G H Raisoni College of Engineering and Management, Pune

(An Autonomous Institute Affiliated to Savitribai Phule Pune University) Gat No. 1200, Domkhel Road, Wagholi, Pune-412207

Department of Computer Engineering

(NAAC Accredited)

T. Y. B. Tech. Course Book

(2020 Pattern)

(With effect from June 2022)

G H Raisoni College of Engineering and Management, Pune
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Department of
Computer Engineering

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Under Graduate (UG) Course Book

T.Y. B. Tech (Computer Engg.)

Semester- V/VI

INDEX

About Computer Engg. Department

- NAAC Accredited Computer Engg. Programme
- Involvement of Experts from IITs, NITs, Govt. Colleges, Reputed Industries, Alumni and Students in development of curriculum
- Choice Based Credit System (CBCS)
- Choice of Electives
- Remedial Teaching
- Sponsorship for Publications and IPR
- Research Mentorship
- Industry Internship
- Provision of Credit Transfer Scheme (CTS)
- Peer Teaching Scheme
- Teacher Guardian Scheme (TGS)
- Various Clubs and Hobby Modules
- Proficiency Courses
- Recognized Research Centre under Savitribai Phule Pune University
- Industry Supported Labs.
- MOUs with Industries.

INSTITUTE VISION AND MISSION

VISION

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and create technical manpower of global standards with capabilities of accepting new challenges

MISSION

Our efforts are dedicated to impart quality and value based education to raise satisfaction level of all stake-holders. Our strength is directed to create competent professionals. Our endeavor is to provide all possible support to promote research and development activities

DEPARTMENT VISION AND MISSION

VISION

To produce global standards ethical professionals, innovators, and entrepreneurs having strong knowledge and urge to learn latest technologies in the field of Computer Engineering.

MISSION

The department continuously strives to:

M1: Pursue excellence in Computer Engineering, able to adapt changing technologies through effective teaching-learning process.

M2: Develop competent professionals for global market with the spirit of self-study, team work, innovation and ethics.

M3: Promote continuous learning, entrepreneurial skills and research.

Programme Educational Objectives (PEOs)

PEO1: Capability to analyze, design and develop cost effective solutions to the real life problems by applying the acquired knowledge.

PEO2: Adoptability to learn latest technological advancement and interdisciplinary approaches by engaging in lifelong learning process.

PEO3: Willingness to pursue higher education, entrepreneurship, and research in the field of Computer Engineering.

PEO4: Being responsible towards society, environment, and ethical responsible team member with interpersonal and leadership skill.

Program Specific Objectives (PSOs)

At the end of the programme students will be able to demonstrate:

PSO1: The ability to analyze, design and develop software systems applying the knowledge acquired in computer core courses such as Operating system, database, computer network, computer organization and architecture, software engineering.

PSO2: The utilization of skills assimilated in basic Computer Engineering Courses to build up expertise in advanced areas of Database, Networking such as WSN, VANET, MANET, IoT, Computing etc.

PSO3: Oneself as a global standard computer professional with good morals, ethics and sensitivity towards mankind and as a responsible team member.

Program Outcomes (POs)

Engineering Graduates will be able to:

1.Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3.Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4.Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6.**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7.Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8.Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9.Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10.Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12.**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

G H Raisoni College of Engineering and Management ,Wagholi
Department of Computer Engg.

Scheme of B. Tech. in Computer Engineering
2020 Pattern
Scheme of B. Tech. in
Computer Science and Engineering

Course Code	Name of Course	Course Category	Teaching Scheme				Credits	Evaluation Scheme						
								Theory			Practical			
			L	T	P	Total Hours		TAE	CAE	ESE	INT	EXT	Total Marks	Hrs
SEMESTER-V														
UCOL301 / UCOP301	Database Management System	C14	2	1	2	5	4	10	15	50	25	25	125	2
UCOL302 / UCOP302	Software Engineering and Project Management	C15	2		2	4	3	10	15	50	25		100	2
UCOL303 / UCOP303	Web Developmen t	C16	2		4	6	4	10	15	50	25		100	2
UCOL304 / UCOP304	Compiler Design	C17	3			3	3	10	15	50			75	2
UCOP305	Cloud Computing	C21			4	4	2				25		25	
UCOL3XX	Elective - I	EL1	3			3	3	10	15	50			75	2
UHUL301	Engineering Economics and Industrial Management	H2	2			2	2	10	15	50			75	2
UHUP302	Aptitude	A11			2	2	1				25		25	
TOTAL			**14**	**1**	**14**	**29**	**22**	**60**	**90**	**300**	**125**	**25**	**600**	

Scheme of B. Tech. in
Computer Science and Engineering

Course Code	Name of Course	Course Category	Teaching Scheme				Credits	Evaluation Scheme						
								Theory			Practical		Total Marks	Hr.
			L	T	P	Total Hours		TAE	CAE	ESE	INT	EXT		
SEMESTER-VI														
UCOL306 / UCOP306	Software Testing	C18	2		2	4	3	10	15	50	25		100	2
UCOL307 / UCOP307	Unstructured Database Management	C19	2		2	4	3	10	15	50	25		100	2
UCOL308 / UCOP308	Machine Learning	C20	2		2	4	3	10	15	50	25		100	2
UCOL3XX	Elective - II	EL2	3			3	3	10	15	50			75	2
UCOOEL309X	Open Elective – II	OE2	2			2	2	10	15	50			75	2
UHUL306X	Humanities Elective	H3	2			2	2	10	15	50			75	2
UHUL304	Understanding Human Values	H4	3			3	3	10	15	50			75	2
UHUP304	Employability Skills	A12			2	2	1				25		25	
UHUP307	Campus Recruitment Training	A13			2	2	1				25		25	
TOTAL			16	--	10	26	21	70	105	350	125	--	650	

Elective	Software Development	IoT and Big Data	NLP and ML	Product Management	Soft Computing	Processing
Track	**Track-I**	**Track-II**	**Track-III**	**Track-IV**	**Track -V**	**Track -VI**
Elective-I (Credits : 3) (Semester-V)	**UCOL311-** User Interface Design and User Experience	**UCOL312-** Business Intelligence Analyst	**UCOL313-** Requirements Engineering	**UCOL314-** Data Mining	**UAIL315-** Artificial Neural Networks	**UECL307-** Digital Signal Processing
Elective-II (Credits : 3) (Semester-VI)	**UCOL316-** Backend Programming	**UCOL318** Natural Language Processing	**UCOL317-** System Analysis, Modeling & Design	**UCOL**319 Computer Vision	**UCOL318-** Fuzzy Logic	**UECL420-** Digital Image Processing

UCOOEL309A	Software testing and Quality Assurance
UCOOEL309B	Computer Network
UCOOEL302B	Information security
UCOOEL302A	Advanced TCP/IP

SEMESTER-V
Detail Syllabus

G H Raisoni College of Engineering and Management ,Wagholi
Department of Computer Engg.

Scheme of T. Y. B. Tech. in Computer Engineering
2020 Pattern

Course Code	Name of Course	Course Category	Teaching Scheme				Credits	Evaluation Scheme						Hrs
								Theory			Practical			
			L	T	P	Total Hours		TAE	CAE	ESE	INT	EXT	Total Marks	
SEMESTER-V														
UCOL301 / UCOP301	Database Management System	C14	2	1	2	5	4	10	15	50	25	25	125	2
UCOL302 / UCOP302	Software Engineering and Project Management	C15	2		2	4	3	10	15	50	25		100	2
UCOL303 / UCOP303	Web Development	C16	2		4	6	4	10	15	50	25		100	2
UCOL304 / UCOP304	Compiler Design	C17	3			3	3	10	15	50			75	2
UCOP305	Cloud Computing	C21			4	4	2				25		25	
UCOL3XX	Elective - I	EL1	3			3	3	10	15	50			75	2
UHUL301	Engineering Economics and Industrial Management	H2	2			2	2	10	15	50			75	2
UHUP302	Aptitude	A11			2	2	1				25		25	
TOTAL			**14**	**1**	**14**	**29**	**22**	**60**	**90**	**300**	**125**	**25**	**600**	

UCOL301: Database Management System		
Teaching Scheme:	**Credit:**	**Examination Scheme:**
Lectures: 03 Hrs./Week	**3**	**TAE:** 10 Marks ,**CAE:** 15 Marks, **ESE :50** Marks

Prerequisite (If any):

Course Objectives: After completing this course, student will able to

This course introduces general idea of database management system, also gives idea to design databases using data modeling and design techniques.

It is also aimed to developing skills to implement real life applications which involve database handling.

This course also provide carrier opportunities in subject areas of designing, storage techniques and data handling and managing techniques

Course Outcomes:

CO1: Analyze an information storage problem and derived an information model expression in the form of Entity relation diagram and design appropriate data model for it.

CO2: Demonstrate SQL queries to perform CRUD (Create, Retrieve, Update, Delete) operations on database and perform inferential analysis of data model

CO3: Identify features of database management systems and Relational database and Understand functional dependencies and various normalization forms

CO4: Perform basic transaction processing and management and ensure database security, integrity and concurrency control

CO5: Analyze the management of structured and unstructured data management with recent tools and technologies

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

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Contents	Hrs.
Unit I: Introduction to DBMS	6
Introduction to DBMS - DBMS Architecture, Data Models, E-R Diagram, Relational Database design:	
Unit II: SQL Concepts	**8**
SQL Concepts - Basics of SQL, DDL, DML, DCL, structure – creation, alteration, defining constraints, Functions - aggregate functions, Built-in functions –numeric, date, string functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All , view and its types.	
Unit III: Relational Database Design	**5**
Functional Dependency (FD) – Basic concepts, closure of set of FD, closure of attribute set, Decomposition, Normalization – 1NF, 2NF, 3NF, BCNF, 4NF, Query Optimization	
Unit IV: Transaction Management	**7**
Transaction control commands – Commit, Rollback, Save point. Transaction Management: Transaction concepts, properties of transactions, serializability of transactions, Two- Phase Commit protocol, Deadlock, two-phase locking protocol. Cursors, Stored Procedures, Stored	

Function, Database Triggers.	
Unit V: Graphs and their Applications	4
NoSQL Databases - Introduction, CRUD Operations, Data Mining, Advances in databases	

Text Books		
	1.	Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts 4th Ed, McGraw Hill, 2002.
	2.	Jeff Ullman, and Jennifer Widom, A First Course in Database systems, 2nd Ed.
Reference Books	1.	G. K. Gupta :"Database Management Systems", McGraw – Hill.
	2.	Regina Obe, Leo Hsu, PostgreSQL: Up and Running, 3rd Ed, O'Reilly Media 2017.
	3.	Kristina Chodorow, Shannon Bradshaw, MongoDB: The Definitive Guide, 3rd Ed, O'Reilly Media 2018.
	4.	RamezElmasri and ShamkantNavathe, Fundamentals of Database Systems 2nd Ed, Benjamin Cummings, 1994.
online TL Material Text Books	1.	https://nptel.ac.in/courses/106/105/106105175/

UCOL301**: Database Management Systems lab**		
Teaching Scheme:	**Credit**	**Examination Scheme**
Practical: 02 Hrs./Week	**1**	**INT :25 Marks Ext: 25 Marks**
Course Outcomes : On completion of the course, student will be able to–		
CO1: Analyze an information storage problem and derived an information model expression in the form of Entity relation diagram and design appropriate data model for it.		
CO2: Demonstrate SQL queries to perform CRUD (Create, Retrieve, Update, Delete) operations on database and perform inferential analysis of data model		
CO3: Identify features of database management systems and Relational database and Understand functional dependencies and various normalization forms		
CO4: Perform basic transaction processing and management and ensure database security, integrity and concurrency control		
Sr. No	**List of Laboratory Assignments(*Any 8)**	
1	Draw E-R diagram and convert entities and relationships to relation table for a given scenario. a. Two assignments shall be carried out i.e. consider two different scenarios (eg. bank, college, Employee, Hotel etc)	
2	To perform following SQL activity: a) Creating a database b) Creating Tables (With and Without Constraints) c) Inserting Record in table	
3	To Perform the following: a. Viewing all databases, Viewing all Tables in a Database, Updating/Deleting Records in a Table	
4	To Perform the following SQL query on database: a. Altering a Table, Dropping/Truncating/Renaming Tables, Backing up / Restoring a Database	

5	For a given set of relation schemes, create tables and perform the following Simple Queries: Simple Queries with Aggregate functions, Queries with Aggregate functions (group by and having clause), Queries involving- Date Functions, String Functions , Math Functions
6	To perform SQL query that demonstrate Join Queries- Inner Join, Outer Join, Left join, Right Join
7	To perform SQL query that demonstrate following: Search conditions, Summary queries, Sub- queries, Subqueries- With IN clause, With EXISTS clause
8	To perform SQL query for extracting data from more than one table using SQL concept
9	To perform SQL query to understand the concepts: Transaction, ROLL BACK, COMMIT & CHECK POINTS.
10	Open ended practical on NOSQL

UCOL302**: Software Engineering and Project Management**		
Teaching Scheme:	**Credit:**	**Examination Scheme:**
Lectures: 02 Hrs./Week	**2**	**TAE:** 10 Marks ,**CAE:** 15 Marks, **ESE :50** Marks
Prerequisite (If any):		
Course Objectives: The student should be made to:		
1. Understand the phases in a software project		
2. Understand various documentations in a software Industry related to the software development		
3. Understand fundamental concepts of requirements engineering and Analysis Modelling.		
4. Understand the major considerations for enterprise integration and deployment.		
5. Learn various testing and maintenance measures		
Course Outcomes:		
CO1: Identify the key activities in managing a software project.		
CO2: Compare different process models.		
CO3: Understand the Concepts of requirements engineering and Analysis Modeling.		
CO4: Apply systematic procedure for software design and deployment		
CO5: Apply the methodology of different types of testing.		

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	**PSO3**
CO1:	3	2	3		-	-	-	-	-	-	3	-		-	-
CO2:	3	2	3		2	-	-	-	-	-	3	-		-	-
CO3:	2	3	3		-	-	-	1	-	-	3	-	3	2	-
CO4:	2	3	3		1	-	-	-	-	-	3	-	3	3	-
CO5:	3	-	3		3	-	-	-	-	-	3	-	3	3	-

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Contents	**Hrs.**
Unit I: INTRODUCTION TO SOFTWARE PROCESS:	**8**
Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models – Software Project Management: Estimation – LOC and FP Based Estimation, COCOMO Model – Project Scheduling – Scheduling, Earned Value Analysis – Risk Management.	
Unit II: REQUIREMENTS ANALYSIS AND SPECIFICATION:	**8**
Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management-Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary.	
Unit III: SOFTWARE DESIGN:	**8**
Design process – Design Concepts- Design Model– Design Heuristic – Architectural Design – Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.	
Unit IV: TESTING AND IMPLEMENTATION	**8**
Software testing fundamentals-Internal and external views of Testing-white box testing – basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging – Software Implementation Techniques: Coding practices-Refactoring.	
Unit V: PROJECT MANAGEMENT	8
Estimation – FP Based, LOC Based, Make/Buy Decision, COCOMO II – Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection, RMMM – Scheduling and Tracking –Relationship between people and effort, Task Set & Network, Scheduling, EVA – Process and Project Metrics. Introduction of Recent trends in software engineering such as Agile methodology ,scrum, pair programming	

Text Books	1.	Roger S. Pressman, "Software Engineering – A Practitioner's Approach", 8th Edition, McGraw-Hill International Edition, 2019.
	2.	Stephen R.Schach, "Software Engineering", Tata McGraw-Hill Publishing Company Limited, 2018
Referenc e Books	1.	Ian Sommerville, "Software Engineering", 10th Edition, Pearson Education Asia, 2017.
	2.	Rajib Mall, "Fundamentals of Software Engineering", 4th Edition, PHI Learning Private Limited, 2014.
online TL Material Text Books	1.	https://onlinecourses.nptel.ac.in/noc19_cs69/preview
	2.	https://onlinecourses.swayam2.ac.in/cec20_cs07/preview

UCOL302: **Software Engineering and Project Management**		
Teaching Scheme:	**Credit**	**Examination Scheme**
Practical: 02 Hrs./Week	**1**	**INT :25 Marks Ext: NA**
Course Outcomes : On completion of the course, student will be able to–		
CO1: Compare different process models.		
CO2: Understand the Concepts of requirements engineering and Analysis Modeling.		
CO3: Apply systematic procedure for software design and deployment		
CO4: Apply the methodology of different types of testing.		

