Features by Cay Horstmann and Gary Cornell. Edition 8. Pearson

Reference Books:

1. The Java Tutorial: A Short Course on the Basics by Raymond Gallardo, Scott Hommel, Sowmya Kannan. Edition 6. Addison-Wesley Professional
2. JAVA-The Complete Reference by Herbert Schildt. Edition 9. Oracle Press, Mcgraw Hill
3. JAVA™ How to program by Deitel Paul, Deitel Harvey. Edition 10. PHI Learning.

Title of the Course: Business Communication & Value Science –IV	**L**	**T**	**P**	**Credit**
Course Code: UCBAE0503	**2**	**0**	**0**	2

Course Pre-Requisite: Basic Knowledge of English (verbal and written)

Completion of all units from Semester 1, 2 and 4 courses: BCVS-I , BCVS II and BCVS III

Course Description: This course will help students to explore essential skills for personal and professional growth, including emotional intelligence, effective communication, corporate social responsibility, time management, stress management, and feedback strategies.

Course Learning Objectives:

1. Identify and apply the key aspects of communicative writing in real life scenarios
2. Understand emotional intelligence in personal and professional lives.
3. Identify Public Speaking with the best practices at workplace
4. Illustrate the attributes needed to function and grow in a corporate environment.

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Identify and apply the key aspects of communicative writing in real life scenarios.	2	Understand
CO2	Understand emotional intelligence in personal and professional lives.	3	Apply
CO3	Identify Public Speaking with the best practices at workplace	4	Analyze
CO4	Analyze the attributes needed to function and grow in a corporate environment.	4	Analyze

CO-PO Mapping:

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

Assessments:

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	10
MSE	30
ISE-2	10
ESE	50

ISE-1 and ISE-2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1: Communicative writing	**CO1,CO2**	**05Hrs.**
Key aspects and principles of communicative writing, formal and business letters, writing winning business proposals, using charts and graphs in communicative writing and how to tell a story with charts and graphs, writing SOP, professional profile building- LinkedIn		
Unit 2: Emotional Intelligence	**CO2,CO3**	**04 Hrs.**
Emotional intelligence, its importance in personal and professional lives, 10 Ways to build EI by Daniel Goleman.		
Unit 3: Public speaking and presentations at workplace	**CO3**	**06Hrs.**
Need of public speaking at your workplace (YouTube videos of Swami Vivekananda's Chicago speech, Steve Jobs' first iPhone launch, Martin Luther King Jr (I have a dream…), J K Rowling commencement speech address 2008, APJ Abdul Kalam, Any regional speakers), best practices of public speaking, public speaking in real life scenarios.		

Unit 4: Importance of Corporate Social Responsibility (CSR)	**CO2**	**05 Hrs.**
Importance of corporate social responsibility (CSR)- some of the stalwarts in CSR, attributes needed to function and grow in a corporate environment (Who am I?), the best practices to share and receive feedback.		
Unit 5: Conflicts and Stress in life and work	**CO3**	**06 Hrs.**
The impact of conflicts, basic guidelines required to manage conflicts, the impact of stress in life and work, the best practices to manage stress, importance of time management in life and work, the best time management practices.		
Unit 6: Corporate etiquette and corporate terms	**CO4**	**04 Hrs.**
Key features of corporate etiquette, netiquette, email-etiquette and standards for online writing, cell phone & telephone etiquette, business idioms and corporate terms.		

Reference Books:

1. Emotional Intelligence: Why it Can Matter More Than IQ by Daniel Goleman.
2. Putting Emotional Intelligence to Work by Ryback David.
3. How to Develop Self Confidence and Improve Public Speaking - Time - Tested Methods of Persuasion by Dale Carnegie

Online Resources:

1. https://youtu.be/reu8rzD6ZAE.
2. https://youtu.be/Wx9v_J34Fyo.
3. https://youtu.be/F2hc2FLOdhI
4. https://youtu.be/wHGqp8lz36c

Title of the Course: Design and Analysis of Algorithms Laboratory **Course Code:** UCBPC0531	**L**	**T**	**P**	**Credit**
	-	-	2	1

Course Pre-Requisite: Basic knowledge of Data Structures and Algorithms

Course Description: This course introduces the concept of algorithm as a precise mathematical concept, and study how to design algorithms, establish their correctness, study their efficiency and memory needs.

Course Learning Objectives:

1.To demonstrate performance of algorithms with respect to time and space complexity.

2. To explain graph and tree traversals.

3. Provide hands-on experience with implementing and testing algorithms using programming languages.

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Identify various Time and Space complexities of various algorithms.	2	Understand
CO2	Apply graph-based, greedy approaches to problem solving	4	Analyze
CO3	Apply Dynamic Programming & Backtracking techniques to solve various problems.	4	Analyze

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2	3	3									2	2
CO2	-				2							2	2
CO3	2	3	3		2							2	2

Assessments:

Teacher Assessment:

One component of In Semester Evaluation (ISE) and one End Semester Examination (ESE) having 50%, and 50% weight respectively.

Assessment	Marks
ISE	25
ESE	50

ISE are based on practical performance/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc. ESE: Assessment is based on oral examination

Course Contents:

Experiment No.1: **CO1** Implement and Analysis factorial of a number program using iterative and recursive methods.	**02 Hrs.**
Experiment No. 2: **CO1** Implement and compare different sorting algorithms. - Quick Sort & Merge Sort.	**02 Hrs.**
Experiment No. 3: **CO1** Implement and understand various searching techniques- Linear Search & Binary Search	**02 Hrs.**
Experiment No. 4: **CO2** Implement and understand basic graph algorithms. - Depth-First Search (DFS), Breadth-First Search (BFS)	**02 Hrs.**
Experiment No.5: **CO2** Implement and understand greedy algorithm techniques. - -Fractional Knapsack problem & Huffman coding	**02 Hrs.**
Experiment No. 6: **CO2** Implementation Of the algorithms of Kruskal and Prim	**02 Hrs.**
Experiment No. 7: Implementation of Dijkstra's Algorithm, **CO2**	**02 Hrs.**
Experiment No. 8: **CO3** Implement & and understand dynamic programming techniques- Fibonacci sequence**,** Longest Common Subsequence (LCS)	**02 Hrs.**
Experiment No. 9: **CO3** Understand and implement Backtracking techniques with N-Queens Problem.	**02 Hrs.**
Experiment No. 10: **CO2, CO3** Study of static code analysis tools for C and Java languages**.** e.g., Clang Static Analyzer, Cppcheck, SpotBugs (formerly FindBugs), PMD etc.	**02 Hrs.**

Textbooks:
1. Thomas Cormen, Charles Leiserson, Ronald Rivest and Cliford Stein, “Introduction to Algorithms”, PHI 2. Fundamentals of Computer Algorithms - Ellis Horowitz, Satraj Sahani, Saguthevar Rajasejaran, Universities Press, Second Edition.
References:
1. Fundamentals of Algorithmics – Gilles Brassard, Paul Bratley (Pearson Education). 2. Mastering Algorithms with C – Kyle Loudon (SPD O’Reilly). 3. Computer Algorithms- Introduction to Design and Analysis – Sara Baase, Allen Van Gelder (Pearson Education).

Title of the Course: Compiler Design (LEX & YACC) Laboratory **Course Code:** UCBPC0532	**L**	**T**	**P**	**Credit**
	-	-	2	1

Course Prerequisite: Fundamentals of Computer Science

Course Description: This course is designed to understand basic building blocks of a compiler and explains the interaction between lex and yacc.

Course Learning Objectives:

1: Students will be able to demonstrate scanning process using lex and yacc tool

2: Students will be able to demonstrate the lexical analysis process and semantic analysis process

3: Students will be able to demonstrate LL and LR parser functionalities

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO 1	Use lex and yacc tools for developing a scanner and a parser.	2	Understand
CO 2	Understand Lexical analyzer and use this knowledge to implement its various sub-functions for any regular language.	3	Apply
CO 3	Examine string for the given regular expression and evaluate expressions using YACC Tool.	4	Analyze

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	1	2	2	-	2							2	1
CO2	1	2	2	2	2							2	1
CO3	1	2	2	2	2							2	

Assessments:

Teacher Assessment:

One component of In Semester Evaluation (ISE) and one End Semester Examination (ESE) having 50%, and 50% weights respectively.

