School of Computer Applications

Curriculum Structure for Bachelor of Computer Applications (BCA)

A.Y. 2024-25 (R24)

Second Year Semester III

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
U16PC301	Software Engineering	3	-	-	3	-	-	3
U16PC302	Core Java	3	-	-	3	-	-	3
UXXOE03X	Open Elective III	2	-	-	2	-	-	2
UXXMM0XX	Multidisciplinary Minor II	3	-	-	3	-	-	3
U03AE003 U03AE005	Modern Indian Language – Hindi OR Modern Indian Language – Marathi	2	-	-	2	-	-	2
U16VS303	Python Programming	-	4	-	-	2	-	2
U16PC303	Core Java Lab	-	2	-	-	1	-	1
UXXMM0XX	Multidisciplinary Minor II Lab	-	2	-	-	1	-	1
U04CC0XX	Co-curricular Courses III	-	4	-	-	2	-	2
U16FP001	Field Project I	-	4	-	-	2	-	2
Total		**13**	**16**	**-**	**13**	**08**	**-**	**21**

* Out of 2 hours, 1-hour theory shall be taught to entire class followed by 1hrs. Practical in batches, Th: Theory, Pr: Practical, Tu: Tutorial

School of Computer Applications

Curriculum Structure for Bachelor of Computer Applications (BCA)

A.Y. 2024-25 (R24)

Second Year B.C.A. Program Semester III: Evaluation Scheme

Course code	Course name	*Theory Marks*					*Practical Marks*		Total
		Internal Assessment				SEE	Term work / *Tutorial*	Practical/ POE	
		T1	T2	FET	Total				
U16PC301	Software Engineering	10	10	5	25	50	-	-	75
U16PC302	Core Java	10	10	5	25	50	-	-	75
UXXOE03X	Open Elective III	-	10	5	15	35	-	-	50
UXXMM0XX	Multidisciplinary Minor II	10	10	5	25	50	-	-	75
U03AE003 OR U03AE005	Modern Indian Language – Hindi Modern Indian Language – Marathi	10	-	5	15	35	-	-	50
U16VS303	Python Programming	-	-	-	-	-	25	25	50
U16PC303	Core Java Lab	-	-	-	-	-	25	-	25
UXXMM0XX	Multidisciplinary Minor II Lab	-	-	-	-		25	-	25
U04CC0XX	Co-curricular Courses III	-	-	-	-	-	50	-	50
U16FP001	Field Project I	-	-	-	-	-	25	25	50

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work, SEE - Semester End Examination, P/F – Pass/ Fail Course, AU – Audit Course

School of Computer Applications

Curriculum Structure for Bachelor of Computer Applications (BCA)

A.Y. 2024-25 (R24)

Second Year Semester IV

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
U16PC401	Android Application Development	3	-	-	3	-	-	3
U16PC402	Computer Network	3	-	-	3	-	-	3
UXXOE04X	Open Elective IV	2	-	-	2	-	-	2
UXXMM0XX	Multidisciplinary Minor III	3	-	-	3	-	-	3
U16PC403	Android Application Development Lab	-	2	-	-	1	-	1
U16PC404	Computer Network Lab	-	2	-	-	1	-	1
U16SE403	Bootstrap	-	4	-	-	2	-	2
UXXMM0XX	Multidisciplinary Minor III Lab	-	2	-	-	1	-	1
U04CC0XX	Co-curricular Courses IV	-	4	-	-	2	-	2
U03VE004	Universal Human Values II	2	-	-	2	-	-	2
Total		**13**	**14**	**-**	**13**	**7**	**-**	**20**

* Out of 2 hours, 1-hour theory shall be taught to the entire class followed by 1hrs. Practical in batches, Th: Theory, Pr: Practical, Tu: Tutorial

- # During the induction Program, students would get an initial exposure to human values through Universal Human Values-1