Sr. No	**List of Laboratory Assignments(*Any 8)**
1	Identification of Project and write problem statement for the project.
2	Preparing Software Requirement Specification Document
3	Design of the Software Design Document
4	Preparing Project Plan with Gant Chart
5	Prepare Use Case Diagram for the identified project
6	Prepare the model for your project with Agile Methodology
7	Identify Test cases
8	Prepare the estimation of cost for identified project
9	Open Ended Practical1
10	Open Ended Practical2

UCOL303:**Web Development**		
Teaching Scheme:	**Credit:**	**Examination Scheme:**
Lectures: 02 Hrs./Week	**2**	**TAE:** 10 Marks ,**CAE:** 15 Marks, **ESE :50** Marks
Prerequisite (If any):		
Course Objectives: After completing this course, student will able to		
1. understanding basic principles of web designinng		
2. To learn web page creation using HTML		
3. To learn dynamic website design using CSS & JAVA Script		
Course Outcomes:		
CO1: Explain the basic principles of web designing		
CO2: Implement all basic tags in HTML		
CO3: Design the web page exploring different tags		

CO4: Make the dynamic website using HTML, CSS & JAVA Script

CO5: Do the web hosting

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	P
Co1	3											2			
Co2		3										3			
Co3		2	2									3			
Co4			2									2			
Co5			2									2			

Course Contents	Hrs.
Unit I: Web Design Principles	**8**
Web Design Principles: Basic principles involved in developing a web site, Planning process, Designing navigation bar, Page design, Home Page Layout Design Concept., Brief History of Internet, What is World Wide Web, Why create a web site, Web Standards	
Unit II: Introduction to HTML	**8**
Introduction to HTML: What is HTML**,** HTML Documents**,** Basic structure of an HTML document**,** Creating an HTML document**,** Mark up Tags**,** Heading-Paragraphs**,** Line Breaks**,** HTML Tags.	
Unit III:	**8**
Elements of HTML: Introduction to elements of HTML**,** Working with Text**,** Working with Lists, Tables and Frames**,** Working with Hyperlinks, Images and Multimedia**,** Working with Forms and controls	
Unit IV:	**8**
Introduction to Cascading Style Sheets & JAVA Script: Concept of CSS**,** Creating Style Sheet**,** CSS Properties**,** CSS Styling(Background, Text Format, Controlling Fonts)**,** Working with block elements and objects**,** Working with Lists and Tables**,** CSS Id and Class**,** Box Model, Advanced CSS, JAVA Script Introduction, Application, Advantages, Popup Boxes, Programming details, Class & object	
Unit V:	8
Introduction to Web Publishing or Hosting: Creating the Web Site, Saving the site**,** Working on the web site**,** Creating web site structure**,** Creating Titles for web pages**,** Themes-Publishing web sites.	

Text Books	1.	HTML 5 in simple steps by Kogent Learning Solutions Inc. Dreamtech Press
	2.	HTML, XHTML, and CSS Bible, 5ed Steven M. Schafer , Wiley India
E--Books	1.	
Reference Books	1.	Web Technologies: HTML, Javascript, Kogent Learning, Wiley India
	2	
on line TL Material	1.	
	2.	
	3.	

UCOL303:**Web Development Lab**		
Teaching Scheme:	**Credit**	**Examination Scheme**
Practical: 04 Hrs./Week	**2**	**INT :25 Marks Ext: NA**
Course Outcomes : On completion of the course, student will be able to–		
CO1: Explain the basic principkes of web designing		
CO2: Implement all basic tags in HTML		
CO3: Design the web page exploring different tags		
CO4: Make the dynamic website using HTML, CSS & JVAScript		
CO5: Do the web hosting		

Sr. No	**List of Laboratory Assignments(*Any 8)**
1	Implementing Basic tags in HTML
2	Design a web page using table tag exploring all attributes
3	Design a form in html considering all input types
4	Design a web page using inline & embedded CSS
5	Design webpage using external CSS
6	Design & implement all types of popup boxes using JAVA Script
7	Design a calculator in html using JAVAScript taking inputs from user
8	Design a dynamic website using combinations of HTML, CSS & JAVA Script
9	Webhosting
10	Explore the different open source web designing tools
	Open Ended Experiments / New Experiments
11	Design a web page using Wordpress
12	Creating blog using open source tool

UCOL304 **Compiler Design**		
Teaching Scheme:	**Credit:**	**Examination Scheme:**
Lectures: 03 Hrs./Week	**3**	**TAE:** 10 Marks ,**CAE:** 15 Marks, **ESE :50** Marks

Prerequisite (If any):

Course Objectives: After completing this course, student will able to

1. This course introduces student general ideas of compiler.
2. This course introduces to use regular languages to describe the lexical elements of a programming language and understand syntax analysis.
3. Aimed to develop skills to understand optimization technique

Course Outcomes:

CO1 Understand basic concepts of compiler and different phases of compiler.

CO2 Explain the role of a semantic analyzer and describe the purpose of a syntax tree.

CO3 Apply context free grammars, compiler parsing techniques, construction of abstract syntax trees, symbol tables.

CO4 Demonstrate lexical analysis using a finite automata along with error recovery.

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO3**
Co1	**3**											**2**			1
Co2	3	-	-	3	-	1	2	3	3	-	-	3	-	1	1
Co3	3	3	-	3	1	1	2	3	3	3	-	3	1	1	-
Co4	3	2	-	2	-	-	1	3	3	2	-	2	-	-	-
Co5	2	-	3	2	-	-	-	2	2	-	3	2	-	-	-

Course Contents	**Hrs.**
Unit I: INTRODUCTION TO COMPILERS	**8**
INTRODUCTION TO COMPILERS Overview of compiler and translator, types of Compiler, Analysis of the Source Program, The Phases of a compiler, grouping of phases, Cousins of the Compiler, design of lexical Analysis, compiler writing tools, Cross compiler- bootstrapping Brief introduction of other system software like Assembler, linker, loader	
Unit II: SYNTAX	**8**
SYNTAX ANALYSIS Review of Context-Free Grammars – Derivation trees and Parse Trees, Ambiguity. Top-Down Parsing: Recursive Descent parsing, Predictive parsing, LL(1) Grammars. Bottom-Up Parsing: Shift Reduce parsing – Operator precedence parsing (Concepts only)LR parsing – Constructing SLR parsing tables, Constructing, Canonical LR parsing tables and Constructing LALR parsing tables.	
Unit III: SEMANTIC ANALYSIS	**8**
SEMANTIC ANALYSIS Need of semantic analysis, Abstract Parse trees for Expressions, variables, statements, functions and class declarations, Syntax directed definitions, Syntax directed translation	

schemes for declaration processing, type analysis, scope analysis, Symbol Tables (ST), Organization of ST for block structure and non block structured languages, Symbol Table management	
Unit IV: INTERMEDIATE CODE GENERATION AND ERROR RECOVERY	**8**
INTERMEDIATE CODE GENERATION AND ERROR RECOVERY Intermediate code generation: Intermediate languages, Design issues, Translation of different language features, different types of intermediate forms. Error Handling and Recovery in Syntax Analyzer-YACC-Design of a syntax Analyzer for a Sample Language.	
UnitV:CODEOPTIMIZATION	8
CODEOPTIMIZATION Principal Sources of Optimization-DAG- Optimization of Basic Blocks-Global Data Flow Analysis-Efficient Data Flow Algorithms-Issues in Design of a Code Generator - A Simple Code Generator Algorithm. Recent trends and Compiler tools, advanced topics & its Application. Virtual Machines and Interpretation Techniques, Just-In-Time (JIT) and Adaptive Compilation.	

Text Books	1.	Alfred V. Aho, Monica S.Lam, R. Sethi and J.D. Ullman "Compilers: principles, techniques and tools" Pearson Education.
	2.	"Modern Compiler Implementaton in ML" by Andrew W. Appel, Cambridge University Press, 1998.
E--Books	1.	Introduction to Compilers and Language Design - by Prof. Douglas Thain University of Notre Dame https://www3.nd.edu/~dthain/compilerbook/compilerbook.pdf
Reference Books	1.	Kenneth C Louden, "Compiler Construction Principle and Practice", PWS publishing Company, 1997
	2.	Dhamdhere D.M., "Compiler Construction Principle and Practice", Mac. Millan India, New Delhi, 1983

UCOL305: CLOUD COMPUTING		
Teaching Scheme:	**Credit:**	**Examination Scheme:**
Lectures: 03 Hrs./Week	**3**	**TAE:** 10 Marks ,**CAE:** 15 Marks, **ESE :50** Marks

Prerequisite (If any)ty:

Course Objectives:

1. To understand Cloud Computing concepts, technologies, architecture and applications
2. To understand the underlying principle of cloud virtualization, cloud storage, data management and data visualization
3. To understand different cloud programming platforms and tools to develop and deploy applications on cloud

Course Outcomes:

CO1: Develop and deploy cloud application using popular cloud platforms

CO2: Design and develop highly scalable cloud-based applications by creating and configuring virtual machines on the cloud and building private cloud

CO3: Design and deploy a cloud application in a PaaS environment

CO4: Develop cloud computing solutions for an enterprise

CO5: Analyze various cloud programming models and apply them to solve problems on the cloud

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	**Program Outcomes and Program Specific Outcomes**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3											2	
CO2					3								2	
CO3			3											3
CO4				3										3
CO5					3									3

Course Contents	**Hrs.**
Unit I:	**8**
Overview, Applications, Intranets and the Cloud. Your Organization and Cloud Computing- Benefits, Limitations, Security Concerns. Software as a Service (SaaS)- Understanding the Multitenant Nature of SaaS Solutions, Understanding SOA. Platform as a Service (PaaS)-IT Evolution Leading to the Cloud, Benefits of Paas Solutions, Disadvantages of PaaS Solutions. Infrastructure as a Service (IaaS)-Understanding IaaS, Improving Performance through Load Balancing, System and Storage Redundancy, Utilizing Cloud-Based NAS Devices, Advantages, Server Types. Identity as a Service (IDaaS).	
Unit II:	**8**
Introduction, Characteristics of Virtualized environments, Taxonomy of Virtualization techniques, Pros and Cons of Virtualization, Technology examples: Xen, KVM, Vmware, Microsoft Hyper-V.	
Unit III:	**8**
Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo Cloud data stores: Datastore and Simple	

DB Gautam Shrauf, Cloud Storage-Overview, Cloud Storage Providers. [Anthony T. Velte]3 Securing the Cloud- General Security Advantages of Cloud-Based Solutions, Introducing Business Continuity and Disaster Recovery. Disaster Recovery- Understanding the Threats.	
Unit IV:	**8**
Infrastructure as Service, best-of breed cloud infrastructure components, cloud ready converged infrastructure, Virtual machine provisioning and migration services, Anatomy of Cloud infrastructure, Distributed management of virtual infrastructure, scheduling techniques, SLA Commitment	
Unit V:	8
Introduction and architecture for federated cloud computing, Performance prediction for HPC on Cloud. SLA management: Types of SLA, Life cycle of SLA, Traditional approaches of SLA. Management responsibilities, lifecycle management, cloud management products, Cloud management standards.	

Text Books	1.	Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley,2011
	2.	Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff, Cambridge University Press, 2010
	3.	Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
Reference Books	1.	Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley- India,2010
online TL Material Text Books	1.	https://onlinecourses.nptel.ac.in/noc19_cs69/preview
	2.	https://onlinecourses.swayam2.ac.in/cec20_cs07/preview

UCOP305: CLOUD COMPUTING **lab**		
Teaching Scheme:	**Credit**	**Examination Scheme**
Practical: 04 Hrs./Week	**2**	**INT :25 Marks Ext: NA**
Course Outcomes : On completion of the course, student will be able to–		
CO1: Develop and deploy cloud application using popular cloud platforms		
CO2: Design and develop highly scalable cloud-based applications by creating and configuring virtual machines on the cloud and building private cloud		
CO3: Design and deploy a cloud application in a PaaS environment		
CO4: Develop cloud computing solutions for an enterprise		
CO5: Analyze various cloud programming models and apply them to solve problems on the cloud		

Sr. No	**List of Laboratory Assignments(*Any 8)**
1	Explore AWS Cloud Based IaaS Service
2	Implement Virtualization using Virtualbox/ VMware Workstation
3	Creating a Warehouse Application in SalesForce.com PaaS
4	Explore Cloud Services using CloudSim Simulator
5	Explore Cloud Service using Google Cloud
6	Explore Cloud Service and table formation using Microsoft Azure Cloud
7	Creating a Warehouse Application in SalesForce.com PaaS
8	Explore open source cloud platform Openstack
9	Implement container management with Kubernetes
10	Implement DevOps and MLOPS using Cloud
Open Ended Experiments	
1	Explore different IoT Cloud Framework
2	Explore Fog Computing Framework

UCOL311:User Interface Design and User Experience

Teaching Scheme:	Credit:	Examination Scheme:
Lectures: 03 Hrs./Week	**3**	**TAE:** 10 Marks , **CAE:** 15 Marks, **ESE :50** Marks

Prerequisite (If any):

Course Objectives: After completing this course, student will able to

1. To analyze and prepare design ideas in a constructive manner
2. To analyze an interaction design problem and propose a user-centered process, justifying the process and identifying the trade-offs.
3. To create a high quality, professional documentation and artifacts relating to the design process for preparation for a professional portfolio.

Course Outcomes:

CO1: Describe the Characteristics of User Interface design and its Principles

CO2: Discuss the issues and challenges for achieving a user-centered design process, especially with regard to prototyping and evaluation techniques

CO3: Use, adapt and extend design standards, design components, guidelines, and patterns focusing on user experience

CO4: Identify best practices of web color management, principles of designing APP, and web usability in designing responsive web pages.

CO5: Create storyboards, video scenarios, and experience prototypes for a small system and plan and perform a real world deployment study of a user experience.