Assessment	Marks
ISE	25
ESE	50

ISE are based on practical performance/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc. ESE: Assessment is based on Practical & oral examination

Course Contents:

Experiment No. 1:	CO-1	**02 Hrs.**
Study of LEX and YACC		
Experiment No. 2:	CO-2	**02 Hrs.**
Write Lex Program to Identify and Count Number of Vowels and Consonants from a Given Input String		
Experiment No.3:	CO-2	**02 Hrs.**
Write a Lex Program to Identify Letter and Word from a Given Input String		
Experiment No. 4:	CO-2	**02 Hrs.**
Write a Lex Program to Identify Positive Number, Negative Number, Positive Fraction Number and Negative Fraction Number from a Given Input String		
Experiment No. 5:	CO-2	**02 Hrs.**
Write a Lex Program to Convert Printf and Scanf Statements into Write and Read using File Handling Concept.		
Experiment No. 6:	CO-2	**02 Hrs.**
Write a Lex Program to Identify Positive Number, Negative Number, Positive Fraction Number and Negative Fraction Number Using File Handling Concept.		
Experiment No. 7:	CO-2	**02 Hrs.**
Write a Lex Program to Identify Special Characters, Arithmetic Operators, and Digits from a Given Input String		

Experiment No. 8:	CO-3	**02 Hrs.**
Write a YACC Program to Convert Infix to Postfix Expression		
Experiment No. 9:	CO-3	**02 Hrs.**
Write a YACC Program to implement a Calculator and Recognize a Valid Arithmetic Expression.		
Experiment No. 10:	CO-3	**02 Hrs.**
Write a YACC Program to Check Whether the Given Input String is Palindrome or Not.		
Textbooks:		
1. Compilers: Principles, Techniques and Tools, Jeffery D. Ullman, Alfred V Aho, Ravi Sethi-Pearson Education India. 2. System Programming and Operating System, D. M. Dhamdhere, 2nd Edition-McGraw Hill Education India		
References:		
1. Compiler Construction, D.M. Dhamdare, Mc-Millan. 2. A Guide to Design and Analysis of Algorithms - Soubhik Chakraborty / prashant pranav / khatton / Dutta.		

Title of the Course: Modern Web Applications Laboratory **Course Code:** UCBPC0533	**L**	**T**	**P**	**Credit**
	0	**0**	**2**	**1**

Course Pre-Requisite: Enable students to develop modern web application.

Course Description: This course contains basic concepts related to designing and development of web pages. Also this course gives brief knowledge on various tools and technologies used for web designing.

Course Learning Objectives:

1. To enable students to develop modern web applications by leveraging the latest technologies.
2. To build a strong foundation in students making them job ready as per industry requirements.
3. To enable them to learn new technologies by applying foundation paradigms
4. To build strong expertise to develop end to end applications - web frontend and backend development.

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Build Design and Develop Web Applications	6	Create
CO2	Create Design applications by utilizing frontend frameworks.	6	Create
CO3	Design Integrate Backend Services & database integrated web applications	6	Create

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1		2	3		3		2				2	2	2
CO2		2	3		3		2				3	3	3
CO3		2	3		3		2				3	3	3

Assessments :

Teacher Assessment:

One component of In Semester Evaluation (ISE) having 100% weights.

Assessment	Marks
ISE	25
ESE	--

ISE are based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc**.**

Course Contents:

Experiment No. 1: **CO1,CO2,CO3** Design the following static web pages required for an online bookstore web site. 1) HOME PAGE: The static home page must contain three frames. 2) LOGIN PAGE 3) CATOLOGUE PAGE: The catalogue page should contain the details of all the books available in the web site in a table. 4) REGISTRATION PAGE	**02 Hrs.**
Experiment No. 2: **CO1,CO2,CO3** Write JavaScript to validate the following fields of the Registration page. 1. First Name (Name should contains alphabets and the length should not be less than 6 characters). 2. Password (Password should not be less than 6 characters length). 3. E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com) 4. Mobile Number (Phone number should contain 10 digits only). 5. Last Name and Address (should not be Empty).	**02 Hrs.**
Experiment No. 3: **CO1,CO2,CO3** Develop and demonstrate the usage of inline, internal and external style sheet using CSS	**02 Hrs.**

Experiment No. 4: **CO1,CO2,CO3** Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems: a) Input: Click on Display Date button using onclick( ) function Output: Display date in the textbox b) Input: A number n obtained using prompt Output: Factorial of n number using alert c) Input: A number n obtained using prompt Output: A multiplication table of numbers from 1 to 10 of n using alert d) Input: A number n obtained using prompt and add another number using confirm Output: Sum of the entire n numbers using alert	**02 Hrs.**
Experiment No.5: **CO1,CO2,CO3** Build HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (color,bold and font size).	**02 Hrs.**
Experiment No. 6: **CO1,CO2,CO3** Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words.It should not accept four and above digits, alphabets and special characters.	**02 Hrs.**
Experiment No. 7: **CO1,CO2,CO3** Create an XML document that contains 10 users information. Write a Java Program, which takes User Id as input and returns the user details by taking the user information from XML document using DOM parser or SAX parser.	**02 Hrs.**
Experiment No. 8: **CO1,CO2,CO3** Create the web applications with Database using (a) JSP, (b) Servlets and (c) JSP. (i)Write a jsp Program to display current Date, Time and Day. (ii) A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello, you are not authorized to visit the site" message, where it should be replaced with the entered name. Otherwise it should send "Welcome to this site" message. (iii)write a program for deploying Java Beans in a jsp page.	**02 Hrs.**
Experiment No. 9: **CO1,CO2,CO3** Write a program to design a simple calculator using (a) JavaScript (b) Servlet and (c) JSP.	**02 Hrs.**
Experiment No. 10: Write a program on stock market. **CO1,CO2,CO3**	**02 Hrs.**

Experiment No. 11: **CO1,CO2,CO3** Write an XML file which will display the Book information which includes the following: 1) Title of the book 2) Author Name 3) ISBN number 4) Publisher name 5) Edition 6) Price	**02 Hrs.**

Textbooks:

1. Basics Of Web Design - Terry Ann Felke-Morris
2. Pro JavaScript Techniques – John Resig
3. Vue.js for Jobseekers - Clive Harber - PBP Publication

References:

1. Web Designing and Development - Prof Satish Jain Ambrish K Rai M Geetha Iyer- PBP Publication

Title of the Course: Business Communication and Value Science-IV Lab	**L**	**T**	**P**	**Credit**
Course Code: UCBAE0534	**0**	**0**	**2**	**1**

Course Pre-Requisite: Business Communication and Value Science-IV Theory

Course Description: This course will help students to explore essential skills for personal and professional growth, including emotional intelligence, effective communication, corporate social responsibility, time management, stress management, and feedback strategies.

Course Learning Objectives:

1. To apply communicative writing in real life scenarios.
2. To apply public speaking in real life scenarios.
3. To understand the attributes needed to function and grow in a corporate environment.
4. To analyze the social issues around and provide solutions.

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Understand the attributes needed to function and grow in a corporate environment.	1	Understand
CO2	Apply communicative writing in real life scenarios.	2	Apply
CO3	Apply public speaking in real life scenarios.	3	Apply
CO4	Analyze the social issues around and provide solutions	4	Analyze

CO-PO Mapping:

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

Assessments:

Teacher Assessment:

One component of In Semester Evaluation (ISE) and one End Semester Examination (ESE) having 50%, and 50% weights respectively.

Assessment	Marks
ISE	25
ESE	--

ISE are based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc. ESE: Assessment is based on oral examination

Course Contents:

Experiment No. 1: **CO1** Writing proposals - Create a business proposal to get funding to begin a start-up of their choice. Represent information with charts and graphs.	**02 Hrs.**
Experiment No. 2: **CO1,CO2** Each group to create a POC (Proof of Concept) for their start-up applying their learnings from the CSBS course (core subjects + BCVS). The POC will be evaluated by the TCS team at the end of the term.	**02 Hrs.**
Experiment No. 3: **CO1,CO3** A short video/movie clip showing manifestations of EI. Discuss and Present the findings on the students with higher EQ who write better exam papers.	**02 Hrs.**
Experiment 4 : **CO2,CO3** Public speaking – Group presentations on the list of best practices along with examples Get, Set, Go – sell your start-up ideas : Each group to pitch their start-up idea.	**02 Hrs.**
Experiment 5 : **CO1,CO2** CSR stories, Group Activity - Research , prepare and present CSR activity of Tata Steel, Microsoft, Google, TCS, Starbucks, Titan, Tata Chemicals and TOMS Shoes.	**02 Hrs.**

Experiment 6 : **CO1,CO2** Conflict resolution: Each group will enact the situation of typical conflicts that occurs in a corporate office , to draw up a list of tips to manage conflicts at work and share on their FB/Insta/LinkedIn/Blog page.	**02 Hrs.**
Experiment 7: **CO3,CO4** Stress management: Each group will present their posters and the class will come up with a list of stress management tips to be put up on the Fb/Insta page.	**02 Hrs.**
Experiment 8: **CO1,CO2** Managing your time better: Start with the YouTube video: A valuable lesson for a happy life (2:33 mins) After viewing this, the facilitator will ask the participants to identify the rocks, pebbles and sands in their life.	**02 Hrs.**
Experiment 9: **CO2,CO3** Mock interview rounds for each group with a prospective employer followed by discussions on corporate etiquette.	**02 Hrs.**
Experiment 10: **CO3,CO4** Quiz in which in the first four rounds each group needs to identify the business idioms and corporate terms from given experts. In the next four rounds they will be asked to supply the correct idiom or term in a given business scenario.	**02 Hrs.**
Experiment 11: **CO3,CO4** Evaluation of POC (Proof of Concept) for their start-up Create memories: Recap activity on the entire BCVS Course.	**02 Hrs.**

Web References:

1. htts://www.tata.com/about-us/tata-group-our-heritagep.
2. https://economictimes.indiatimes.com/tata-success-story-is-based-on-humanity- philanthropy-and-ethics/articleshow/41766592.cms

Online Resources:

1. https://youtu.be/reu8rzD6ZAE .
2. https://youtu.be/Wx9v_J34Fyo.
3. https://youtu.be/F2hc2FLOdhI
4. https://youtu.be/wHGqp8lz36c
5. https://youtu.be/hxS5He3KVEM

Title of the Course: Business Strategies	L	T	P	Credit
Course Code: UCBMM0541	3	-	-	3

Course Pre-Requisite: Overview of business organizations and their operations and challenges faced by them.

Course Description: This course enables the learners to understand new forms of Strategic Management concepts and their use in business. The course helps the students understand the internal and external environments of firms and prepare a competitive strategy for industry attractiveness. The syllabus emphasizes corporate strategy and its implementation. In addition, the learners will also be acquainted with recent developments and trends in the business world.

Course Learning Objectives:

1. Understand current management concepts of strategic management.
2. Understand Pre-requisite and process of strategy formulation.
3. Differentiate between various generic strategies used in business.
4. Analyze the role of make in India in economy.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Remember the fundamental concepts of strategic management to analyze business situations and apply these concepts to solve business problems.	1	Remember
CO2	Understand the fundamental principles of and interrelationships among business functions such as: R&D, production, marketing, finance, HR and information technology.	2	Understand
CO3	Identify the inter-relationships of business to individuals, other organizations, government, and society.	3	Analyze
CO4	Analyze complex, unstructured qualitative and quantitative problems using appropriate tools.	3	Analyze

CO-PO Mapping:

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

Assessments:

Teacher Assessment:

Assessment	Marks
ESE	100

ESE: Assessment is based on 100% course content.

Course Contents:

Unit 1: Introduction to Strategic Management	**CO1**	**7 Hours**
Importance of Strategic Management, Vision and Objectives, Schools of thought in Strategic Management, Strategy Content, Process, and Practice, Fit Concept and Configuration Perspective in Strategic Management.		
Unit 2: Internal Environment of Firm	**CO1**	**8 Hours**
Core Competence as the Root of Competitive Advantage, Sources of Sustained Competitive Advantage, Business Processes and Capabilities-based Approach to Strategy.		
Unit 3: External Environments of Firm	**CO2**	**10 Hours**
Five Forces of Industry Attractiveness that Shape Strategy, The concept of Strategic Groups, and Industry Life Cycle, Generic Strategies, Generic Strategies, and the Value Chain.		
Unit 4: Corporate Strategy, and Growth Strategies	**CO3**	**7 Hours**
The Motive for Diversification, Related and Unrelated Diversification, Business Portfolio Analysis, Expansion, Integration and Diversification, Strategic Alliances, Joint Ventures, and Mergers & Acquisitions.		
Unit 5: Strategy Implementation: Structure and Systems	**CO3**	**4 Hours**
The 7S Framework, Strategic Control and Corporate Governance.		
Unit 6: Emerging Strategic Trends	**CO4**	**9 Hours**
Business Process Outsourcing and Knowledge Process Outsourcing in India: Concept and Strategies. Start-up Business Strategies and Make in India Model: Process of business start-ups and its Challenges, Growth Prospects, and government initiatives in Make in India Model with reference to National manufacturing.		

Textbooks:
1. Robert M. Grant (2012). Contemporary Strategic Management. Blackwell Publishing 2. Sukul Lomash and P.K Mishra (2003). Business Policy and Strategic Management. Vikas Publishing House Pvt. Ltd, New Delhi
References:
1. M.E. Porter (1980). Competitive Strategy: Techniques for Analyzing Industries and Competitors. New York: Free Press 2. M.E. Porter (1985). Competitive Advantage: Creating and Sustaining Superior Performance. New York: Free Press 3. Rumelt (2017). Good Strategy Bad Strategy: The Difference and Why It Matters. Profile BooksMain edition.

Teaching and Evaluation Scheme for Third Year Semester-VI											
Sr. No.	**Course Code**	**Cluster**	**Course**	**Teaching Scheme**				**Evaluation Scheme**			
				L	**T**	**P**	**Credits**	**Components**	**Max**	**Min Marks for Pass**	
1	UCBPC0601	PC	Computer Networks	3	0	0	3	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
2	UCBPC0602	PC	Machine Learning	3	0	0	3	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
3	UCBPC0603	PC	Design Thinking	2	0	0	2	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
4	UCBPC0604	PC	Information Security	2	0	0	2	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
5	UCBPE06**	PE	Program Elective II	3	0	0	3	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
6	UCBOE06**	OE	Open Elective-II	3	0	0	3	ISE-I	10		40
								ISE-II	10		
								MSE	30		
								ESE	50	20	
7	UCBPC0631	PC	Computer Networks Laboratory	0	0	2	1	ISE	25	10	
8	UCBPC0632	PC	Machine Learning Laboratory	0	0	2	1	ISE	25	10	
								ESE(POE)	25	10	
9	UCBPC0633	PC	Information Security Laboratory	0	0	2	1	ISE	25	10	
10	UCBCC0634	CC	Co-Curricular Course-III	0	0	2	1	ISE	25	10	
11	UCBIL0671	OJT	Mini-Project-IV	0	0	2	1	ISE	25	10	
12	UCBMM0641	MM	Consumer Behaviour (MM-IV)	3	0	0	3	ESE	100	40	
			Total	**19**	**0**	**10**	**24**	**Total**	**850**		
	Total Contact Hours=29, Total Credits=24										

Exit Option: Award of UG Certificate in Major with 135 credits and an additional 8 credits for exit course.