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	**3**												**2**		
CO2	**3**	**3**											**2**		
CO3	**1**	**2**	**3**	**2**									**3**		
CO4			**3**		**2**								**3**		
CO5			**2**	**1**	**3**									**3**	

Course Contents	**Hrs.**
Unit I: Introduction	**7**
Introduction to User Interface Design (UI), Brief History of UI Design. Human Computer Interface, Characteristics of Graphics Interface, Direct Manipulation Graphical System, Web User Interface: Popularity, Characteristic & Principles.	
Unit II: User Design Process	**8**
User Design Process: - Introduction to design process, User centered design process, Usability Engineering and Task centered Approaches. Introduction to Design centered Approaches, Design Centered Methods. Prototyping in practice- Design rationale and Evaluation techniques. Examples of test cases and their formats "Model-View-Controller (MVC) Framework	
Unit III: User Experience design	**8**
User Experience design component in Interface Design, Visual Communication design component in Interface Design. System menus and navigation schemes, Structures of menus, Functions and contents of menus, Formatting, Phrasing, Navigating, Selecting menu choices, and kinds of	

graphical menus. Windows: Characteristics components presentation styles Type's Management's organizations operations. Web systems device based controls, characteristics Screen -based controls, operate control - text boxes-selection control combination control-custom and control-presentation control.	
Unit IV: Web Design	**8**
Web Design, Design techniques such as scenarios, personas, storyboards, wire framing, and information architecture. App Design and its principles. Prototyping tools, both low-fidelity and high-fidelity. Design for small screens, responsive design. Non-GUI design (e.g., auditory interfaces, gesture interfaces). Understanding the Designing language of Desktop, Web and Mobile. Flow & Layout & Organizational structures. Swing Programming Intro & Widgets. UI Widgets & Input Devices.	
Unit V:	**5**
Case Studies and Best Practices based on advance and recent technology for designing UI/UX. User interface management system (UIMS) –Case study.	

Text Books	1.	Wilbent. O. Galitz ,"The Essential Guide to User Interface Design", John Wiley& Sons, 2001
	2.	Ben Sheiderman, "Design The User Interface", Pearson Education, 1998.
E--Books	1.	Introduction to UI Design https://www.coursera.org/learn/ui-design
	2	Introduction to User Experience Design https://www.coursera.org/learn/user-experience-design
Referenc e Books	1.	Greenberg, S., Carpendale, S., Marquart, N., and Buxton, B. (2011) Sketching User Experiences: The Workbook. San Francisco: Morgan
	2.	Alan Cooper, "The Essential Of User Interface Design", Wiley – Dream Tech Ltd.,2002.
	3.	Buxton, B. (2007) Sketching User Experiences. Sketching User Experiences. San Francisco: Morgan Kaufmann. (Amazon)
Online TL Material	1.	https://onlinecourses.nptel.a c.in/noc21_ar05/ User Interface Design
	2.	https://www.coursera.org/specializations/ui-ux-design

UCOL312: Business Intelligence Analyst		
Teaching Scheme:	**Credit:**	**Examination Scheme:**
Lectures: 03 Hrs./Week	**3**	**TAE:** 10 Marks , **CAE:** 15 Marks, **ESE :50** Marks

Prerequisite (If any):

Course Objectives: After completing this course, student will able to

1. Introduce concepts of Business Intelligence analyst in the field of Engineering.
2. Develop skills and solve engineering problems based on Analytics.
3. Analyze concepts of Differential and Inferential in the field of Engineering.
4. solve applications based problems on analytics methods

Course Outcomes:

CO1: Understand and use the analytics to solve the business problem and engineering problems in respective disciplines.

CO2: Determine the statistics on the basis of Differential and inferential and apply to various engineering problems in respective disciplines.

CO3: Apply the concepts of regression in solving engineering problems.

CO4: Use Clustering and Classification to solve various problems in Engineering.

CO5: Apply the Knowledge of Analytics to solve various problems in Engineering.

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	3	2	1	1	--	--	--	--	--	--	3	3	3	2
CO2	3	3	2	1	1	--	--	--	--	--	--	3	3	3	2
CO3	3	3	2	1	1	--	--	--	--	--	--	3	3	3	2
CO4	3	3	2	1	1	--	--	--	--	--	--	3	3	3	2
CO5	3	3	2	1	1	--	--	--	--	--	--	3	3	3	2

Course Contents	**Hrs.**
Unit I: Introduction	**4**
Buzzwords, Analysis vs. Analytics, Business Analytics, Data Analytics and Data Science, Adding BI and ML, Info graphic. Data Analytics Life Cycle	
Unit II: Descriptive and Inferential Statistics	**6**
Descriptive Statistics Population and Sample, Types of Data, Measurement Levels, Representation of categorical variables, Measures of Central Tendency (Mean, Median, Mode), Skewness ,Variance, Standard Deviation, Coefficient of Variation, Covariance, Correlation **Inferential Statistics** Distribution, Standard Error, Estimators and Estimates	
Unit III: Regression	**8**

Linear Regression Introduction to Regression Simple and Multiple Linear Regression, Correlation vs. Regression , SST (Sum of Squares Total) , SSR (Sum of Squares Regression) , SSE (Sum of Squares Error) , R-Square Adjusted R-Squared **Multiple Linear Regression** Multiple Linear Regression **,** Regression using Data Analysis toolbox of Excel**,** Significance of P-Value	
Unit IV: Clustering and Classification	**8**
Clustering Introduction to clustering and classification, K-means clustering, Clustering Categorical **,** Data How to choose Number of Clusters **,** Pros and Cons of K-Means Clustering**,** Relationship between Clustering and Regression **,** Market Segmentation with Cluster Analysis **Classification** Introduction to Classification **,** Classification Applications **,** Logistic Regression **,** Classification using SVM**,** K-nearest neighbor**,** Decision Trees.	
Unit V: DBMS and BIRT	**5**
Introduction to databases , Schema creation , Keys , Relation Creations , Data Insertion , SELECT: Data Retrieval , Drop and Truncate Relation, Data Upload via CSV file ,Where clause , Order by Clause , Aggregate functions, Group by Clause, And Or In Not In , Between , Like Not Like , Distinct , Nested Queries , Aggregate Functions , Having Clause , Union Intersection ,Joins (Inner, Left, Right, Full Outer), Business Performance Management Systems	

Text Books	1.	Business Analytics: Data Analysis & Decision Making, By S. Christian Albright, Wayne L. Winston · 2016
	2.	Business Intelligence and Analytics: Systems for Decision Support 10th Edition ISBN-13: 978-0133050905 by Ramesh Sharda, Dursun Delen
E--Books	1.	
	2	
Reference Books	1.	Business Intelligence Guidebook: From Data Integration to Analytics 1st Edition by Rick Sher
	2.	**Introduction to Database Management Systems Book by Atul Kahate**
Online TL Material	1.	

UCOL313**:** Requirements Engineering		
Teaching Scheme:	**Credit:**	**Examination Scheme:**
Lectures: 03 Hrs./Week	**3**	**TAE:** 10 Marks ,**CAE:** 15 Marks, **ESE :50** Marks

Prerequisite (If any):

Course Objectives:

To capture software requirements and handle difficult situations in gathering data to build systems.

To address elicitation, specification, and management of software system requirements.

Examines iterative prototyping user interactions for a system.

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

CO1 To design, implement and evaluate a computer-based system, process, component, or program to meet desired needs

CO2 To understand professional, ethical, legal, security, and social issues and responsibilities

CO3 To use current techniques, skills, and tools necessary for computing practices

CO4 To develop and present a talk on the status of a project

CO5 To develop a written report on a project based on Requirements

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	**Program me Outcomes**						**program me Specific Outcomes**	
	PO1	**PO2**	**PO3**	**PO5**	**PO8**	**PO11**	**PSO1**	**PSO2**
CO1	3	2	3	-	-	3	-	-
CO2	3	2	3	-	-	3	-	-
CO3	2	3	3	2	1	3	3	2
CO4	2	3	3	-	-	3	3	3
CO5	3	-	3	1	-	3	-	3

Course Contents	**Hrs.**
Unit I: An Introduction to Requirement Engineering	**7**
An Introduction to Requirement Engineering Framework for Requirements Engineering ,Rationale for Requirements Engineering and the problems with requirements , The definition and characteristics of a requirement ,The characteristics of a requirements engineering process, The problems of defining requirements ,A framework for Requirements Engineering, Requirement Engineering activities – elicitation, analysis, validation, documentation and management , The importance of requirements planning and estimating	
Unit II: Hierarchy of Requirements	**8**
Hierarchy of Requirements Building the hierarchy through decomposition of requirements, Categories of requirements , Functional requirements, Non-functional requirements, including performance, usability, access,	

security, archiving, backup and recovery, availability, robustness	
Unit III: Stakeholders Needs and Analysis	**8**
Stakeholders Needs and Analysis The definition of the term 'stakeholder', Project Stakeholders, Business Stakeholders, External stakeholders , Requirements Elicitation, Elicitation techniques	
Unit IV: Use of models in Requirements Engineering	**8**
Use of models in Requirements Engineering The purpose of modelling requirements , Generating questions, Cross-checking for consistency and completeness, Defining business rules, Use case diagram, Class diagram, Requirements Documentation	
Unit V: Requirements Analysis and Management	8
Requirements Analysis and Management Requirements Validation, Types of reviews, Stakeholders and their areas of concern, Dealing with changing requirements, The importance of traceability, Requirements Engineering support tools, CARE, CASE, Case study of Scrum and agile Model	

Text Books	1.	Software & Systems Requirements Engineering in Practice, by Brian Berenbach, et al (ISBN 978-0-07-160547-2)
	2.	Requirements Engineering: Processes and Techniques, Gerald Kotonya and Ian Sommerville, published by John Wiley & Sons April 1998 ISBN: 0471972088
Reference Books	1.	Managing Software Requirements: A Use Case Approach, Second Edition, by Dean Leffingwell and Don Widrig (ISBN 0-321-12247-X) - for handy reference
	2.	Interaction Design: beyond human-computer interaction, Third Edition, by Jennifer Preece, Yvonne Rogers and Helen Sharp (0-978-0-470-66576-3) - for reference on this subject

UCOL314**:** DATA MINING		
Teaching Scheme:	**Credit:**	**Examination Scheme:**
Lectures: 03 Hrs./Week	**3**	**TAE:** 10 Marks ,**CAE:** 15 Marks, **ESE :50** Marks

Prerequisite (If any):

Course Objectives:

To identify the scope and essentiality of Data Mining.

To analyze data, choose relevant models and algorithms for respective applications.

To develop research interest towards advances in data mining

To identify the scope and essentiality of Data Mining.

Course Outcomes:

CO1 To Understand Data and Data Mining Principles

CO2 To Identify appropriate data mining algorithms to solve real world problems

CO3 To compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining

CO4 To describe complex data types with respect to spatial and web mining

CO5 To benefit the user experiences towards research and innovation.

Course Outcomes	Program Outcomes and Program Specific Outcomes													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2
CO1	2	3											2	2
CO2	2		3										1	
CO3	2	2		3									2	2
CO4	2		3										2	2
CO5	2		3										2	

Course Contents	**Hrs.**
Unit I:	**8**
Introduction to data mining: What is Data Mining? What is the Data Mining Process? Basic Data Mining Tasks, Problem Identification, Data Mining Metrics, Data Cleaning (pre-processing, feature selection, data reduction, feature encoding, noise and missing values, etc.), Key Issues, Opportunities for Data Mining.	
Unit II::	**8**
Mining frequent patterns, associations and correlations: Basic concepts, efficient and scalable frequent item set mining algorithms, mining various kinds of association rules – multilevel and multidimensional, association rule mining versus correlation analysis, constraint based association mining.	
Unit III:	**8**
Classification and prediction: Definition, decision tree induction, Bayesian classification, rule based classification, classification by backpropagation and support vector machines, associative	

classification, lazy learners, prediction, accuracy and error measures.	
Unit IV: TESTING AND IMPLEMENTATION	**8**
Cluster analysis: Definition, clustering algorithms - partitioning, hierarchical, density based, grid based and model based; Clustering high dimensional data, constraint based cluster analysis, outlier analysis – density based and distance based	
Unit V: PROJECT MANAGEMENT	8
Data mining on complex data and applications: Algorithms for mining of spatial data, multimedia data, text data; Data mining applications, social impacts of data mining, trends in data mining.	

Text Books	1.	Han, J. and Kamber, M., "Data Mining - Concepts and Techniques", 3rd Ed., Morgan Kaufmann Series.
	2.	Ali, A. B. M. S. and Wasimi, S. A., "Data Mining - Methods and Techniques", Cengage Publishers
Reference Books	1.	Tan, P.N., Steinbach, M. and Kumar, V., "Introduction to Data Mining", Addison Wesley – Pearson.
	2.	Pujari, A. K., "Data Mining Techniques", 4th Ed., Sangam Books.

UECL307**:** Digital signal Processing		
Teaching Scheme:	**Credit:**	**Examination Scheme:**
Lectures: 03 Hrs./Week	**3**	**TAE:** 10 Marks ,**CAE:** 15 Marks, **ESE :50** Marks

Prerequisite (If any):

Course Objectives:

To study different types of signals and systems

To understand transformation tools for analysis of signals & systems

To learn design of various digital filters and use of DSP processor for real time applications

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

CO1: Understand fundamentals and applications of discrete-time signals and systems

CO2: Apply Z transform to discrete-time signals and systems

CO3: Apply Fourier transform to discrete-time signals and systems

CO4: Design digital filters for discrete time signals for applications

CO5: Understand architecture and functioning of DSP processor for real time applications

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O 2	PS O3
CO1															
CO2															
CO3															
CO4															
CO5															

Course Contents	**Hrs.**
Unit I: Introduction	**8**
Introduction to discrete signals & Systems, Operations on Discrete signals**,** Z- Transform representation, ROC, Z-transform properties, Inverse Z-Transforms Methods, applications of Z-Transform & Inverse Z-Transforms.	
Unit II: Transform Analysis of LTI Systems	**8**
Frequency analysis of discrete time signals, Discrete Time Fourier Transform and Discrete Fourier Transform, Properties, Inverse Discrete Fourier Transform, Efficient Computation of DFT using FFT algorithms, Linear Filtering approach to computation of DFT, FFT of long sequences using overlap add and overlap save method.	
Unit III: Digital Systems Structures	**8**
Structures for FIR Systems and IIR Systems, representation of Structures using Block diagram & Signal Flow Graph	
Unit IV: Digital Filters	**8**

Design of IIR filters from analog filters using Impulse Invariant Method, Bilinear Transformation, Matched Z-Transformation, Butterworth Approximation, Chebyshev, FIR filters design Methods-Windowing, Hamming & Kaiser.	
Unit V: DSP Processor & Applications	8
Desirable Features of DSP Processors, Types of Architectures of DSP processor, Multirate signal processing, Adaptive filtering, Case study, Advanced topics based on course.	