Sr. No	Course Code	Exit Courses	Examination Mode	Credits
1	UCBEX0691	Certification course in AWS	Online Certification	3
2	UCBEX0692	Certification Course in CISA(Certified Information Systems Auditor		3
3	UCBEX0693	Certification Course in Professional Android Developer		2

Program Elective-I		
Sr. No.	**Course Code**	**Course Name**
1	UCBPE0511	Cloud, Microservices & Application
2	UCBPE0512	Artificial Intelligence
3	UCBPE0513	IT Project Management

Program Elective-II		
Sr. No.	**Course Code**	**Course Name**
1	UCBPE0611	Software Design with UML
2	UCBPE0612	Android Application Development
3	UCBPE0613	Financial Management

Open Elective-I		
Sr. No.	**Course Code**	**Course Name**
1	UCBOE0521	Introduction to Data Analytics
2	UCBOE0522	Behavioural Economics
3	UCBOE0523	Introduction Java Programming

Open Elective-II		
Sr. No.	**Course Code**	**Course Name**
1	UCBOE0621	Industry 4.0
2	UCBOE0622	Intellectual Property and Entrepreneurship

Title of the Course: Computer Networks	L	T	P	Credit
Course Code: UCBPC0601	3	0	0	3

Course Pre-Requisite: Basic knowledge of Data Communication System.

Course Description: The course introduces main concepts of networking; application areas; classification; reference models, transmission environment; technologies; routing algorithms.

Course Learning Objectives:

1. To equip the students with a general overview of the concepts and fundamentals of computer networks.
2. To introduce fundamentals of networking concepts with the help of layered architecture which includes OSI and TCP/IP model.
3. Familiarize the students with packet tracing and analyzing tools.
4. To aware the students about various routing algorithms.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Familiarize the student with the basic taxonomy and terminology of computer networks.	2	Understand
CO2	Understand data transmission across the network.	2	Understand
CO3	Evaluate the principles of data integrity.	3	Apply
CO4	Configure and illustrate different application layer protocols.	4	Analyze

CO-PO Mapping:

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

Assessments:

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	10
MSE	30
ISE-2	10
ESE	50

ISE-1 and ISE-2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1: Data Communication and Networking Overview	**CO1**	**06 Hours**
Communication model, Data Communication and Networking-Types of Network and Topology, Network Devices: -Hub, Switch, Bridge, Router, Repeater, Modem, NIC etc.		
Unit 2: Data Transmission	**CO1**	**08 Hours**
Concepts and terminology, Analog and Digital Data Transmission, Transmission Impairments, Channel Capacity, Guided Transmission Media and Wireless Transmission.		
Unit 3: Protocol Architecture Model	**CO2**	**08 Hours**
Protocol Layers, Hierarchy, Layered Architecture, Overview of OSI Model, Overview of TCP/IP Model, Comparison between OSI and TCP/IP Protocol suite, Addressing:- Unicast, Multicast and Broadcast.		
Unit 4: Data Link Layer	**CO3**	**08 Hours**
Design issues for Data Link Layer, Farming Methods:- Bit, Byte and Character Stuffing, Error Detection Methods:- CRC and Checksum. Error Correction Method:-Hamming Code, Flow Control Noisy and Noiseless Protocols:-Stop and Wait, Sliding Window, Go Back N, Selective Repeat.		
Unit 5: Network Layer	**CO3**	**08 Hours**
Network layer services, Addressing: - Classful Addressing/ Classless Addressing, IP packet format, Routing Algorithms:- Shortest path routing,, Distance Vector routing, Link state routing, Flooding, Introduction to ARP, RARP, ICMP,IGMP		
Unit 6: Application Layer	**CO4**	**07 Hours**
DNS, DDNS, TELNET, EMAIL, FTP, WWW, HTTP, SNMP		

Textbooks:
1. “Data Communications and Networking” – Behrouz A Forouzan (The McGraw Hill) . 2. “Computer Networks” – Andrew S. Tanenbaum- (Prentice Hall) 5th Edition
References:
1. “Data & computer communications”: - William Stallings (Pearson Education). 2. “Data communication and computer Networks” Ajit Pal (PHI Learning) .

Title of the Course: Machine Learning **Course Code:** UCBPC0602	**L**	**T**	**P**	**Credit**
	3	**0**	**0**	3

Course Pre-Requisite: Linear Algebra and Statistics

Course Description: This Course is designed to understand and implement the various machine algorithms. Also, this course provides insights of solving various applications using ML modeling.

Course Learning Objectives:

1. To describe the fundamentals of machine learning concepts.
2. To analyze supervised and Unsupervised algorithms of machine learning.
3. To apply the algorithms to solve problems.
4. To analyze the real-world applications of machine learning.

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Describe the fundamentals of machine learning concepts.	2	Understand
CO2	Analyze supervised and Unsupervised algorithms of machine learning.	3	Analyze
CO3	Apply the algorithms to solve problems	3	Apply
CO4	Analyze the real-world applications of machine learning.	4	Analyze

CO-PO Mapping:

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

Assessments:

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	10
MSE	30
ISE-2	10
ESE	50

ISE-1 and ISE-2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1: Introduction to Machine Learning	**CO1**	**07 Hrs.**

Introduction to machine learning – definition, terminology. Types of machine learning – supervised learning, unsupervised learning, semi-supervised learning, reinforcement learning. Machine learning process. Performance metric in machine learning. Tools and frameworks. Data preprocessing (overview). Data visualization.

Unit 2: Regression	**CO2, CO3**	**08 Hrs.**

Simple linear regression – hypothesis, cost function, parameter learning with gradient descent, learning rate, gradient descent for linear regression, examples. Simple linear regression in matrix form. Multivariate linear regression – multiple features, hypothesis functions. Gradient descent for multiple variables, feature scaling, polynomial regression.

Unit 3: Classification	**CO2, CO3**	**08 Hrs.**

Logistic Regression-cost function, gradient descent and Multiclass classification, Decision trees – definition, terminology, the need, advantages, and limitations. Constructing and understanding decision trees. Decision tree algorithms – ID3, CART, random forest, examples. Naïvï e Bayes classifier. K–Nearest Neighbour classifier. Model Evaluation

Unit 4 : Neural Netwroks and Support Vector Machine	**CO2, CO3**	**08 Hrs.**
neuron representation and model, hypothesis for neuron, cost function, solution of a problem using single neuron, gradient descent for a neuron. Multiclass classification with neural network. Learning in neural networks – feedforward neural network, backpropagation algorithm. Loss function – support vector machines (SVMs), softmax regression .		
Unit 5 : Unsupervised Learning and Reinforcement Learning	**CO2,CO3**	**08 Hrs.**
Unsupervised learning: Introduction to clustering, K Means clustering, Hierarchical clustering, Association rule mining. Introduction to reinforcement learning – Q learning.		
Unit 6 : Case Studies of Machine Learning	**CO4**	**06 Hrs.**
Introduction to machine learning libraries, applications in structured data, applications in unstructured data – Image, Text, Speech.		

Textbooks:

1. Abhishek Vijayvargia, BPB publications, Machine Learning with Python - an approach to applied ML .
2. Tom M. Mitchell, McGraw Hill Education; First edition Machine Learning

References:

1. John Paul Muller,Wiley Publication Machine Learning for dummies .
2. Andreas C. Müller, Sarah Guido,O'Relly Publication ,Introduction to Machine Learning with Python .

Title of the Course: Design Thinking	**L**	**T**	**P**	**Credit**
Course Code: UCBPC0603	3	0	0	3

Course Pre-Requisite: Basic concepts of computer science.

Course Description: The course aims to provide knowledge about different design techniques, its implementation, and testing.

Course Learning Objectives:

1. To understand design thinking and its phases
2. To Apply Empathy Techniques.
3. To apply ideation and prototyping to design a solution model.
4. Analyze the design model concerning its future scope.

Course Outcomes:

CO	**After the completion of the course, the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Understand design thinking and its phases.	2	Understand
CO2	Apply Empathy techniques to understand user needs.	3	Apply
CO3	Apply ideation and prototyping to design a solution model.	3	Apply
CO4	Analyze the design model concerning its future scope.	4	Analyze

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	1		2	1							1	2	1
CO2	1		2								1	2	1
CO3	2	2	2	2							1	2	2
CO4	1	2	2	2							1	1	2

Assessments:

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	10
MSE	30
ISE-2	10
ESE	50

ISE-1 and ISE-2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1: Introduction to Design Thinking	**CO1**	**08 Hrs.**
Why Design? - Four Questions, Ten Tools - Principles of Design Thinking - The process of Design Thinking - How to plan a Design Thinking project.		
Unit 2: Empathize Phase	**CO2**	**7 Hours**
Empathize phase - Steps involved - Immersion activity- Questionnaire – Empathy map for case study.		
Unit 3: Understand, Observe and Define The Problem	**CO1**	**8 Hours**
search field determination - Problem clarification - Understanding of the problem - Problem analysis - Reformulation of the problem - Observation Phase - Empathetic design - Tips for observing - Methods for Empathetic Design - Point-of-View Phase - Characterization of the target group - Description of customer needs..		
Unit 4: Ideation And Prototyping	**CO3**	**8 Hours**
Ideate Phase - The creative process and creative principles - Creativity techniques - Evaluation of ideas - Prototype Phase - Lean Startup Method for Prototype Development - Visualization and presentation techniques.		

Unit 5: Testing And Implementation	**CO1, CO4**	**8 Hours**
Test Phase - Tips for interviews - Tips for surveys - Kano Model - Desirability Testing - How to conduct workshops - Requirements for space - Material requirements - Agility for Design Thinking.		
Unit 6: Future	**CO4**	**6 Hours**
Design Thinking meets the corporation – The New Social Contract – Design Activism – Designing tomorrow. Case Study- Design Thinking principles in UI/UX Design.Design Tool-Figma.		
Textbooks:		
1. Christian Müller-Roterberg, "Handbook of Design Thinking", Kindle Direct Publishing, November 2018. 2. Dan Senor and Saul Singer, "Start-Up Nation", Grand Central Publishing, Twelfth Edition, 2009		
References:		
1. Corral, Luis & Fronza, Ilenia, "Design Thinking and Agile Practices for Software Engineering: An Opportunity for Innovation. 2. Design thinking 101: Principles, Tools & Examples to transform your creative process.		

Title of the Course: Information Security **Course Code:** UCBPC0604	**L**	**T**	**P**	**Credit**
	2	**0**	**0**	2

Course Prerequisite: Computer Network, Data Communication, Engg. Mathematics

Course Description: This course gives you a practical survey of both the principles and practice of cryptography and network security. In the first part of course, the basic issues to be addressed by a network security capability are explored by providing a tutorial and survey of cryptography and network security technology. The later part of course deals with the practice of network security: practical applications that have been implemented and are in use to provide network security.

Course Learning Objectives:

1. To explain the use of Cryptographic algorithms to ensure data protection and integrity
2. To apply the knowledge of cryptographic techniques to solve the problems on security
3. To illustrate the different Network and Internet security protocols in TCP/IP stack
4. To analyze the security facilities designed to provide system security

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Explain the use of Cryptographic algorithms to ensure data protection and integrity.	2	Understand
CO2	Apply the knowledge of cryptographic techniques to solve the problems on security.	3	Apply
CO3	Analyze the security facilities designed to provide system security	4	Analyze

CO-PO Mapping:

CO	PO1	PO2	PO3	PO 4	PO5	PO 6	PO 7	PO 8	PO9	PO1 0	PO1 1	PSO1	PSO2
CO1	2											2	2
CO2	2	3	3		2							2	2
CO3		2	2		2							2	2

Assessments:

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	10
MSE	30
ISE-2	10
ESE	50

ISE-1 and ISE-2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1:Introduction to Information Security	**CO1**	**05 Hrs.**

Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security,Symmetric Cipher Model, Substitution Techniques.

Unit 2: Symmetric and Asymmetric Key Cryptography	**CO1**	**06 Hrs.**

Block Cipher Structure, Data Encryption Standard (DES), A DES Example, Strength of DES, Block Cipher Design Principles, AES Structure, Multiple Encryption and Triple-DES ,Principles of Public- Key Cryptosystems, RSA Algorithm, Other Public key Cryptosystems - Diffie-Hellman Key Exchange.

Unit 3: Cryptographic Authentication Functions	**CO2**	**06 Hrs.**

Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Requirements and Security, Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithm (SHA), Message Authentication Requirements, Message Authentication Functions, Requirements for MAC and Security of MACs, MACs Based on Hash Functions: MAC, MACs Based on Block Ciphers: DAA and CMAC, Digital Signatures, Digital Signature Standard (DSS).

Unit 4 :Key Management and User Authentication	**CO3**	**04 Hrs.**
Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, Public Key Infrastructure, Remote User-Authentication Principles, Kerberos.		
Unit 5 :Internet security Protocols	**CO2**	**05 Hrs.**
Secure Sockets Layer (SSL), Transport Layer Security (TLS), HTTPS, SSH, Pretty Good Privacy (PGP), S/MIME, IP Security Overview, IP Security Policy, Encapsulating Security Payload.		
Unit 6 :Firewall and Intrusion detection system	**CO3**	**04 Hrs.**
Introduction, Types of firewall, Firewall configuration, VPN, Types of VPN, Overview of IDS, IDS Components, Approaches of IDS.		
Textbooks:		
1. Williams Stallings, Pearson Education (LPE), 7th Edition,Cryptography and Network Security Principles.		
References:		
1. B.A. Forouzan,McGrawHill,Cryptography & Network Security. 2. Menezes, an Oorschot, and S.A. Vanstone, Handbook of Applied Cryptography .		

Title of the Course: Software Design with UML	L	T	P	Credit
Course Code: UCBPE0611	3			3

Course Pre-Requisite: Fundamentals of Software Development Life Cycle Process, Object Oriented Concepts.

Course Description: This course to study about SDLC modeling techniques using UML diagrams and also understand the object-oriented approach to analyzing and designing systems and software solutions.

Course Learning Objectives:

1. To Understanding UML Fundamentals.
2. To acquaint themselves with the Object-Oriented Analysis and Design (OOAD) with UML.
3. To use Modeling System Behavior with UML Diagrams.
4. To use different Designing tools for Modeling.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Understand the concepts and principles of object oriented programming concepts and the software development process models	2	Understand
CO2	Make use of static and dynamic UML diagrams for solving design solutions	3	Apply
CO3	Analyze the design methods and modeling techniques.	4	Analyze
CO4	Design UML diagrams for real time problems.	4	Analyze

CO-PO Mapping:

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

Assessments:

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	10
MSE	30
ISE-2	10
ESE	50

ISE-1 and ISE-2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1: Introduction to Object Oriented Software Engineering and UML	**CO1**	**8 Hours**

Software development process: The Waterfall Model vs. The Spiral Model, The Software Crisis, description of the real world using the Objects Model, Classes, inheritance and multiple configurations, Quality software characteristics, Description of the Object Oriented Analysis process vs. the Structure Analysis Model.

Unit 2: Introduction to the UML Language.	**CO1**	**7 Hours**

Standards, Elements of the language, General description of various models, The process of Object-Oriented software development. Description of Design Patterns. Technological Description of Distributed Systems.

Unit 3: Requirement Analysis and Design	**CO2**	**7 Hours**

Requirements Analysis Using Case Modeling:

Analysis of system requirements. Actor definitions, writing a case goal, Use Case Diagrams, Use Case Relationships.

Design (Interaction Diagrams): Description of goal, Defining UML Method, Operation, Object Interface, Class. Sequence Diagram. Finding objects from Flow of Events. Describing the process of finding objects using a Sequence Diagram. Describing the process of finding objects using a Collaboration Diagram.

Unit 4: Static and Package Diagram Model	**CO2**	**8 Hours**
The Logical View Design Stage: The Static Structure Diagrams. The Class Diagram Model, Attributes descriptions, Operations descriptions, Connections descriptions in the Static Model, Association, Generalization, Aggregation, Dependency, Interfacing, Multiplicity. **Package Diagram Model:** Description of the model, White box, black box, Connections between packagers, Interfaces, Create Package Diagram, Drill Down.		
Unit 5: Dynamic and Component Diagrams	**CO2**	**8 Hours**
Description of the State Diagram, Events Handling, Description of the Activity Diagram, Physical Aspect, Logical Aspect, Connections and Dependencies, User face, Initial DB design in a UML environment.		
Unit 6: Deployment Model	**CO3**	**7 Hours**
Processors, Connections, Components, Tasks, Threads, Signals and Events, Case Studies.		

Textbooks:

1. Bernd Bruegge and Allen H. Dutoit (2013). Object-Oriented Software Engineering: using UML, Patterns, and Java. Pearson Edu.