Text Books	1.	ital Signal Processing, Principles, Algorithms, and Applications, J. G. Proakis and D. G. Manolakis, Prentice Hall, 2006,4th
	2.	ory and Applications of Digital Signal Processing. R. Rabiner, and B., Gold, Prentice Hall,2000,3rd
Reference Books	1.	ital Signal Processing, A. V. Oppenheim and R. W. Schafer, Prentice Hall,1998
	2.	lerstanding of Digital Signal Processing, Richards Lyons , Pearson, 2011, 3rd Edition
	3.	ital Filters: Analysis Design and Application, A. Antonion, Prentice Hall,1999,
	4.	Digital Signal Processing, A Computer based approach, S. K. Mitra, Mc Graw Hill, 4th edition
online TL Material Text Books	1.	*https://nptel.ac.in/courses/117102060/*
	2.	https://freevideolectures.com/course/2499/elec3104-digital-signal-processing http://eemedia.ee.unsw.edu.au/ELEC3104/index.htm https://ocw.mit.edu/resources/res-6-008-digital-signal-processing-spring-2011/study-materials/

UECL307: Digital signal Processing Lab		
Teaching Scheme:	**Credit**	**Examination Scheme**
Practical: 02 Hrs./Week	**1**	**INT :25 Marks Ext: NA**
Course Outcomes : On completion of the course, student will be able to–		
CO1: Understand fundamentals and applications of discrete-time signals and systems		
CO2: Apply Z transform to discrete-time signals and systems		
CO3: Apply Fourier transform to discrete-time signals and systems		
CO4: Design digital filters for discrete time signals for applications		
CO5: Understand architecture and functioning of DSP processor for real time applications		

Sr. No	**Name of Experiments / Mini Projects/ Case Studies**
1	Write a MATLAB program to generate standard discrete time signals & plot them
2	Write a MATLAB code to verify Sampling theorem.
3	Write a MATLAB program to compute frequency response of first order system h(n)=0.8^n u(n)
4	Write a MATLAB program to calculate Circular convolution of two sequences using DFT and IDFT
5	Write a MALAB Program to perform Z Transform of X(Z)=1 + Z-1 + 2 Z -2 / 1 - 0.25 Z-2 using partial fraction expansion method
6	Write a MATLAB program to find N point Fast Fourier Transform (FFT) & Inverse Fast Fourier Transform (IFFT)
7	Write a MATLAB program to design Butterworth and Chebyshev Low pass and high pass filter
8	To Study DSP processor architecture and perform Echo generation using DSK6713 Processor

SEMESTER-VI
Detail Syllabus

Scheme of B. Tech. in
Computer Science and Engineering

Course Code	Name of Course	Course Category	Teaching Scheme				Credits	Evaluation Scheme						
								Theory			Practical		Total Marks	Hr.
			L	T	P	Total Hours		TAE	CAE	ESE	INT	EXT		
SEMESTER-VI														
UCOL306 / UCOP306	Software Testing	C18	2		2	4	3	10	15	50	25		100	2
UCOL307 / UCOP307	Unstructured Database Management	C19	2		2	4	3	10	15	50	25		100	2
UCOL308 / UCOP308	Machine Learning Algorithms	C20	2		2	4	3	10	15	50	25		100	2
UCOL3XX	Elective - II	EL2	3			3	3	10	15	50			75	2
UCOL309	Open Elective – II	OE2	2			2	2	10	15	50			75	2
UHUL306X	Humanities Elective	H3	2			2	2	10	15	50			75	2
UHUL303	Understanding Human Values	H4	3			3	3	10	15	50			75	2
UHUP304	Employability Skills	A12			2	2	1				25		25	
UHUP305	Campus Recruitment Training	A13			2	2	1				25		25	
TOTAL			**16**	**--**	**10**	**26**	**21**	**70**	**105**	**350**	**125**	**--**	**650**	

Elective	Software Development	IoT and Big Data	NLP and ML	Product Management	Soft Computing	Processing

Track	Track-I	Track-II	Track-III	Track-IV	Track -V	Track -VI
Elective-I (Credits : 3) (Semester-V)	**UCOL311-** User Interface Design and User Experience	**UCOL312-** Business Intelligence Analyst	**UCOL313-** Requirements Engineering	**UCOL314-** Data Mining	**UAIL317-** Artificial Neural Networks	**UECL307-** Digital Signal Processing
Elective-II (Credits : 3) (Semester-VI)	**UCOL316-** Backend Programming	**UCOL318-** Natural Language Processing	**UCOL317-** System Analysis, Modeling & Design	**UCOL319-** Computer Vision	**UCOL318-** Fuzzy Logic	**UECL420-** Digital Image Processing

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UCOL309A	Software testing and Quality Assurance
UCOL309B	Computer Network
UCOL309C	Information security
UCOL309D	Advanced TCP/IP

UCOL306: Software Testing		
Teaching Scheme:	**Credit:**	**Examination Scheme:**
Lectures: 02Hrs./Week	**2**	**TAE:** 10 Marks ,**CAE:** 15 Marks, **ESE :50** Marks

Prerequisite (If any):

Course Objectives: After completing this course, student's will be able to

- This course introduces students the criteria for test cases while making them aware of basic methods to design the test cases.
- It is also aimed at making students familiar with test management and test automation techniques
- The course also provides students an opportunity to get exposed to test metrics and measurements

Course Outcomes: After completing this course, student's will be able to

CO1: Identify bugs to create defect report of a given application.

CO2: Summarize test cases for different types and levels of testing.

CO3: Illustrate test plan for an application.

CO4: Develop and validate a test plan.

CO5: Analyze software using automated testing tools.

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO3**
CO1		2											2		
CO2	2	2	3	2	2								1		
CO3	2	3	2	3	2	2				2	2	2	2		
CO4	2	3	3	2	2					2	2	2	2	2	
CO5	2	3	3	3	3	2	2	2	2	2	2	2	2	2	

Course Contents	**Hrs.**
Unit I: Introduction	**6**
Testing as an Engineering Activity – Testing as a Process – Testing axioms – Basic definitions – Software Testing Principles – The Tester‟s Role in a Software Development Organization – Origins of Defects – Cost of defects – Defect Classes – The Defect Repository and Test Design – Defect Examples – Developer/Tester Support of Developing a Defect	

Repository – Defect Prevention strategies. Software testing life cycle	
Unit II: TEST CASES DESIGN	**6**
Test case Design Strategies – Using Black Bod Approach to Test Case Design – Random Testing – Requirements based testing – Boundary Value Analysis – Equivalence Class Partitioning – Statebased testing – Cause-effect graphing – Compatibility testing – user documentation testing – domain testing – Using White Box Approach to Test design – Test Adequacy Criteria – static testing vs. structural testing – code functional testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – code complexity testing – Evaluating Test Adequacy Criteria. Defect report format and test cases format	
Unit III: LEVELS OF TESTING	**8**
The need for Levers of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests – The Test Harness – Running the Unit tests and Recording results – Integration tests – Designing Integration Tests – Integration Test Planning – Scenario testing – Defect bash elimination System Testing – Acceptance testing – Performance testing – Regression Testing – Internationalization testing – Ad-hoc testing – Alpha, Beta Tests – Testing OO systems – Usability and Accessibility testing – Configuration testing – Compatibility testing – Testing the documentation – Website testing. IEEE Test plan report	
Unit IV: TEST MANAGEMENT	**8**
People and organizational issues in testing – Organization structures for testing teams – testing services – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – test management – test process – Reporting Test Results – The role of three groups in Test Planning and Policy Development – Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group.	
Unit V: TEST AUTOMATION	8
Software test automation – skill needed for automation – scope of automation – Selenium Integrated Development Environment (IDE) design and architecture for automation – requirements for a test tool – challenges in automation – Test metrics and measurements, Software Testing Matrix Parameters- Requirement ID, Risks involved, Requirement type and description, Unit test cases, Integration test cases, User Acceptance Test Cases and Trace. Advance Topic: (As per the instructor)	

Text Books	1.	Srinivasan Desikan and Gopalaswamy Ramesh, “Software Testing – Principles and Practices”, Pearson Education, 2006. 2. Ron Patton, “Software Testing”, Second Edition, Sams Publishing, Pearson Education, 2007.
	2.	Singh,Y.,Software Testing, Cambridge University Press, 2013
Reference Books	1.	Glenford J. Myers, Corey Sandler, Tom Badgett. The Art of Software Testing, 3rd Edition
	2.	Ron Patton, Software Testing, 2nd Edition, 2005
On-line TL Material	1.	NPTEL course on Software Testing:

UCOP306: Software Testing Lab		
Teaching Scheme:	**Credit**	**Examination Scheme**
Practical: 02 Hrs./Week	**1**	**INT :25 Marks**
Course Outcomes : On completion of the course, student will be able to–		
CO1: Identify bugs to create defect report of a given application.		
CO2: Summarize test cases for different types and levels of testing.		
CO3: Illustrate test plan and Develop and validate a test plan for an application.		
CO4: Analyze software using automated testing tools		

Sr. No	**List of Laboratory Assignments(*Any 8)**
1	Identify system specification and design test cases for simple calculator application.
2	Design Test cases for Purchase Order Management.
3	Design test cases for Inventory Management.
4	Design test cases for Railway Reservation Form
5	Identify system specification and design test cases for e-commerce(Flipcart, Amazon) login form
6	Write a program and design test cases for the following control and decision making statements For…..Loop Switch….Case Do……While If……Else
7	Prepare test plan for an identified mobile/notepad application.
8	Prepare defect report after executing testcases for library management system/amount withdrawal from ATM machine/any login form.
9	Design and run test cases for Wordpad/MS Word application using automated tool.
10	Open Source Practical

UCOL307: UNSTRUCTURED DATABASE MANAGEMENT		
Teaching Scheme:	**Credit:**	**Examination Scheme:**
Lectures: 02Hrs./Week	**2**	**TAE:** 10 Marks ,**CAE:** 15 Marks, **ESE :50** Marks

Prerequisite (If any):

Course Objectives: After completing this course, student's will be able to

1.To explore the emergence, requirements and benefits of a NoSQL database

2.To site principles behind the NoSQL databases, such as modern distributed database theory, P2P indexing or the Map Reduce programming model;

3.To understand the basic architecture and data models of a NoSQL database (key-value stores, document databases, column-family stores, graph databases);

Course Outcomes: After completing this course, student's will be able to

CO1:To Differentiate between a relational database and a non-relational (NoSQL) database

CO2:To Perform CRUD operations (create, read, update and delete) on data in NoSQL environment

CO3:To Define, compare and use the four types of NoSQL Databases (Document-oriented, Key Value Pairs, Column-oriented and Graph).

CO4:To Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.

CO5:To implement the advanced unstructured database management techniques

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO3**
CO1		3											2		
CO2			3		2		2						1		
CO3	2	2		3	2	2	2		2		2	2	3	3	1
CO4	2	2	3	2	2	2			2		2	2	3	3	
CO5	3	3	3	3	3	3	2			2	2	2	3	3	1

Course Contents	**Hrs.**
Unit I: INTRODUCATION	**6**
Overview, and History of NoSQL Databases Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points	
Unit II:	**6**
Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases, Replication and sharding, MapReduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication	
Unit III:	**8**
NoSQL Key/Value databases using MongoDB, Document Databases, What Is a Document Database? Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable	

Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, When Not to Use, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.	
Unit IV:	**8**
Column- oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, What Is a Column-Family Data Store? Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage, When Not to Use	
Unit V:	8
NoSQL Key/Value databases using Riak, Key-Value Databases, What Is a Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, When Not to Use, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets	

Text Books	1.	NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence , Author: Sadalage, P. & Fowler, Publication: Pearson Education
	2.	Shashank Tiwari. Professional NoSQL. John Wiley and Sons. ISBN: 978-0-470-94224-6.
Reference Books	1.	Name: Redmond, E. &Wilson, Author: Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement Edition: 1st Edition.

UCOP307: UNSTRUCTURED DATABASE MANAGEMENT Lab		
Teaching Scheme:	**Credit**	**Examination Scheme**
Practical: 02 Hrs./Week	**1**	**INT :25 Marks**

Course Outcomes : On completion of the course, student will be able to	
CO1:To Perform CRUD operations (create, read, update and delete) on data in NoSQL environment	
CO2:To Define, compare and use the four types of NoSQL Databases (Document-oriented, Key Value Pairs, Column-oriented and Graph).	
CO3:To Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.	
CO4:To Perform CRUD operations (create, read, update and delete) on data in NoSQL environment	
Sr. No	**List of Laboratory Assignments(*Any 7) (The practical's are divided into tools: MongoDB and Cassandra.)**
1	Installation and setup of MongoDB client and server
2	Create a database and collection using MongoDB environment. For example a document collection meant for analyzing Restaurant records can have fields like restaurant_id, restaurant_name, customer_name, locality, date, cuisine, grade, comments. etc. Create database using INSERT, UPDATE, UPSERTS, DELETE and INDEX. Practice writing simple MongoDB queries such as displaying all the records, display selected records with conditions
3	Experiment with MongoDB comparison and logical query operators - $gt, $gte, $lt, $lte, $in, #nin, $ne, $and, $or, $not
4	Practice exercise on element, array based and evaluation query operators -$exists, $type, $mod, $regex
5	Exercise on MongoDB shell commands and user management
6	Installation and configuration of Cassandra. Find out two use cases where Cassandra is preferred over MongoDB
7	Create database in Casandra using – Create, Alter and Drop. Add records using Inset, Update, Delete and Truncate.
8	Exercise based on Cassandra Query Language i.e. selecting records, select records with specific conditions
9	Mini-project

<table>
<tr><td colspan="10">Course Title: BACKEND PROGRAMMING</td></tr>
<tr><td rowspan="2">Semester</td><td rowspan="2">VI</td><td colspan="4" rowspan="2">Teaching Scheme</td><td colspan="5">Evaluation Scheme</td></tr>
<tr><td colspan="3">Theory</td><td colspan="2">Practical</td></tr>
<tr><td>Term</td><td>Even</td><td>Th</td><td>Tu</td><td>Pr</td><td>Credits</td><td>TAE</td><td>CAE</td><td>ESE</td><td>INT</td><td>EXT</td></tr>
<tr><td>Course Category</td><td>EL2</td><td rowspan="2">3 Hrs</td><td rowspan="2">NA</td><td rowspan="2">NA</td><td rowspan="2">3</td><td rowspan="2">10</td><td rowspan="2">15</td><td rowspan="2">50</td><td rowspan="2">NA</td><td rowspan="2">NA</td></tr>
<tr><td>Course Code</td><td>UCSL331</td></tr>
<tr><td>Teaching Mode</td><td>Offline</td><td colspan="3" rowspan="2">3 Hrs</td><td rowspan="2">Total</td><td colspan="3">75</td><td colspan="2">--</td></tr>
<tr><td>Duration of ESE</td><td>2 Hrs</td><td colspan="5">75</td></tr>
<tr><td></td><td colspan="9">high volume concurrent connections, which is the need of modern day web application</td></tr>
<tr><td></td><td colspan="9">To make industry-ready engineer who can be readily deployed in a projects related to backend programming</td></tr>
<tr><td></td><td colspan="9">Up on successful completion of this course, student will be able to:</td></tr>
<tr><td></td><td colspan="9">CO1: Create small programs using basic PHP and NodeJS concepts</td></tr>
<tr><td></td><td colspan="9">In-Built and Create User defined functions in PHP and Java Script programming.</td></tr>
<tr><td></td><td colspan="9">CO3: Design and develop a Web site using form controls for presenting web based content</td></tr>
<tr><td></td><td colspan="9">CO4: Debug the program by applying concepts and error</td></tr>
<tr><td></td><td colspan="9">CO5: Create dynamic Website/ Web based Applications, using PHP, MySQL, NodeJS.</td></tr>
</table>

Course Objectives	To understand various languages for backend programing
	To develop a scalable and reliable backend web applications that can handle

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	--	3	--	--	2	--	--	--	--	--	3	2	2	2
CO2	--	--	3	--	3	--	--	--	--	--	3	2	1	1
CO3	--	--		3	3	--	--	--	--	--	3	2	2	3
CO4	--	--	3	--	3	--	--	--	--	--	3	2	2	1
CO5	--	--	3	--	3	--	--	--	--	--	3	2	2	3

Course Contents:

Unit	Contents	Hours
I	Introduction to backend programming and various backend programming languages such as PHP, Python, Ruby, Java, Rust, C# etc, brief introduction of all with integrated frameworks. Foundation Paradigms: OOPs, Design Patterns, Object Oriented Design, JSON, DOM, AJAX	6
II	Introduction to PHP, Configuration of PHP, Apache Web Server, MySQL and Open Source, Relationship between Apache, MySQL and PHP (AMP Module), Installing PHP for (Windows, Wamp server , XAMP server) Apache Web Server, MySQL and Open Source Relationship between Apache, MySQL and PHP(AMP Module), Installing PHP for (Windows, Wamp server , XAMP server)	6
III	Concepts and Installation of MySQL, MySQL structure and syntax, Types of MySQL tables and Storage engines, MySQL commands, Integration of PHP with MySQL, Connection to the MySQL Database, Creating and Deleting MySQL database using PHP, Updating, Inserting, Deleting records in the MySQL database, Hosting Website (Using 'C' panel, Using Filezilla Software)	6
IV	Express Framework: Introduction to Express Framework, Introduction to Nodejs, What is Nodejs, Getting Started with Express, Express Routing, Implementing MVC in Express, Middleware, Using Template Engines, Error Handling, API Handling, Debugging, Developing Template Engines, Using Process Managers, Security & Deployment	6
V	Node.js: Node Core, Node Modules, File System, Debugger, Automation and Deployment	6

Text Books	1.	Beginning PHP and MySQL, 4th Edition, W. Jason Gilmore, Apress, 2010
	2.	PHP: The Complete Reference, Steven Holzner, McGraw-Hill, 2008
	3.	Practical Node.js: Building Real-World Scalable Web Apps 1st Edition by Azat Mardan, Apress
E-Books	1.	Web programming for business : PHP object-oriented programming with oracle by Paper & David https://www.pdfdrive.com/web-programming-for-business-php-object-oriented-programming-with-oracle-e199764860.html
Reference Books	1.	Learning PHP, MySQL, JavaScript, CSS & HTML5, Third Edition, Robin Nixon, O'reilly Media , 2014
	2.	Teach yourself PHP, MySQL and Apache All in One , 5th Edition, Julie C. Meloni, Pearson Education, 2012

	3.	Mastering Node.js by Sandro Pasquali, Packt Publishing
On line TL Material	1.	https://nptel.ac.in/courses/106/106/106106156/

UCOL308: Machine Learning		
Teaching Scheme:	**Credit**	**Examination Scheme**
Lectures: 03 Hrs./Week	**03**	**Theory: TAE:10** Marks**, CAE:** 15 Marks **,ESE :** 50 Marks
Prerequisite (If any): None		
Course Objectives:		
1. To acquire basic knowledge of machine learning concepts		
2. To understand the process of selecting features for model construction		
3. To learn supervised and unsupervised machine learning algorithms		
4. To get knowledge about reinforcement Learning and deep learning		
5. To understand ensemble methods in machine learning		
6. To be aware about combined working of all learning.		
Course Outcomes: After completion of the course student will be able to,		
1. Explain different machine learning techniques		
2. Use different Machine learning models and methods problem solving		
3. Apply feature selection to create accurate predictive model		
4. Analyze various machine learning models		
5. Combine different machine learning models for improved accuracy		
Course Contents		**Hrs.**
Unit I: Introduction to Machine Learning		**06**
What Is Machine Learning, Examples of Machine Learning Applications: Learning Associations, Classification, Regression, Unsupervised Learning, Reinforcement Learning.		
Unit II: Feature Selection		**06**
Scikit- learn Dataset, Creating training and test sets, managing categorical data, Managing missing features, Data scaling and normalization, Feature selection and Filtering, Principle Component Analysis(PCA)-non negative matrix factorization, Sparse PCA, Kernel PCA.		
Unit III: Supervised Learning		**06**
Learning a Class from example, Linear Regression, Logistic Regression , Naïve bayes classifier, Support Vector Machines, KNN Algorithm, Decision Trees, Random Forests, Model Evaluation: Overfitting & Underfitting		
Unit IV: Unsupervised Learning		**06**

Clustering: k-Means Clustering, Hierarchical Clustering, Agglomerative Clustering-Dendrograms; Expectation-Maximization Algorithm, The Curse of Dimensionality, Dimensionality Reduction, Factor Analysis	
Unit V: Combining Multiple Learners	**06**
Rationale, Generating Diverse Learners, Voting, Bagging, Boosting, Mixture of Experts Revisited, Stacked Generalization, Fine-Tuning an Ensemble, Cascading.	
Unit VI: Advances in Machine Learning	**06**
Reinforcement Learning- Introduction, Elements of Reinforcement Learning, Model-Based Learning: Value Iteration, Policy Iteration Deep Learning- Defining Deep learning, common architectural principles of deep networks, building blocks of deep networks.	

Text Books:
T1. Ethem alpaydin, "Introduction to machine Learning", The MIT Press Cambridge, Second Edition,2010
T2. Tom M. Mitchell ,Machine Learning, McGraw-Hill
Reference Books
R1. Giuseppe Bonaccorso, "Machine Learning Algorithms", Packt Publishing Limited, ISBN-10:1785889621, ISBN-13: 978-1785889622
R2. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", Cambridge University Press, Edition 2012, ISBN-10: 1107422221; ISBN-13: 978-1107422223

UCOP308: Machine Learning: Machine Learning lab		
Practical: 02 Hours/Week	**Credit 01**	**Examination Scheme:** **Cont. Ass:** 25 Marks ,**Ext.** : 25 Marks ,**Total:** 50 Marks
Course Outcome:		
1 Use different Machine learning models and methods problem solving		
2 Apply feature selection to create accurate predictive model		
3 Analyze various machine learning models		
4 Combine different machine learning models for improved accuracy		

Sr. No	**List of Laboratory Assignments**
1	Understanding data formats of Pandas: Series, Dataframe, Panel; Creating, Appending, Deleting. Importing different types of Datasets. Working with Dimensions
2	Type conversions from different datatype into Series, Dataframe and Panel, Necessary operations like renaming, traversing columns and indexes, Statistics on data formats of Pandas
3	Understanding data formats of Numpy: ndarrays (1D, 2D and 3D arrays), Array creation routines
4	Matplotlib plotting for Data visualization
5	Tweaking Colors, Symbols, Formulations. Plotting Categorical data, 3D Axes, Parametric Curves, Trigonometry functions, Histogram, Bar, Pie chart. Graph plotting using Pandas
6	Introduction to Scipy, Scikit-learn, Importing Algorithm Classes and creating objects with parametric values

7	Dataset selection: Dataset for Classification / Regression / Associative Rule Mining. and Analysis: Independent Variables, Dependent Variables, Handling Missing Values, Categorical data, and Feature Scaling
8	Regression: Performing Simple Linear Regression over a salary dataset and predict salaries according to their experience years
9	Regression & Data Valuation: Performing Multi-linear Regression (using appropriate Model) to evaluate with data which is useful for model training
10	Regression: Using Polynomial regression resolve bluff query for new employee salary
11	Classification: Using KNN (with WCSS), NB Predicting if a customer with certain age and Salary will purchase a product or not
12	Classification: Using DT and SVM Predicting if a customer with certain age and Salary will purchase a product or not
13	Clustering: Using K-Means clustering, determine Customers of a Mall according to Categories so as to launch a scheme for business growth a product or not for imbalanced data and determining Fitting issues and Sampling methods and Optimizing techniques

UCOL318: Natural Language Processing

Teaching Scheme:	Credit:	Examination Scheme:
Lectures: 03 Hrs./Week	**3**	**TAE:** 10 Marks ,**CAE:** 15 Marks, **ESE :50** Marks

Prerequisite (If any):

Course Objectives:

1. Introduces students to leading trends and systems in natural language processing.
2. Make them understand the concepts of morphology, syntax, semantics and pragmatics of the language

Course Outcomes:

CO1 Understand approaches to syntax and semantics in NLP.

CO2 Demonstrate approaches to discourse, generation, dialogue and summarization within NLP.

CO3 Apply current methods for statistical approaches to machine translation.

CO4 Recognize the significance of pragmatics for natural language understanding.

Course Outcomes	Program Outcomes											
	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	--	1	--	--	--	--	--	--	--
CO2	3	3	2	--	1	--	--	--	--	--	--	--
CO3	3	3	2	--	1	--	--	--	--	--	--	--
CO4	3	3	2	--	1	--	--	--	--	--	--	--
CO5	--	3	3	--	2	--	--	--	--	--	--	--

Course Contents	Hrs.
Unit I:	**6**
Introduction and Basic Text Processing, Spelling Correction, Language Modeling, Advanced smoothing for language modeling, POS tagging	
Unit II:	**8**
Models for Sequential tagging – MaxEnt, CRF, Syntax – Constituency Parsing, Dependency Parsing, Distributional Semantics	
Unit III:	**8**
Lexical Semantics, Topic Models , Entity Linking,	
Unit IV:	**6**
Information Extraction, Text Summarization, Text Classification,	
Unit V:	6

Sentiment Analysis and Opinion Mining	

Text Books	1.	Dan Jurafsky and James Martin. Speech and Language Processing: An Introduction to Natural Language Processing,
	2	Computational Linguistics and Speech Recognition. Prentice Hall, Second Edition, 2009.
	3	Chris Manning and Hinrich Schütze. Foundations of Statistical Natural Language Processing. MIT Press, Cambridge, MA: May 1999.
Reference Books	1.	
	2.	

UCOL317: System Analysis, Modeling & Design		
Teaching Scheme:	**Credit:**	**Examination Scheme:**
Lectures: 03 Hrs./Week	**3**	**TAE:** 10 Marks ,**CAE:** 15 Marks, **ESE :50** Marks
Prerequisite (If any):		
Course Objectives:		
To introduce concepts of System Design.		
To develop skills in student to design problems based on System analysis		
To introduce concepts of System Modeling		
Course Outcomes:		
Upon successful completion of this course, student will be able to:		
CO1: Understand and use the system concepts in problem solving.		
CO2: Determine the system analysis techniques in respective problem areas.		
CO3: Apply concepts of System modeling in solving problems.		
CO4: Use Modeling concepts for designing projects		
CO5: Use system design concepts for developing projects		

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	--	1	--	--	--	--	--	--	--
CO2	3	3	2	--	1	--	--	--	--	--	--	--
CO3	3	3	2	--	1	--	--	--	--	--	--	--
CO4	3	3	2	--	1	--	--	--	--	--	--	--
CO5	--	3	3	--	2	--	--	--	--	--	--	--

Course Contents	**Hrs.**
Unit I:	**8**
System Concepts and SDLC: Components and Characteristics of a System; Types of Information Systems; Modern Approach to System Analysis and Development, Role and Need of System Analyst in System Development. System Development Life Cycle, SDLC Models, Requirement Analysis, Feasibility Study and types.	
Unit II:	**8**
System Development Methodology:, System Analysis and system Design, Link Program Testing, Conversion And Installation, System Review And Evaluation, Maintenance; Prototyping System Analysis: System Planning and Initial Investigation, Fact Analysis, Information Gathering Tools; Tools of Structured Analysis: Data flow Diagram(DFD), Data Dictionaries, Decision Trees And Tables; Cost/Benefit Analysis, Types of costs	
Unit III:	**8**
System Requirement Specifications, Documentation Techniques for System Analysis; Object Oriented AnalysisUML(Unified Modelling language), Object Oriented Development Life Cycle and Modelling, Modelling using UML (Use cases, Activity Diagram, Class Diagram, Sequence Diagram)	
Unit IV:	**8**
System Design: Modular and Structured Design, Module Specifications, Coupling and Cohesion; Forms-Driven Methodology IPO Charts, Structured Walkthrough; Input/output and Forms Design: Requirements of Forms Design, Types of Forms; Dialog (User Interface) Design; File and Data Base Design: File Structure and File Organization, Data Structure, Normalization and its Types, Role of Data Base Administrator. System Implementation	
Unit V:	8
System Testing and Quality Assurance, Test Plan, Testing Techniques Available, Quality Assurance Goals in Systems Life cycle, Trends in Testing; Implementation and Software Maintenance; System Control And Audit Trails; System Administration And Training; Hardware/Software Selection-Suppliers, Software Industry, Procedure and Phases in Selection of Software, Evaluation Process; Project Scheduling and Management.	

Text Books	1.	Jeffery. Hoffer, “Modern System Analysis And Design”, Person Edu., New Delhi.
	2.	Dennis Alan, “System Analysis and Design”, Wiley Publications, John Wiley & Sons, Inc.
Reference	1.	Hawryszkiewyez, I.T. Introduction to System Analysis and Design. Prentice Hall of India

Books	2.	Awadh. Elias M. “Systems Analysis and Design”, Prentice Hall of India, New Delhi

UCOL319: Fuzzy Logic

Teaching Scheme:	**Credit:**	**Examination Scheme:**
Lectures: 03 Hrs./Week	**3**	**TAE:** 10 Marks ,**CAE:** 15 Marks, **ESE :50** Marks

Prerequisite (If any):

Course Objectives:

Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.

Introduce students to artificial neural networks and fuzzy theory from an engineering perspective.

To study Associate Memories and introduces Fuzzy sets and Fuzzy Logic system components.

Course Outcomes:

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

CO1: Concepts of Artificial Intelligence and its application in Biomedical Engineering

CO2: Develop Fuzzy Inference System for various applications.

CO3: Real time Implementation of Artificial Neural Network and Fuzzy Logic using MATLAB

CO4: Fuzzy Logic architecture, learning strategy and learning rule

CO5: Application of Neural Networks

Course Outcomes	Program Outcomes											
	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	--	1	--	--	--	--	--	--	--
CO2	3	3	2	--	1	--	--	--	--	--	--	--
CO3	3	3	2	--	1	--	--	--	--	--	--	--
CO4	3	3	2	--	1	--	--	--	--	--	--	--
CO5	--	3	2	--	1	--	--	--	--	--	--	--

Course Contents	**Hrs.**
Unit I:	**8**
Introduction of Classical Sets and Fuzzy Sets Statistics and Random Processes, Uncertainty in Information, Fuzzy Sets and Membership, Chance versus Ambiguity. Classical Sets - Operations on Classical Sets, Properties of Classical (Crisp) Sets, Mapping of Classical Sets to Functions Fuzzy Sets - Fuzzy Set operations, Properties of Fuzzy Sets.	
Unit II:	**1**

	0
Classical Relations and Fuzzy Relations : Cartesian Product, Crisp Relations- Cardinality of Crisp Relations, Operations on Crisp Relations, Properties of Crisp Relations, Composition. Fuzzy Relations - Cardinality of Fuzzy Relations, Operations on Fuzzy Relations, Properties of Fuzzy Relations, Fuzzy Cartesian Product and Composition, Non-interactive Fuzzy Sets. Crisp Equivalence Relation, Crisp Tolerance Relation, Fuzzy Tolerance and Equivalence Relations. Value Assignments - Cosine Amplitude, Max-min Method, Other Similarity methods	
Unit III:	**8**
Fuzzy Rule- Based Systems: Natural Language, Linguistic Hedges, Rule-Based Systems - Canonical Rule Forms, Decomposition of Compound Rules, Aggregation of Fuzzy Rules, Graphical Techniques of Inference	
Unit IV:	**8**
Fuzzy Decision Making: Fuzzy Synthetic Evaluation, Fuzzy Ordering, Multi objective Decision Making, Fuzzy Bayesian Decision Method, Decision Making under Fuzzy States and Fuzzy Actions.	
Unit V:	8
Fuzzy Logic System Components: Fuzzification, Membership Value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods. Neural Network Applications: Process identification, Fraction Approximation, Control and Process Monitoring, Fault diagnosis and Load forecasting. Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.	