References:

1. Erich Gamma, Richard Helm, Ralph Johnson, and John M. Vlissides (1977). Design Patterns: Elements of Reusable Object-Oriented Software. Addison-Wesley Professional Computing Series.
2. Craig Larman (2005). Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development. Pearson Education.
3. Simon Bennett, Steve Mc Robb and Ray Farmer (2010). Object Oriented Systems Analysis and Design Using UML. McGraw Hill Education.

Title of the Course: Financial Management	L	T	P	Credit
Course Code: UCBPE0613	3	-	-	3

Course Pre-Requisite: Overview of business organizations and their operations and challenges faced by them.

Course Description: The course helps the students to know the Financial Management concept in decision making

Course Learning Objectives:

1. To familiarize the students with basic concepts of financial management.
2. To understand the concept of time value of money and its uses.
3. To enable students to rank different projects using capital budgeting.
4. Familiarize with working capital management.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Remember the fundamental concepts of financial management and Estimate time value of money.	1	Remember
CO2	Understand working capital management, cost of capital and cash management.	2	Understanding
CO3	Apply the capital budgeting techniques and evaluate the investment decisions.	3	Apply
CO4	Leverage the concept for deciding the financial angle of IT projects.	4	Analyze

CO-PO Mapping:

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

Assessments:

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	10
ISE-2	10
MSE	30
ESE	50

ISE-1 and ISE-2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

UNIT 1: INTRODUCTION	**CO1**	**06 Hours**

Financial Management- Introduction, Meaning, Objectives- Profit Maximization and Wealth Maximization approach, Scope of financial management, Functions of Financial Management. **Sources of Finance:** Short Term Sources, Medium Term Sources & Long Term Sources of Finances

UNIT 2: TIME VALUE OF MONEY	**CO1**	**06 Hours**

Simple and Compound Interest Rates, Time Lines and Notation, Future Value of a Single Amount, Future value of uneven cash flow, Future Value of an Annuity .Present Value of a Single Amount, Present value of uneven cash flow , Present Value of an Annuity.

UNIT 3: CAPITAL BUDGETING	**CO3**	**08 Hours**

Capital Budgeting : Capital Budgeting Concept , Nature & Significance of Capital Budgeting ,Capital Budgeting Techniques, Project Evaluation and Selection - Alternative Methods.

UNIT 4: LEVERAGE	CO4	06 Hours
Operating & Financial Leverage: Operating Leverage, Financial Leverage, Total Leverage, and Indifference Analysis in leverage study.		
UNIT 5: WORKING CAPITAL MANAGEMENT	**CO2**	**12 Hours**
Concept of working capital, Working Capital Cycle ,Types of Working capital, Use and Importance of Working Capital, Influencing Factors, Estimation of Working Capital		
UNIT 6: COST OF CAPITAL AND CASH MANAGEMENT	**CO2**	**07 Hours**
Cost of Capital: Concept, Computation of Specific Cost of Capital for Equity - Preference – Debt, Weighted Average Cost of Capital – Factors affecting Cost of Capital. **Cash Management**: Introduction, Functions, Objectives, Importance and Motives of Holding Cash.		
Home Assignment:		
Simple Illustration on Capital Budgeting and Working Capital Management.		
Textbooks:		
Chandra, Prasanna - Financial Management - Theory & Practice, Tata McGraw Hill..		
References:		
Pandey, I M., 2005, Financial Management, Vikas Publishing House Pvt. Ltd., New Delhi. Khan M Y and Jain P K 2005, Basic Financial Management, Tata McGraw Hill, New Delhi. R P Rustagi - Financial Management (Galgotia) Srivastava, Misra: Financial Management		

Title of the Course: Industry 4.0 **Course Code:** UCBOE0621	**L**	**T**	**P**	**Credits**
	3	**-**	**-**	**3**

Course Prerequisite: A basic understanding of engineering principles, digital technologies, data analytics and business processes.

Course Description: This course provides an overview of Industry 4.0, exploring its core concepts, the evolution of smart manufacturing systems and gain insight into the technological advancements such as robotics, augmented reality, and the Internet of Things to understand the challenges and strategies for adopting Industry 4.0 in real-world industrial settings.

Course Learning Objectives:

1. To understand concepts, technologies, and current state of Industry 4.0
2. To Analyze the components, frameworks, and supportive technologies enabling Industry 4.0
3. To Develop strategic technology roadmaps for adopting Industry 4.0 innovations in production.
4. To Identify and address challenges and obstacles in implementing Industry 4.0 systems.

Course Outcomes:

COs	**After the completion of the course the student will be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Describe Industry 4.0 and scope for Indian Industry	2	Understand
CO2	Demonstrate conceptual framework and road map of Industry 4.0	2	Understand
CO3	Discover Robotic technology and Augmented reality for Industry 4.0	4	Analyze
CO4	Discover obstacle and framework conditions for Industry 4.0	4	Analyze

CO-PO Mapping:

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

Assessment Scheme:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	10
MSE	30
ISE-2	10
ESE	50

ISE-1 and ISE-2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1: Introduction to Industry 4.0	**CO1**	**8 Hours**

Introduction, core idea of Industry 4.0, origin concept of industry 4.0, Industry 4.0 production system, current state of industry 4.0, Core Technologies, How is India preparing for Industry 4.0

Unit 2: A Conceptual Framework	**CO2**	**8 Hours**

Introduction, Main Concepts and Components of Industry 4.0, State of Art, Supportive Technologies, Proposed Framework for Industry 4.0

Unit 3: Technology Roadmap	**CO2**	**8 Hours**

Introduction, Proposed Framework for Technology Roadmap, Strategy Phase, New Product and Process Development Phase.

Unit 4: Advances in Robotics	**CO3**	7 **Hours**

Introduction, Recent Technological Components of Robots- Advanced Sensor Technologies, Internet of Robotic Things, Cloud Robotics, and Cognitive Architecture for Cyber-Physical Robotics, Industrial Robotic Applications- Manufacturing, Maintenance and Assembly.

Unit 5: The Role of Augmented Reality	**CO3**	**8 Hours**

Introduction, AR Hardware and Software Technology, Industrial Applications of AR.

Unit 6: Obstacles and Framework Conditions	**CO4**	**6 Hours**
Lack of A Digital Strategy alongside Resource Scarcity, Lack of standards and poor data security, Financing conditions, availability of skilled workers, comprehensive broadband infrastructure, state support, legal framework, protection of corporate data, liability, handling personal data.		

Textbooks:

1. Industry 4.0: Managing the Digital Transformation by Alp Ustundag and Emre Cevikcan, Springer.
2. The Concept Industry 4.0 by Bartodziej, Christoph Jan Bartodziej, Springer.
3. The Challenges of Industry 4.0 for Small and Medium-sized Enterprises by Christian Schroder. Springer.

Reference Books:

1. "Industry 4.0: The Industrial Internet of Things" by Alasdair Gilchrist, Apress, 1st Edition, 2016
2. The Fourth Industrial Revolution" by Klaus Schwab, Crown Business, 1st Edition,2016

Title of the Course: Intellectual Property and Entrepreneurship	L	T	P	Credit
Course Code: UCBOE0622	3	0	0	3

Course Pre-Requisite: Basic knowledge of business, innovation, and legal principles related to intellectual property.

Course Description: This course provides an in-depth understanding of Intellectual Property Rights (IPR) and its role in entrepreneurship. It covers various types of intellectual property (patents, copyrights, trademarks, trade secrets) and their significance in business innovation. The course also introduces entrepreneurial concepts, business models, startup ecosystems, financial, and ethical considerations in new ventures. Additionally, it explores the commercialization of intellectual property and technology transfer in industries.

Course Learning Objectives:

1. To understand the fundamental concepts of Intellectual Property Rights (IPR).
2. To differentiate between patents, copyrights, trademarks, and trade secrets.
3. To analyse entrepreneurial processes, business models, and startup ecosystems.
4. To evaluate financial, legal, and ethical aspects of entrepreneurship and intellectual property.
5. To explore technology commercialization and innovation management.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Explain the fundamentals of Intellectual Property Rights (IPR).	2	Understand
CO2	Differentiate between patents, copyrights, trademarks, and trade secrets.	2	Understand
CO3	Understand the commercialization of technology and its role in industry.	2	Understand
CO4	Analyze the entrepreneurial process, business models, and startup ecosystems	4	Analyse
CO5	Evaluate financial, legal, and ethical considerations in entrepreneurship	5	Evaluate

CO-PO Mapping:

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

Assessments:

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE-1	10
MSE	30
ISE-2	10
ESE	50

ISE-1 and ISE-2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit 1: Introduction to Intellectual Property Rights (IPR)	**CO1**	**7 Hours**
Definition, Need, and Importance of Intellectual Property, History and Evolution of Intellectual Property Laws, International Organizations for Intellectual Property (WIPO, WTO, TRIPS), The Role of IPR in Technology and Business Growth.		
Unit 2: Types of Intellectual Property	**CO2**	**7 Hours**
Patents: Definition, Patent Filing Process, Patent Infringement, Copyrights: Protection of Literary, Artistic, and Software Works, Trademarks: Branding, Trademark Registration, and Disputes, Trade Secrets and Industrial Design: Business Confidentiality and Design Rights.		
Unit 3: Entrepreneurship and Business Models	**CO3**	**7 Hours**
Introduction to Entrepreneurship and its Importance, Types of Entrepreneurs and Startups, Business Model Development and Lean Startup Approach, Role of Incubators, Accelerators, and Funding Mechanisms.		
Unit 4: Financial, Legal, and Ethical Considerations in Entrepreneurship	**CO4**	**7 Hours**
Financial Planning, Fundraising, and Risk Management, Legal Aspects: Business Registration, Contracts, and Compliance, Ethical Issues in Entrepreneurship and Corporate Social Responsibility (CSR).		

Unit 5: Innovation, Technology Transfer & Commercialization	CO5	8 Hours
University-Industry Collaboration and Innovation Strategies, Technology Licensing, Patent Commercialization, and Tech Transfer, Case Studies on Successful Technology Commercialization.		
Unit 6: Case Studies on IPR and Entrepreneurship	**CO2,CO3,CO5**	**9 Hours**
Case Study on Elon Musk & Tesla's Open Patent Initiative, Case Study on Copyright Infringement in the Software Industry, Successful Indian Startups and Their IPR Strategies.		
Textbooks:		
1. Intellectual Property Rights and Innovation Management – M. Ashok Kumar 2. Entrepreneurship Development and Small Business Enterprises – Poornima M. Charantimath 3. Innovation and Entrepreneurship – Peter F. Drucker		
References:		
World Intellectual Property Organization (WIPO) Startup India, NASSCOM, IPR India		

Title of the Course: Computer Networks Laboratory **Course Code:** UCBPC0631	**L**	**T**	**P**	**Credit**
	-	**-**	**2**	1

Course Pre-Requisite: Basic Knowledge of Data Communication System.

Course Description: The course introduces main concepts of networking; application areas; classification; reference models; transmission environment; technologies; routing algorithms

Course Learning Objectives:

1. To equip the students with a general overview of the concepts and fundamentals of computer networks.
2. To introduce fundamentals of networking concepts with the help of layered architecture which includes OSI and TCP/IP model.
3. Familiarize the students with packet tracing and analyzing tools.

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Familiarize the student with the basic taxonomy and terminology of computer networks.	2	Understand
CO2	Evaluate the principles of data integrity	2	Understand
CO3	Apply Dynamic Programming concept to solve various problems.	3	Apply
CO4	Configure and illustrate different application layer protocols	4	Analyze

CO-PO Mapping:

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

Assessments :

Teacher Assessment:

One component of In Semester Evaluation (ISE) and one End Semester Examination (ESE) having 50%, and 50% weights respectively.

Assessment	Marks
ISE	25
ESE	50

ISE are based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc. ESE: Assessment is based on oral examination

Course Contents:

Experiment No. 1: **(CO1,CO2,CO3)** Simulation between two different LANs using Cisco Packet Tracer.	**02 Hrs.**
Experiment No. 2: **(CO1,CO2,CO3)** Simulation between wireless devices using DHCP in Cisco Packet Tracer.	**02 Hrs.**
Experiment No. 3: Study of crimping tools and technologies. **(CO1,CO2,CO3)**	**02 Hrs.**
Experiment No. 4: **(CO1,CO2,CO3)** Simulation DNS resolution in Cisco Packet Tracer.	**02 Hrs.**
Experiment No. 5: **(CO1,CO2,CO3)** Study of the DNS tool with all its options: (nslookup ,dig, host ,whois)	**02 Hrs.**
Experiment No. 6: **(CO1,CO2,CO3)** Capturing and Analyzing operation of various application layer protocols Using Network Protocol Analyzer Wireshark.	**02 Hrs.**
Experiment No. 7: Configuration of FTP Server. (vsFTPd in Ubuntu). **(CO1,CO2,CO3)**	**02 Hrs.**
Experiment No. 8: **(CO1,CO2,CO3)** Configuration and testing of Web Server in Ubuntu (Apache2).	**02 Hrs.**
Experiment No.9: **(CO1,CO2,CO3)** Implementation and configuration of e-mail Server. (mailX in Ubuntu).	**02 Hrs.**
Experiment No. 10: **(CO1,CO2,CO3)** Demonstration of remote desktop tools like Any Desk.	**02 Hrs.**
Experiment No. 11: Implementation of various routing protocols. **(CO1,CO2,CO3)**	**02 Hrs.**
Experiment No. 12: Configuration of Virtual Private Network. **(CO1,CO2,CO3)**	**02 Hrs.**

Textbooks:
1. “Data Communications and Networking” – Behrouz A Forouzan (The McGraw Hill) **2.** “Computer Networks” – Andrew S. Tanenbaum- (Prentice Hall) 5th Edition Mcgraw-Hill.
References:
1. “Data & computer communications”: - William Stallings (Pearson Education). **2.** “Data communication and computer Networks” Ajit Pal (PHI Learning).

Title of the Course: Machine Learning Laboratory **Course Code:** UCBPC0632	**L**	**T**	**P**	**Credit**
	-	**-**	**2**	1

Course Pre-Requisite: Knowledge of datasets and machine leaning algorithms.

Course Description: This Course is designed to implement the various machine algorithms for solving given application problem.

Course Learning Objectives:

1. To apply the different types of machine learning algorithms to real-world data sets.
2. To make use of modern tools to design and implement machine learning algorithms to solve specific problems.
3. To evaluate the performance of different machine learning algorithms using appropriate metrics and techniques.

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Apply the different types of machine learning algorithms to real-world data sets.	3	Create
CO2	Make use of modern tools to design and implement machine learning algorithms to solve specific problems.	6	Create
CO3	Evaluate the performance of different machine learning algorithms using appropriate metrics and techniques	6	Create

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3		2									2	2
CO2	3	3	2		3							2	2
CO3	2	1	1	3	3							2	2

Assessments :

Teacher Assessment:

One component of In Semester Evaluation (ISE) and one End Semester Examination (ESE) having 50%, and 50% weights respectively.