Text Books	1.	Fuzzy Logic With Engineering Applications By: Timothy J. Ross. Pub: A John Wiley and Sons, Ltd.
	2.	Fuzzy systems Design Principles By: Riza C. Berkan and Sheldon L. Trubateh. Pub: Standard Publishers and Distributors. Delhi.
	3.	Neural Netwroks, Fuzy logic , Gnenetic algorithms: synthesis and applications by Rajasekharan and Rai- PHI Publication.
Reference Books	1.	Fuzzy systems Design Principles By: Riza C. Berkan and Sheldon L. Trubateh. Pub: Standard Publishers and Distributors. Delhi.
	2.	Neural Networks and Artificial Intelligence for Biomedical Engineering. By: Donna L. Hudson and Maurice E. Cohen. , Pub: Prentice Hall of India. Pvt. Ltd. New Delhi.

UECL420: DIGITAL IMAGE PROCESSING		
Teaching Scheme:	**Credit:**	**Examination Scheme:**
Lectures: 03 Hrs./Week	**3**	**TAE:** 10 Marks ,**CAE:** 15 Marks, **ESE :50** Marks
Prerequisite (If any):		
Course Objectives:		
Understand fundamentals and applications of Digital image processing		
Understand Digital image processing techniques		
Understand applying Image Processing algorithms to real problems		
Course Outcomes:		
Upon successful completion of this course, student will be able to:		
CO1: Interpret the need for image transforms and their properties		
CO2: Apply Image enhancement & restoration techniques to digital image processing		
CO3: Apply Image segmentation techniques to **d**igital image processing application		
CO4: Develop algorithm for image compression and coding for real-time image transmission		
CO5: Make use of techniques, skills and modern engineering tools necessary for engineering application to real time applications		

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O 2	PS O3
CO1	3	3	3	2	2						1	1	3	1	1
CO2	3	3	3	2	2						1	1	3	1	1
CO3	3	3	3	2	2						1	1	3	1	1
CO4	3	3	3	2	2						1	1	3	1	1
CO5	3	3	3	2	2						1	1	3	1	1

Course Contents	**Hrs.**
Unit I:	**8**
INTRODUCTION: Digital image representation, Fundamental steps in image processing, Components of Digital Image processing systems, Elements of visual perception, Image Formation model, Image Sampling and quantization, Relationship between pixels – neighbourhood, adjacency connectivity, regions, boundaries and distance measures, Color Image Processing.	
Unit II:	**10**
INTRODUCTION: Digital image representation, Fundamental steps in image processing, Components of Digital Image processing systems, Elements of visual perception, Image Formation model, Image Sampling and quantization, Relationship between pixels – neighbourhood, adjacency connectivity, regions, boundaries and distance measures, Color Image Processing.	

Unit III:	8
IMAGE SEGMENTATION: Detection of discontinuities - point, line and edge detection, Edge linking and boundary detection, Thresholding, Region-based segmentation - region growing, region splitting and merging, Use of motion in segmentation- Spatial techniques and Frequency domain techniques, Color Transformations, Smoothing and sharpening, Image Segmentation based on color.	
Unit IV:	**8**
IMAGE COMPRESSION: Coding redundancy, Interpixel redundancy, fidelity criteria, Image compression models, Error-free compression, Variable length coding, Bit-plane coding, Lossless predictive coding, Lossy compression, Image compression standards, Real-Time image transmission, JPEG and MPEG, CODEC.	
Unit V:	8
WAVELET TRANSFORM: Continuous Wavelet transform(CWT), Discrete Wavelet transform(DWT), Multi-resolution Analysis, Sub-band coding, Scaling and wavelet functions, Implementation of 1D and 2D DWT, application to real problems, Application of DIP using AI & CNN , Advance topics based on the course	

Text Books	1.	Digital Image Processing, Gonzalez, Rafael C. and Richard E. Woods, (4th Edition, 1992), Pearson Education, London
	2.	Multirate Systems and Filter-banks, P. P. Vaidyanathan, Prentice Hall, 1992.
E--Books	1.	kupdf.net_fundamentals-of-digital-image-processing-anil-k-jainpdf
Reference Books	1.	Digital Image Processing Using MATLAB, Rafael C. Gonzalez, Richard E. Woods, Steven L. , Tata McGraw Hill Pvt. Ltd., 3rd Edition , 2011
	2.	Fundamental of Digital Image Processing, Anil K Jain, Prentice-Hall, Engle- wood Cliffs, NJ, 1989
	3.	Wavelet and Subband Coding, M. Vetterli and J. Kovacevic, Prentice Hall, 1995.
	4.	A wavelet Tour of Signal Processing, Stephane Mallat, 3rd Academic Press, Dec. 2008
on line TL Material	1.	http://www.vssut.ac.in/lecture_notes/lecture1423722885.pdf

UCOL320Computer Vision		
Teaching Scheme:	**Credit:**	**Examination Scheme:**
Lectures: 03 Hrs./Week	**4**	**TAE:** 10 Marks, CAE**:** 15 Marks, **ESE :**50Marks
Prerequisite (If any):		
Course Objectives:		
1. Introduce image formation models.		
2. Implementing algorithms for image processing and feature extraction for single and multiple images.		
3. Understand segmentation, clustering and classification of images		
Course Outcomes: After completing this course, students will be able to		
CO1: Understand Image Formation Models.		

CO2: Design and implement algorithms to perform image processing and feature extraction for Single Image	
CO3: Design and implement algorithms to perform image processing and feature extraction for Multiple Images.	
CO4: Understand segmentation , clustering, classification of Image.	
Course Contents	**Hrs.**
Unit I: Image Formation Models	**7**
Geometric Camera Models, Image Formation, Intrinsic and Extrinsic Parameters, Linear and Non-linear approach to Camera Calibration, Light and Shading, Colour.	
Unit II: Early Vision	**7**
Just one image: Linear filters, Spatial Frequency, Sampling and Aliasing, Filters as Template, Scale Image Pyramid, Local image features, Representing the Image Gradient, Texture representation , Synthesizing Textures, Image De noising, Shape from Texture.	
Unit III: Multiple image	**8**
Stereopsis, Binocular Camera Geometry and Epipolar Constraint, Binocular Reconstruction, Local and Global Methods for Binocular Fusion, Structure from Motion.	
Unit IV: Mid-Level Vision	**7**
Segmentation, Clustering, Grouping, Model Fitting, Fitting using probabilistic models ,Tracking.	
Unit V: High Level Vision	**7**
Registration, Smooth surfaces and their outlines, Range Data, Learning to classify, Classifying image.	

List of Assignment	
1.	Program to change the Brightness of Image
2.	To Flip the image around the vertical and horizontal line
3.	Display the color components of the image Red Green Blue Components of Image
4.	Image registration/geo referencing and supervised classification – Land use or Land cover map preparation
5.	Unsupervised classification – Land use or Land cover map preparation
6	To find the negative of an image
7	Calculate the Histogram of a given image
8	Histogram Equalization of an image
9	Program for Image Filtering(low pass filter)1)Average filter2)Weighted Average filter3)Median filter High pass filters using1)Sobel operator2) Laplacian operator
10	Edge detection with gradient and convolution of an Image
11	Program to find threshold of grayscale image

Text Book	1	Digital Image Processing, R.C. Gonzalez, R.E Woods, Pearson Education, 3rd Edition, 2008.
Reference Book	1	Computer Vision: A Modern Approach. D. A. Forsyth, J. Ponce, Prentice Hall, 2nd Edition, 2011
	2	Digital Image Processing and Computer Vision, R. J. Schalkoff, John Wiley & Sons Australia, 1989.
	3	Computer Vision, L. Shapiro, G. Stockman, Prentice-Hall, 2001.
	4	Introductory Techniques for 3D Computer Vision, E. Trucco, A. Verri, Prentice Hall, 1998
Online TL Material	1	https://www.coursera.org/learn/introduction-computer-vision-watson-opencv

UAIL313/UAIP313: Natural Language Processing		
Teaching Scheme:	**Credit:**	**Examination Scheme:**
Lectures: 03 Hrs./Week **Practical: 02 Hrs/Week**	**4**	**TAE:** 10 Marks ,**CAE:** 15 Marks, **ESE :50** Marks **External :** 25 Marks

Prerequisite (If any):

Course Objectives:

1. Introduces students to leading trends and systems in natural language processing.

2. Make understand the concepts of morphology, syntax, semantics and pragmatics of the language

3. Make learn the statistical approaches for machine translation

Couse Outcomes: After completing this course, students will be able to

CO1. Understand approaches to syntax and semantics in NLP.

CO2. Demonstrate approaches to discourse, generation, dialogue and summarization within NLP.

CO3. Apply current methods for statistical approaches to machine translation.

CO4. Recognize the significance of pragmatics for natural language understanding.

Course Contents	Hrs.
UNIT I: Introduction	**8**
Introduction and Basic Text Processing, Spelling Correction, Language Modeling, Advanced smoothing for language modeling, POS tagging.	
UNIT II: NLP Models	**8**
Models for Sequential tagging – MaxEnt, CRF, Syntax – Constituency Parsing, Dependency Parsing, Distributional Semantics	
UNIT III: Semantics	**8**
Lexical Semantics, Topic Models , Entity Linking,	
UNIT IV: Text Summarization & Classification	**8**
Information Extraction, Text Summarization, Text Classification,	
UNIT V: Sentiment Analysis	**8**
Sentiment Analysis and Opinion Mining	

Text Books	1.	Dan Jurafsky and James Martin. Speech and Language Processing: An Introduction to Natural Language Processing,
	2.	Computational Linguistics and Speech Recognition. Prentice Hall, Second Edition, 2009.
	3.	Chris Manning and HinrichSchütze. Foundations of Statistical Natural Language Processing. MIT Press, Cambridge, MA: May 1999.
Reference Books	1.	Siddiqui T., Tiwary U. S.. Natural language processing and Information retrieval, OUP, 2008
	2.	Bharati A., Sangal R., Chaitanya V.. Natural language processing: a Paninian perspective, PHI, 2000

Sr. No	**List of Laboratory Assignments**
1	Use of named entity recognition information extraction technique
2	Implement sentiment analysis technique for classifying the data in to positive, negative or neutral class
3	Use of NLP technique for text summarization
4	Implement simple machine translation from one language to another
5	Implement a code for aspect mining and topic modeling

UCOOEL309-B Block Chain (open Elective-II)

Examination Scheme
TAE : 10 Marks **CAE : 15** Marks**ESE : 50** Marks

Prerequisite (if any):. Computer Network, Network Security

Course Objectives:

1. Understand how block chain systems (mainly Bitcoin and Ethereum) works.
2. To securely interact with them.
3. To familiarize public block chain platforms Bitcoin, Ethereum and block chain platforms
4. Design, build, and deploy smart contracts and distributed applications

Course Outcomes :

Upon successful completion of the course, graduates will be able to

1. Understand the basics of block chain systems
2. Analyze the incentive structure in a block chain based system and assess its functions, benefits and vulnerabilities.
3. Describe and understand the differences between the most prominent block chain structures and permissioned block chain service providers
4. Attain awareness of the new challenges that exist in monetizing businesses around block chains and smart contracts

Course Contents	Hrs
Unit–I: Overview of Bitcoin	**8**
Introduction of Block Chain, An Overview of Bitcoin ,Basic Components of Bitcoin and alternative coins and networks. Understand why the Block chain was first proposed. Basics of Cryptography, cryptocurrency.	
Unit–II: Methods of Block chain Security	**7**
Strengthening Proof of Work (GHOST protocol in Ethereum) ,Proof of Stake Delegated Proof of stake (Bitshares) POS proposals in Ethereum (Casper) , Blockchain Proof of work Bitcoin Mitigating Attacks	
Unit–III: Public, Private and Hybrid Block chains	**7**
public and private block chains and sidechains, Bitcoin block chain, Hybrid Blockchain, Benefits of Hybrid Blockchain, private block chain initiatives. The Hyperledger project, Digital Assets Holdings, and BaaS (Microsoft Azure) .	
Unit–IV Smart Contracts	**8**
Smart contracts platform elements (Ethereum) ,Understand what makes a contract “smart” and what are their practical limitations , Capabilities of Smart Contracts, Smart Contract Working, Applications of Smart Contract	

Text Books:

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies 1st Edition by Andreas M. Antonopoulos

2. Blockchain: “Blueprint for a New Economy”, by Melanie Swan
3. Blockchain: The blockchain for beginners guide to blockchain technology and leveraging block chain programming”, by Josh Thompsons
Reference Books:
. 1. Blockchain Revolution: How the Technology Behind Bitcoin Is Changing Money, Business, and the World by Don Tapscott and Alex Tapscott
2. The Business Blockchain: Promise, Practice, and Application of the Next Internet Technology by William Mougayar and Vitalik Buterin
3. Blockchain: Blueprint for a New Economy by Melanie Swan

UCOOEL302B: **Information Security (Elective –II)**		
Teaching Scheme:	**Credit:**	**Examination Scheme:**
Lectures: 02 Hrs./Week	**2**	**TAE:** 10 Marks , **CAE:** 15 Marks, **ESE :50** Marks
Prerequisite (If any):		

Course Objectives: After completing this course, student will able to

1. Identify the fundamental concepts and key issues of the information systems and role on information in enterprise
2. Describe various information systems within an enterprise view including the enterprise strategy, business, application, information.
3. Analyze case studies that focus on issues of strategic value of the IS in order to evaluate costs, benefits and risks of the project

Course Outcomes: After completing this course, student will able to

CO1: Describe the fundamental techniques of information security.

CO2: Identify and explain risk and potential security issues.

CO3: Evaluate information security tools and technologies to analyze different systems.

CO4: Demonstrate responsible computer use as it deals with social, political, legal and ethical issues in today's electronic society.

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3
CO1	3	3	2	3	3			3		3		3	1		
CO2	2	2	3	3	2			2		2		2	2		
CO3	3	3	3	3	3			3		3		3	2	1	
CO4	3	3	3	3	3			3		3		3	3	2	

Course Contents	Hrs.
Unit I: Introduction to Information Security	**6**
Introduction to Information security, Security mindset, why we need it, Practical Cryptography: encryption, authentication, Types of Assessment for Information Security, Software security **.**	
Unit II: Malicious code and Attacks	**6**
Malicious code, malware, trap doors, logic bombs, Trojan horses, viruses, worms, rootkit, Modern malware, botnets, Database security, database access control, SQL injections, Inference attacks on databases, Defenses.	
Unit III: Firewalls	**6**
Firewalls: design goals, access policy and limitations, filtering types, firewall configuration, firewall types, Intrusion detection systems, statistical approaches, knowledge-based approach, machine learning approaches. HIDS, NIDS.	
Unit IV: Information Security within Organizations	**6**
Information Systems within Organizations: Categories of Information Systems, Survey of Functional Systems, Competitive Strategy and Value Chains, Business Process Design E-Commerce and Supply Chain Systems: Doing Business on the WWW, Web Technologies, Supply Chain Management, Inter-Organizational Information Systems, Ethics of Supply Chain Information Sharing	
Unit V: Business Intelligence and Knowledge Management	**6**
Business Intelligence and Knowledge Management: Developing Business/IT Solutions, Data Warehouses and Data Marts, Data Mining, Knowledge Management Information Systems Management: Planning the Use of IT, Managing the Computing Infrastructure, Enterprise Applications, Outsourcing, User Rights and Responsibilities	

Text Books	1.	Keri E. Pearlson, Carol S. Saunders, Dennis F. Galletta “Managing and Using Information Systems: A Strategic Approach”, 6th Edition, Wiley Publication
	2.	David T. Bourgeois,James L. Smith, Shouhong Wang, Joseph Mortati “Information Systems for Business and Beyond”
E--Books	1.	https://digitalcommons.biola.edu/open-textbooks/1/
Reference Books	1.	Applegate, L. M., F. W. McFarlan, and R. D. Austin. Corporate Information Strategy and Management: Text and Cases. 6th ed. New York: McGraw-Hill, 2003
	2.	Patricia Wallace, “Introduction to Information Systems, 4th Edition”, Pearson 2021

UCOOEL302A **Advanced TCP/IP (Open Elective-II)**		
Teaching Scheme	**Credit**	**Examination Scheme**
Lectures: 02 Hr/Week -	**02**	**TAE : 10** Marks **CAE : 15** Marks **ESE : 50** Marks
Prerequisite (if any):. Computer Network, Network Security		
Course Objectives		
• Give an introduction to the TCP/IP client-server model of interaction, and to writing networking applications using the client/server technology. • Explain the concept of Transport Layer. • Design, build, and deploy basics of roting. • Discussion on writing of secure software.		

Course Outcome :

.Upon successful completion of the course, graduates will be able to

- Understand the basics of TCP/ IP protocol Suite.
- Understand the terminology and concepts of TCP-IP reference model and IPV6 message format and its services.
- Acquire the concepts of protocols, network interfaces, and design/performance issues in Local Area Networks and wide area networks.
- Design and implement client-server applications using TCP and UDP sockets.

Course Contents	**Hrs**
Unit–I: Introduction to TCP/ IP Suite	**8**
TCP/IP protocol suite, TCP connection management, TCP state transition diagram, Introduction to Client-Server environment, Client-Server architecture, ClientServer models, Server complexity and scalability, UNIX I/O paradigm and Network I/O, IP address manipulation routines, Network Address Translation (NAT)	
Unit–II: The Transport Layer	**8**
TCP services, TCP Header, TCP connection establishment and termination, TCP & UDP Datagram and its characteristics, RTP, Flow Control and Error Control Mechanisms**.**	
Unit–III: IP Mechanisms	**8**
Routing TCP/IP: Static Routing, Dynamic Routing Protocols, Sockets and Socket Programming, , Socket programming primitives, Sending and Receiving data through a Socket, Socket Function	
Unit–IV: Security Issues at network and transport layers	**8**
IPSec protocol suite: Authentication Header, ESP, IKE: Key management, VPN, Firewall-types and configurations, SSL/TLS protocols.TCP/IP Vulnerabilities , Securing TCP/IP Spoofing,	

Text Books:

1. Behrouz Forouzan, TCP/IP Protocol suite, Tata McGraw-Hill Edition

2. Douglas Comer, Internetworking with TCP/IP, Principles, Protocols and Architecture, Volume 1, Pearson Education Asia

3. Richard Stevens, Bill Fenner, "UNIX network programming Volume-1 - The Sockets Networking API", 3rd edition

Reference Books:

1. Kurose , Rose, "Computer Networking: a Top-Down Approach", Addison-Wesley, ISBN : 0132856204

2. TCP/IP Illustrated (Volume I, Volume II and Volume III), W. Richard Stevens, Addison-Wesley

3. Pete Loshin, TCP/IP Clearly Explained, Morgan Kaufmann Publications

Course Title: **Engineering Economics and Industrial Management**										
Semester	V	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	ODD	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	H	2	--	-	2	10	15	50	--	--
Course Code	UHUL303									
Teaching Mode	Offline	2 Hrs.			Total	75			--	
Duration of ESE	2 Hrs.					75				

Course Objectives	Understanding of basic knowledge of Economics and its application.
	Understanding of Management as discipline and its practices.
	Strengthening knowledge of management in the functional area of Marketing and Finance.
Course Outcomes	CO 1. Understand the basic concepts of Micro & Macro-Economics and its applications
	CO 2. Implement the fiscal policies for government organizations and NGO's
	CO 3. Analyzing the functions of Management and its importance
	CO 4. Evaluate the marketing strategies.
	CO 5. Formulate the scope of financial management.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1			1							2	2			2
CO2			2						2	2	2			2
CO3			2						2	2	3			2
CO4			3						2	2	3			2
CO5			3							2	3			2

Course Contents:

Unit	Contents	Hours
I	Demand, Utility and Indifference curves, approach to Analysis of demand, Elasticity of demand, Measure of demand elasticity, Factors of Production, Advertising elasticity. Market and Market Structures: Price and output determination under perfect competition, monopolistic competition, oligopoly & monopoly, Depreciation and methods for its determination.	7
II	Functions of central and commercial banks, Inflation, Deflation, Stagflation, Direct and Indirect Taxes, New economic policy, Liberalization, Globalization, Privatization, Monetary & Fiscal policies of the government, Meaning and phases of business cycles.	6
III	Definition, nature and scope of Management, Functions of management - Planning, Organizing, Directing, Controlling, Principles of management, Communication.	5
IV	Meaning of Marketing management, concepts of marketing, Marketing Mix, Service Marketing, Product Life Cycle, New Product Development, Pricing strategies, Channels of distribution, Promotion Mix	7

V	Meaning, nature and scope of Financial Management, Sources of Financing, Ratio Analysis. Time value of money.	5

Text Books	1.	Modern Economics Theory, by K.K. Dewett, S. Chand & company ltd., 3rd Edition, 2006
	2.	Essentials of Management by Harold Koontz & Hein & Weihrich Tata McGraw Hill Publishing, 7th Edition, 2008.
	3.	Marketing Management by Philip Kotler, Kevin Keller, 14th Edition, 2016.
	4.	Financial Management by M.Y. Khan & P.K. Jain, Tata McGraw Hill Publishing, 5th Edition, 2008.
E-- Books	1.	http://164.100.133.129:81/econtent/Uploads/Managerial_Economics%20(1).pdf [Economics]
	2.	http://164.100.133.129:81/econtent/Uploads/Financial_Management.pdf [Financial Management]
	1	Management by Stephen P. Robbins Mary A. Coulter, 14th Edition
	2.	Marketing Management by Ramaswamy V S and Namakumari, Macmillan India Ltd.
	3.	Financial Management by I M Pandey, Vikas Publishing House, New Delhi.

Course Title: **Universal Human Values 2 : Understanding Harmony**										
Semester	VI	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	EVEN	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	H	3	--	--	3	10	15	50	--	--
Course Code	UHUL304									
Teaching Mode	Offline	3 Hrs.			Total	75			--	
Duration of ESE	2 Hrs.					75				

Course Objectives	Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence
	Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
	Strengthening of self-reflection and development of commitment and courage to act.
Course Outcomes	**CO1**: Students are expected to become more aware of themselves.
	CO2: Students are expected to become more aware of their surroundings (family, society, nature).
	CO3: Students should become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

	CO3: Students would have better critical ability, they would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
	CO4: Students would be able to apply what they have learnt to their own self in different day-to-day settings in real life.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1						**2**		**3**	**1**			**2**		**2**
CO2			**3**			**2**		**2**		**2**		**2**		**2**
CO3			**3**			**3**	**3**	**2**						**2**
CO4			**2**			**2**	**2**	**2**						**2**
CO5			**1**			**1**	**1**	**2**				**3**		**2**

Course Contents:

Unit	Contents	Hours
I	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education: rpose and motivation for the course, Self-Exploration, Continuous Happiness and Prosperity, Right understanding relationship and physical facility, Understanding happiness and prosperity correctly, Method to fulfil the above human aspirations.	8
II	Understanding Harmony in the Human Being - Harmony in Myself! Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body', Understanding the Body as an instrument of 'I', Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body.	8
III	Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship nderstanding values in human-human relationship, Understanding the meaning of Trust, Understanding the meaning of Respect, Understanding the harmony in the society, Visualizing a universal harmonious order in society	8
IV	Understanding Harmony in the Nature and Existence - Whole existence as Coexistence Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature, Understanding Existence as Co-existence, Holistic perception of harmony	8

V	**Implications of the above Holistic Understanding of Harmony on Professional Ethics** tural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics, Strategy for transition from the present state to Universal Human Order: a) At the level of individual, b) At the level of society.	8

Text Books	1.	Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
Reference Books	1.	JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
	2.	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
	3.	The Story of Stuff (Book)
	4.	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
	5.	Small is Beautiful - E. F Schumacher.
	6.	Slow is Beautiful - Cecile Andrews
	7.	Economy of Permanence - J C Kumarappa
	8.	Bharat Mein Angreji Raj - PanditSunderlal
	9.	Rediscovering India - by Dharampal
	10.	Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
	11.	India Wins Freedom - Maulana Abdul Kalam Azad
	12.	Vivekananda - Romain Rolland (English)
	13.	Gandhi - Romain Rolland (English)

Course Title: **Aptitude (Skill course)**										
Semester	V	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	A	-	-	2 Hrs.	1	-	-	-	25	-
Course Code	UHUP305									
Teaching Mode	Offline	2 Hrs.			Total	-			25	
Duration of ESE	-					25				

Course Objectives	1. The Curriculum aims to equip students in order to apply quantitative reasoning and Mathematical analysis methodologies to understand and solve problems.
	2. The students shall attain conceptual clarity to comprehend reasoning questions in a simple way and arrive at decisions at a logical manner.
	3. The program intends to enhance student's Critical Thinking, Analytical, Evaluative and Creative skills that make them best fit and sustain in the corporate/competitive world.
Course Outcomes	Upon successful completion of this course, student shall be able to:
	CO 1. Students shall draw conclusions or make decisions based on analysis and critique of quantitative information. This leads them to effectively justify the conclusion and execute their plans.
	CO 2. Students shall solve real life problems requiring interpretation and comparison

	of various probabilities to ascertain the best outcomes expected.
	CO 3. Students shall Identify logical relation to analyze, comprehend and apply mathematical techniques instead of assumptions to different real time situations.
	CO 4. Students shall solve the campus placements aptitude papers that qualifies them to get employed.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	2	2	3	-	-
CO2	-	-	-	3	-	-	-	-	-	-	-	2	3	-	-
CO3	-	-	-	3	2	-	-	-	-	-	2	3	-	-	-
CO4	-	-	-	-	-	-	-	-	3	3	-	-	-	3	-

Course Content:

Unit	Contents	Hours
I	Orientation on syllabus, Emerging aptitude requirement, Pre-assessment on existing knowledge	4
II	Number System, Problem on Numbers, Ratio and Proportion, Averages, Percentage, Profit/ Loss and Discount, Simple Interest and Compound Interest,	6
III	Partnership, Mixtures and Alligations, Speed, Time & Distance, Time & Work, Boats and Stream, Pipes and Cistern, Permutation & Combination, Probability, Progression, Mensuration	6

Text Books	1.	Book on Aptitude and Verbal Ability- Global Education Ltd(Under Review)
Reference Books	1.	antitative Aptitude- R S Aggarwal - 2017 Edition- S. Chand
	2.	mpus Recruitment- Paxis Group
E-Learning	1.	ifi study,indiabix.com,freshers world, sawal.com,unacademy

Course Title: **Employability Skills (Skill course)**										
Semester	VI	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	EVEN	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	A	-	-	2	1	-	-	-	25	--
Course Code	UIDP302									
Teaching Mode	Offline	2 Hrs			Total	-			25	
Duration of ESE	-					25				

Course Objectives	
	1. To introduce them with the current market scenarios
	2. To equip the students with the essential skills for employability
	3.To demonstrate self-sufficiency to be highly employable or venture their start-ups
	CO 1. Students shall exhibit their ability to set clear and realistic professional objective
	CO 2. Enabling them to make well informed choices and commercially equipped
	CO 3. Master Verbal (LSRW) and non-verbal communication skills required in the process of recruitment
	CO 4. Students shall exhibit improved Interpersonal skills for better professional conduct
	CO 5. Students shall exercise higher order thinking skills, creativity skills, convincing and negotiation skills

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12			
CO1	-	-	-	-	-	-	-	3	2	-	1	2			
CO2	-	-	-	-	-	-	-	-	-	-	2	-			
CO3	-	-	-	-	-	-	-	-	3	3	3	2			
CO4	-	-	-	-	-	-	-	-	3	2	2	-			
CO5	-	-	-	-	-	-	-	-	-	3	3	3			

Course Content:

Unit	Contents	Hours

I	**Orientation - Researching Job and Company- Emerging Market Trends:** Experience sharing of Major Campus interviews, Skill Requirements, Current Market trends, Researching the Job and company	4
II	**Personal and company commercial:** Guidelines for preparing a 30- 90 second self-introduction .Questions to think about in developing a commercial Understand " What to avoid" in a commercial **Self-Selling Proficiency**: What to say and do, How to demonstrate commercial awareness in an interview ,Post Interview activity, Telephone etiquette in a phone Interview **Resume Building :** Guidelines on framing resume and cover letter Checklist to ensure completeness , Sample resumes and cover letter references Basic Guidelines on Video Resume an its difference with conventional	4
III	**Verbal and Non-Verbal Communication:** Format of Business Correspondence, Email and Letter writing etiquette, Hands on training on email and letter writing with case study, Body Language in an Interview- Dos' and Donts', Tips and techniques on Essay Writing How to knot the crux on Essay writing Practise on some common essay writing topics in an interview. **Voice Versant Neutralization :** Voice Modulation, Pitch and tone training and Accent Neutralization	4
IV	**Personal Interview- Group Discussion**: Preparation tips on GD and Extempore: Dos' and Donts', Presentation on PI Preparation and FAQs - Role Plays/ Mock Interview with Technical Faculty and Mock Interview by Faculty **Assessment and feedback series:**	3

Text Books	1.	Employability Book – Global Education Ltd(Under Review)
Reference Books	1.	nployability Skills by NIMI Chennai, First Edition Aug 2019
	2.	hat employers wants by Karen Holmes, March 2017 Edition
E-Learning	1	emy , Coursera, Alison, Edx, WPA Apprentice, Hubspot, Codecademy

Course Title: **Campus Recruitment Training (Skill course)**										
Semester	VI	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	EVEN	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	A	-	-	2	1	-	-	-	25	-
Course Code	UIDP301									
Teaching Mode	Offline	2 Hrs			Total	-			25	
Duration of	-					25				

ESE				

Course Objectives	1. The Curriculum aims to equip students in order to apply quantitative reasoning and Mathematical analysis methodologies to understand and solve problems. 2. The students shall attain conceptual clarity to comprehend reasoning questions in a simple way and arrive at decisions at a logical manner. 3. The program intends to enhance student's Critical Thinking, Analytical, 4.Evaluative and Creative skills that make them best fit and sustain in the corporate/competitive world.
Course Outcomes	Upon successful completion of this course, student shall be able to: CO 1. Students shall draw conclusions or make decisions based on analysis and critique of quantitative information. This leads them to effectively justify the conclusion and execute their plans. CO 2. Students shall solve real life problems requiring interpretation and comparison of various probabilities to ascertain the best outcomes expected. CO 3. Students shall Identify logical relation to analyze, comprehend and apply mathematical techniques instead of assumptions to different real time situations. CO 4. Shall solve the campus placements aptitude papers that qualifies them to get employed.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	-	-	1	-	-	-	-	-	-	-	2	2	3	-	-
CO2	-	-	-	3	-	-	-	-	-	-	-	2	3	-	-
CO3	-	-	-	3	2	-	-	-	-	-	2	3	-	-	-
CO4	-	-	-	-	-	-	-	-	3	3	-	-	-	3	-