Assessment	Marks
ISE	25
ESE(OE)	25

ISE are based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc. ESE: Assessment is based on oral examination

Course Contents:

Experiment No. 1: Linear Regression-Implement a linear regression algorithm to predict a continuous target variable based on one or more predictor variables. E.g. Implement a linear regression model on a housing prices dataset to predict the prices of houses based on their features. **(CO1,CO2,CO3)**	**02 Hrs.**
Experiment No. 2: Logistic Regression-Implement a logistic regression algorithm to classify data into two or more classes based on predictor variables**.** **(CO1,CO2,CO3)**	**02 Hrs.**
Experiment No. 3: Decision Trees-Implement a decision tree algorithm to classify data into multiple classes based on predictor variables. **(CO1,CO2,CO3)**	**02 Hrs.**
Experiment No. 4: Random Forest-Implement a random forest algorithm to classify data into multiple classes based on predictor variables. **(CO1,CO2,CO3)**	**02 Hrs.**
Experiment No. 5: K-Nearest Neighbor Classifier-Implement a K-Nearest Neighbors classifier on a breast cancer dataset to predict whether a tumor is malignant (cancerous) or benign (non-cancerous). **(CO1,CO2,CO3)**	**02 Hrs.**
Experiment No. 6: Naïve Bayes Classifier-Implement and evaluate a Naïvï e Bayes classifier on a dataset of email messages. **(CO1,CO2,CO3)**	**02 Hrs.**
Experiment No. 7: K-Means Clustering-Implement a k-means clustering algorithm to cluster data into multiple groups based on similarity of features **(CO1,CO2,CO3)**	**02 Hrs.**
Experiment No. 8: Association Rule Mining-Implement Apriori algorithm, to mine frequent itemsets and generate association rules from a dataset of retail transactions. **(CO1,CO2,CO3)**	**02 Hrs.**

Experiment No. 9: Neural Networks-Implement a neural network algorithm to classify data into multiple classes based on predictor variables. **(CO1,CO2,CO3)**	**02 Hrs.**
Experiment No. 10: Basic two layered artificial neural networks-Implement and train a two-layered artificial neural network to classify images of handwritten digits from the MNIST dataset **(CO1,CO2,CO3)**	**02 Hrs.**
Experiment No. 11: Microproject **(CO1,CO2,CO3)**	**02 Hrs.**

Textbooks:

1. Abhishek Vijayvargiya, BPB publications, Machine Learning with Python - an approach to applied ML.
2. Tom M. Mitchell, McGraw Hill Education; First edition Machine Learning

References:

1. John Paul Muller,Wiley Publication Machine Learning for dummies.
2. Andreas C. Müller, Sarah Guido,O'Relly Publication ,Introduction to Machine Learning with Python.

Title of the Course: Information Security Laboratory **Course Code:** UCBPC0633	**L**	**T**	**P**	**Credit**
	-	-	2	1

Course Prerequisite: Computer Network and Programming Language like Java/Python.

Course Description: This course is designed to do the practical implementation of Cryptographic algorithms and have hands-on experience on open source/free tools available to demonstrate the security concepts.

Course Learning Objectives:

1. To demonstrate encryption and authentication mechanisms.
2. To implement various cryptographic algorithms using various programming languages.
3. To make use of various security tools to analyze the security concepts

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Demonstrate encryption and authentication mechanisms.	2	Understand
CO2	Implement various cryptographic algorithms using various programming languages	2	Understand
CO3	Make use of various security tools to analyze the security concepts	3	Apply

CO-PO Mapping:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2			1									
CO2	2	2		2	3							2	
CO3	2		2		3		2					2	

Assessments :

Teacher Assessment:

One component of In Semester Evaluation (ISE) having 100% weight.

Assessment	Marks
ISE	25
ESE	--

ISE are based on practical performance/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.

Course Contents:

Experiment No. 1: Classical Encryption Techniques : Substitution Ciphers-To implement the program of substitution ciphers like Caesar Cipher, Playfair Cipher, Hill Cipher **CO1**	**02 Hrs.**
Experiment No. 2: Classical Encryption Techniques : Transposition Ciphers -To implement the program of Transposition ciphers like Rail fence technique, Columnar transposition. **CO1**	**02 Hrs.**
Experiment No. 3: Symmetric Ciphers : DES-Implement a program to perform Encryption and Decryption using DES cipher. **CO1**	**02 Hrs.**
Experiment No. 4: Symmetric Ciphers : AES-Implement a program to perform Encryption and Decryption using AES cipher **CO1**	**02 Hrs.**
Experiment No. 5: Asymmetric Ciphers : RSA Algorithm-Implement a program to perform Encryption and Decryption using RSA algorithm **CO2**	**02 Hrs.**
Experiment No. 6: Key Exchange Algorithm: Diffie Hellman Algorithm-To implement a program using Diffie Hellman key exchange algorithm. **CO2**	**02 Hrs.**

Experiment No. 7: Message Integrity using Hash function-To implement the program on Hash functions –SHA, MD5 etc to show the integrity check on the files transferred **CO2**	**02 Hrs.**
Experiment No. 8: Demonstration of SSL protocol -Working of SSL protocol using Network analyzer tools like Wireshark. **CO3**	**02 Hrs.**
Experiment No. 9: Demonstration of User Authentication Tools-Use any of the user authentication tools like Kerberos, NTLM, LDAP, RADIUS. **CO3**	**02 Hrs.**
Experiment No. 10: Demonstration of Firewall & IDS/ IPS Systems-Use any of the Windows and Linux based firewall for demonstration **CO3**	**02 Hrs.**
Experiment No. 11: Demonstration of Creation of Digital Signature & Digitally Signed Certificate. **CO3**	**02 Hrs.**
Experiment No. 12: Configuration of Virtual Private Network **CO3**	**02 Hrs.**
Textbooks:	
1. Williams Stallings, Pearson Education (LPE), 7th Edition,Cryptography and Network Security Principles and Practices.	
References:	
1. B.A. Forouzan,McGrawHill,Cryptography & Network Security. 2. Menezes, an Oorschot, and S.A. Vanstone, Handbook of Applied Cryptography.	

Title of the Course: Consumer Behaviour	L	T	P	Credit
Course Code: UCBMM0641	3	-	-	3

Course Pre-Requisite: Basics of Marketing Management.

Course Description: The course helps the students to know customer better and their buying influences.

Course Learning Objectives:

1. Understand concept and nature of consumer behavior study.
2. Differentiate between various models of consumer behavior.
3. Explain the concepts and significance of social influences on buyers.
4. Analyze the role of family life cycle and roles involved in buying.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Explain of the pre and post purchase consumer behavior.	2	Understand
CO2	Identify the dynamics of human behavior and the basic factors that influence the consumers' decision process.	3	Apply
CO3	Examine different models of consumer behavior	4	Analyze
CO4	Analyze the influence of Social determinants on consumer behavior	4	Analyze

CO-PO Mapping:

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

Assessments:

Teacher Assessment:

Assessment	Marks
ESE	100

ESE: Assessment is based on 100% course content.

Course Contents:

Unit 1: Introduction to Consumer Behavior	**CO1**	**6 Hours**
Introduction to Consumer Behavior, Concept, Scope and their applications. Nature and Need for Studying Consumer Behavior, Consumer Buying Behavior in Digital Era; Factors Influencing Consumer Behavior.		
UNIT 2: Consumer Modeling:	**CO3**	**10 Hours**
General Model of Consumer Behaviour – The Economic Model, Learning Model, Psychoanalytic Model, The Sociological Model; Specific Model of Consumer Behaviour – The Howard Sheath Model, The Nicosia Model, The Engel –Kollat-Blackwell Model.		
UNIT 3: Individual Influences on Consumer Behavior	**CO2**	**6 Hours**
Consumer needs, Motivation; Emotions and Mood, Consumer Involvement; Consumer LearningConditioning and Cognitive learning theories; Personality and Self-Concept Perception – Perceptual process, Perceptual Distortion and Factors Influencing Perception. Consumer Attitude –Attitude Formation and Change; Consumer Attitude and implications for marketers		
UNIT 4: External Influences of Consumer Behaviour	**CO2**	**7 Hours**
Need of studying Consumer behaviour, Consumer behaviour external factors, cultural behavioural factors, social factors, personal factors and psychological factors		
UNIT 5: Social Influence on Consumer Behaviour-I	**CO4**	**8 Hours**
Consumer groups; Consumer Reference Group; Family - Relevance of the Family for a Marketer, Family and Buying Decision Process, Family Life Cycle and Decision-Making. Diffusion of Innovation and Opinion Leadership		
UNIT 6: Social Influence on Consumer Behaviour-II	**CO4**	**8 Hours**
Social class and mobility Culture - The Measurement of Social Class, Relevance of Social Class for a Marketer; Culture – Characteristics, Components; Sub-Culture – Meaning and Types; Cross Culture.		

Textbooks:
1. Dheeraj Sharma, Jagadish Seth, Banwari Mittal, Consumer Behaviour – A Managerial Perspective, Cengage Learning, 2015. 2. Kardes, Cline, Cronley, Consumer Behaviour-Science and Practice, Cengage Learning, 2012. 3. Leon G. Schiffman, Leslie lazerKanuk, S. Ramesh Kumar, 10e, Pearson, 2011
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