Course Content:

Unit	Contents	Hours
I	Blood Relation, Direction, Analogy, Puzzles, Seating Arrangement, Syllogism,	6
II	Clocks, Calendar, Cubes & Dices, Coding and Decoding, Spatial and 2-D Ability, Data Sufficiency, Number Series	6
III	Table chart, pie chart, bar graph and line graph, problems based on the various data , such as combination of gender, city, profession, salary, sports, vehicle, problems based on Pie chart, degree of fraction occupied by the commodity, line chart and bar chart	6

Text Books	1.	Book on Aptitude and Verbal Ability- Global Education Ltd(Under Review)
Reference Books	1.	antitative Aptitude- R S Aggarwal - 2017 Edition- S. Chand
	2.	mpus Recruitment- Paxis Group
E-Learning	1.	ifi study,indiabix.com,freshers world, sawal.com,unacademy

UHUL306X : Humanities Elective

Course Title: Content Designing and Media Fundamentals										
Semester	VI	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	H	02	--	--	02	10	15	50	--	--
Course Code	UHUL306B									
Teaching Mode	Offline	02 Hrs.			Total	75			--	
Duration of ESE	02 Hrs					100				

Course Objectives	To introduce students to the basics of Content Writing, the writing styles with relevant techniques
	To nourish their creative content writing with appropriate methods and practices
	To develop an overall understanding of digital marketing / online marketing platforms
	To demonstrate the emerging trends in digital marketing & the use of digital marketing tools.
	To introduce students to the Social Media related content writing and also to

	critically assess the choice of visual aids	
Course Outcomes	After the completion of the course, students shall be equipped with	
	CO1:	The skills to implement the concepts of Content Writing in their writing styles
	CO2:	The knowledge of various styles and techniques of writing and editing
	CO3:	The understanding of various online platforms and exploring the digital marketing strategies
	CO4:	The evolving styles in digital marketing and its associated tools
	CO5:	The prime choice of visual aids and the in par content writing via Social Media

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	**Program Outcomes and Program Specific Outcomes**														
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PS O 2**	**PS O3**
CO1	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	1	3	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-
CO5	-	-	-	-	-	-	-	-	1	2	1	-	-	-	-

Course Contents:

Unit	**Contents**	**Hours**
I	**The Fundamentals of Content Writing:** The concept of content writing and its significance- Types of Content Writing- Principles and Process of Content Writing- Traits of a content writer- Print and Web content Writing	08
II	**The Content Writing Theory:** The Method: Brief/ Conceive/ Research/ Structure/ Format – Editing & Proof reading- Writing styles- Corporate Communication: B2B/B2C/ Press Release/ Newsletters-Formal & Informal Language	09
III	**Basics of Digital Marketing:** Introduction to Digital Marketing- Website planning and Creation- Search Engine Optimisation- Social Media Marketing- Web Analytics- Web Marketing and Remarketing- Design Essentials	08
IV	**Social Media and Visual Aids:** Basics of Social Media and its related content writing- Public relations- Infographics- Importance and relevance- Images and Screenshots- Videos, Memes, Gifs- Product demonstration	05
V	**Plagiarism in Content Writing:** What is Plagiarism- Importance of plagiarism free content writing- Plagiarism detection tools- Techniques to avoid plagiarism	05

Text Books	1. Content Writing Step-By-Step by Joseph Robinson published in 2020-KDP Print US 2. Content Writing Handbook by Kounal Gupta published in 2021 – Henry Harvin
Reference Books	1. The No-Fluff Guide to Writing Web Content by Alina Bradford Published in 2019-KDP Print US
E- Learning	1. C IS FOR CONTENT by Fuzia

Sr. No.	Name of Activities
1	Content Brainstorming and Designing
2	Media and Visual Aids and Presentations
3	Writing Styles for Different Content Scenarios
4	Presentation on Free Digital platforms

Course Title: Cyber Ethics and Moral Responsibility

Semester	VI	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	H	02	--	--	02	10	15	50	--	--
Course Code	UHUL306A									
Teaching Mode	Offline	02 Hrs.			Total	75			--	
Duration of ESE	02 Hrs					100				

Course Objectives	Define cyber ethics and Morality with how classic ethical frameworks relate to it.	
	Apply critical thought to a wide variety of topics pertaining to cyber ethics.	
	Clearly articulate arguments both for and against various cyber ethical cases and bullying.	
	Demonstrate the ability to include ethical considerations in their decision-making.	
	Examine the scope of intellectual property issues and the available protection measures.	
Course Outcomes	After the completion of the course, students shall be equipped with	
	CO1:	Cyber Ethics and Morality with its related frameworks.
	CO2:	Critical thinking in a varied cyber ethics topics.
	CO3:	Articulate arguments and arrive clarity for and against cyber ethical cases. Being vocal and firm on the concern of Cyber bullying.
	CO4:	Decision making skills by considering ethical scenarios and its relevant consequences.
	CO5:	A better understanding of intellectual property issues and the protective measures.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O 2	PS O3
CO1	-	-	-	-	-	1	-	3	1	-	-	1	-	-	-
CO2	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	3	-	2	-	-	-	-	-
CO4	-	-	-	-	-	1	1	2	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-

Course Contents:

Unit	Contents	Hours
I	**Introduction to the course:** Introduction to Cyber Ethics and Morality- The need of Cyber Ethics in current era- Ethical Concepts and Theories- Netiquettes-Developing Ethical Analytical skills and Values	07
II	**Ethical Perspectives as a User:** Freedom of Expression-Criminal Liability vs. Accountability- Code of Conduct-Moral Responsibility and Trust- Content Reliability- Decision Making and Reasoning Skills -Online Communities and its usages- Free speech and content control- Plagiarism and Email spam- Cyber-bullying	12
III	**Regulating Internet Privacy:** Personal Information on the Internet- Consumer Privacy on the Internet-Professional Ethics- Surveillance and Cyberspace – The Digital Divide-Emerging and converging technologies- Regulating commerce in cyberspace	07
IV	**Intellectual Property:** Respecting Intellectual Property online- The domain of intellectual Property-Justifications and critiques- Trends of Intellectual property rights	07
V	**Cyber Ethics as a practice with case studies**	05

Text Books	1. Cyber Ethics 4.0- Serving Humanity with values edited by Global Ethics.net in 2018 2. Raising Humans in a Digital World by Diana Graber- An Imprint of Hapercollins in 2019
Reference Books	1. Cyber ethics: Social & Moral Issues in the Computer Age edited by Robert M Baird, Reagan Ramsower-Stuart E Rosenbaum in 2000
E- Learning	1. Cyber Ethics for students and Youth-Education Beaureau- Online Site with Resources

Sr. No.	Name of Activities
1	Group Discussions on real time Scenarios
2	Role Plays
3	Case Studies
4	Group Presentations

Course Title: UHUP304 **Employability Skills (Skill course)**										
Semester	VI	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	EVEN	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	A	-	-	2	1	-	-	-	25	--
Course Code	UHUP304									
Teaching Mode	Offline	2 Hrs			Total	-			25	
Duration of ESE	-					25				

Course Objectives	1. To introduce them with the current market scenarios
	2. To equip the students with the essential skills for employability
	3.To demonstrate self-sufficiency to be highly employable or venture their start-ups
	CO 1. Students shall exhibit their ability to set clear and realistic professional objective
	CO 2. Enabling them to make well informed choices and commercially equipped
	CO 3. Master Verbal (LSRW) and non-verbal communication skills required in the process of recruitment
	CO 4. Students shall exhibit improved Interpersonal skills for better professional conduct
	CO 5. Students shall exercise higher order thinking skills, creativity skills, convincing and negotiation skills

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12			
CO1	-	-	-	-	-	-	-	3	2	-	1	2			
CO2	-	-	-	-	-	-	-	-	-	-	2	-			
CO3	-	-	-	-	-	-	-	-	3	3	3	2			
CO4	-	-	-	-	-	-	-	-	3	2	2	-			
CO5	-	-	-	-	-	-	-	-	-	3	3	3			

Course Content:

Unit	Contents	Hours
I	**Orientation - Researching Job and Company- Emerging Market Trends:** Experience sharing of Major Campus interviews, Skill Requirements, Current Market trends, Researching the Job and company	4
II	**Personal and company commercial:** Guidelines for preparing a 30- 90 second self-introduction .Questions to think about in developing a commercial Understand " What to avoid" in a commercial **Self-Selling Proficiency**: What to say and do, How to demonstrate commercial awareness in an interview ,Post Interview activity, Telephone etiquette in a phone Interview **Resume Building :** Guidelines on framing resume and cover letter Checklist to ensure completeness , Sample resumes and cover letter references Basic Guidelines on Video Resume an its difference with conventional	4
III	**Verbal and Non-Verbal Communication:** Format of Business Correspondence, Email and Letter writing etiquette, Hands on training on email and letter writing with case study, Body Language in an Interview- Dos' and Donts', Tips and techniques on Essay Writing How to knot the crux on Essay writing Practise on some common essay writing topics in an interview. **Voice Versant Neutralization :** Voice Modulation, Pitch and tone training and Accent Neutralization	4
IV	**Personal Interview- Group Discussion**: Preparation tips on GD and Extempore: Dos' and Donts', Presentation on PI Preparation and FAQs - Role Plays/ Mock Interview with Technical Faculty and Mock Interview by Faculty **Assessment and feedback series:**	3

Text Books	1.	Employability Book – Global Education Ltd(Under Review)
Reference Books	1.	Employability Skills by NIMI Chennai, First Edition Aug 2019
	2.	What employers wants by Karen Holmes, March 2017 Edition
E-Learning	1	Udemy , Coursera, Alison, Edx, WPA Apprentice, Hubspot, Codecademy

Course Title: UHUP307 **Campus Recruitment Training (Skill course)**										
Semester	VI	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	EVEN	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	A	-	-	2	1	-	-	-	25	-
Course Code	UHUP307									
Teaching Mode	Offline	2 Hrs			Total	-			25	
Duration of ESE	-					25				

Course Objectives	1. The Curriculum aims to equip students in order to apply quantitative reasoning and Mathematical analysis methodologies to understand and solve problems.
	2. The students shall attain conceptual clarity to comprehend reasoning questions in a simple way and arrive at decisions at a logical manner.
	3. The program intends to enhance student's Critical Thinking, Analytical, 4.Evaluative and Creative skills that make them best fit and sustain in the corporate/competitive world.
Course Outcomes	Upon successful completion of this course, student shall be able to:
	CO 1. Students shall draw conclusions or make decisions based on analysis and critique of quantitative information. This leads them to effectively justify the conclusion and execute their plans.
	CO 2. Students shall solve real life problems requiring interpretation and comparison of various probabilities to ascertain the best outcomes expected.
	CO 3. Students shall Identify logical relation to analyze, comprehend and apply mathematical techniques instead of assumptions to different real time situations.
	CO 4. Shall solve the campus placements aptitude papers that qualifies them to get employed.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	-	-	1	-	-	-	-	-	-	-	2	2	3	-	-
CO2	-	-	-	3	-	-	-	-	-	-	-	2	3	-	-
CO3	-	-	-	3	2	-	-	-	-	-	2	3	-	-	-
CO4	-	-	-	-	-	-	-	-	3	3	-	-	-	3	-

Course Content:

Unit	Contents	Hours
I	Blood Relation, Direction, Analogy, Puzzles, Seating Arrangement, Syllogism,	6
II	Clocks, Calendar, Cubes & Dices, Coding and Decoding, Spatial and 2-D Ability, Data Sufficiency, Number Series	6
III	Table chart, pie chart, bar graph and line graph, problems based on the various data , such as combination of gender, city, profession, salary, sports, vehicle, problems based on Pie chart, degree of fraction occupied by the commodity, line chart and bar chart	6

Text Books	1.	Book on Aptitude and Verbal Ability- Global Education Ltd(Under Review)
Reference Books	1.	Quantitative Aptitude- R S Aggarwal - 2017 Edition- S. Chand
	2.	Campus Recruitment- Paxis Group
E-Learning	1.	Wifi study,indiabix.com,freshers world, sawal.com,unacademy

Course Title: UHUL304 :**Universal Human Values 2 : Understanding Harmony or human values**										
Semester	VI	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	EVEN	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	H	3	--	--	3	10	15	50	--	--
Course Code	UHUL304									
Teaching Mode	Offline	3 Hrs.			Total	75			--	
Duration of ESE	2 Hrs.					75				

Course Objectives	Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence
	Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
	Strengthening of self-reflection and development of commitment and courage to act.
Course	CO 1. Students are expected to become more aware of themselves.

Outcomes	CO 2. Students are expected to become more aware of their surroundings (family, society, nature).
	CO 3. Students should become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
	CO 4. Students would have better critical ability, they would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
	CO 5. Students would be able to apply what they have learnt to their own self in different day-to-day settings in real life.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes													
	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	--	--	--	--	--	**2**	--	**3**	**1**	--	--	**2**	--	**2**
CO2	--	--	**3**	--	--	**2**	--	**2**	--	**2**	--	**2**	--	**2**
CO3	--	--	**3**	--	--	**3**	**3**	**2**	--	--	--	--	--	**2**
CO4	--	--	**2**	--	--	**2**	**2**	**2**	--	--	--	--	--	**2**
CO5	--	--	**1**	--	--	**1**	**1**	**2**	--	--	--	**3**	--	**2**

Course Contents:

Unit	Contents	Hours
I	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education: Purpose and motivation for the course, Self-Exploration, Continuous Happiness and Prosperity, Right understanding relationship and physical facility, Understanding happiness and prosperity correctly, Method to fulfil the above human aspirations.	8
II	Understanding Harmony in the Human Being - Harmony in Myself! Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body',Understanding the Body as an instrument of 'I', Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body.	8

III	Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship Understanding values in human-human relationship, Understanding the meaning of Trust, Understanding the meaning of Respect, Understanding the harmony in the society, Visualizing a universal harmonious order in society	8
IV	Understanding Harmony in the Nature and Existence - Whole existence as Coexistence Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature, Understanding Existence as Co-existence, Holistic perception of harmony	8
V	Implications of the above Holistic Understanding of Harmony on Professional Ethics Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics, Strategy for transition from the present state to Universal Human Order: a) At the level of individual, b) At the level of society.	8

Text Books	1.	Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
Reference Books	1.	JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
	2.	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
	3.	The Story of Stuff (Book)
	4.	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
	5.	Small is Beautiful - E. F Schumacher.
	6.	Slow is Beautiful - Cecile Andrews
	7.	Economy of Permanence - J C Kumarappa
	8.	Bharat Mein Angreji Raj – PanditSunderlal
	9.	Rediscovering India - by Dharampal
	10.	Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
	11.	India Wins Freedom - Maulana Abdul Kalam Azad
	12.	Vivekananda - Romain Rolland (English)
	13.	Gandhi - Romain Rolland (English)