School of Computer Applications

Curriculum Structure for Bachelor of Computer Applications (BCA)

A.Y. 2024-25 (R24)

Second Year Semester IV: Evaluation Scheme

Course code	Course name	*Theory Marks*					*Practical Marks*		Total
		Internal Assessment				ESE	Term work / *Tutorial*	Practical/ POE	
		T1	T2	FET	Total				
U16PC401	Android Application Development	10	10	5	25	50	-	-	75
U16PC402	Computer Network	10	10	5	25	50	-	-	75
UXXOE04X	Open Elective IV	-	10	5	15	35	-	-	50
UXXMM0XX	Multidisciplinary Minor III	10	10	5	25	50	-	-	75
U16PC403	Android Application Development Lab	-	-	-	-	-	25	-	25
U16PC404	Computer Network Lab	-	-	-	-	-	25	-	25
U16SE403	Bootstrap	-	-	-	-	-	25	25	50
UXXMM0XX	Multidisciplinary Minor III Lab	-	-	-	-	-	25	-	25
U04CC0XX	Co-curricular Courses IV	-	-	-	-	-	50	-	50
U03VE004	Universal Human Values II	-	10	5	15	35	-	-	50

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work, ESE - End Semester Examination, P/F – Pass/ Fail Course, AU – Audit Course

School of Computer Applications

Curriculum Structure for Bachelor of Computer Applications (BCA)
A.Y. 2024-25 (R24)

Open Elective for UG program

Sr. No.	Semester	Course Code	Course Name	Credits
1	I	U16OE011	MS Office & Latex	2
2	II	U16OE021	Python Programming	2
3	III	U16OE031	Data Analytics Tools	2
4	IV	U16OE041	Web Designing Tools	2
5	V	U16OE051	Data Visualization Techniques using Tableau	2
6	VI	U16OE061	Multimedia Computing	2
Total Credits 12				

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Curriculum Structure for Bachelor of Computer Applications (BCA)

A.Y. 2024-25 (R24)

Multi-Disciplinary Minor Track I –Data Science and Analytics

Semester	Course Code	Course Name	Credits
II	U16MM011	Basics of Data Science	2
III	U16MM021	Statistical Computing	3
	U16MM022	Statistical Computing Lab	1
IV	U16MM031	Python for Data Science	3
	U16MM032	Python for Data Science Lab	1
V	U16MM041	Foundation Skills of Machine Learning	3
	U16MM042	Foundation Skills of Machine Learning Lab	1
VI	U16MM051	Predictive Modeling and Analytics	3
	U16MM052	Predictive Modeling and Analytics Lab	1

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Curriculum Structure for Bachelor of Computer Applications (BCA)

A.Y. 2024-25 (R24)

Multi-Disciplinary Minor Track II –Information and Cyber Security

Semester	Course Code	Course Name	Credits
II	U16MM012	Introduction to Data Communication	2
III	U16MM023	Information Security	3
	U16MM024	Information Security Lab	1
IV	U16MM033	Cyber Security Awareness	3
	U16MM034	Cyber Security Awareness Lab	1
V	U16MM043	Cyber Security	3
	U16MM044	Cyber Security Lab	1
VI	U16MM053	Ethical hacking	3
	U16MM054	Ethical hacking Lab	1

School of Computer Applications

Curriculum Structure for Bachelor of Computer Applications (BCA)

A.Y. 2024-25 (R24)

Multi-Disciplinary Minor Track III – Artificial Intelligence and Applications

Semester	Course Code	Course Name	Credits
II	U16MM013	Basics of Artificial Intelligence	2
III	U16MM025	Artificial Neural Networks	3
	U16MM026	Artificial Neural Networks Lab	1
IV	U16MM035	Fuzzy Logic	3
	U16MM036	Fuzzy Logic Lab	1
V	U16MM045	Introduction to Genetic Algorithm	3
	U16MM046	Introduction to Genetic Algorithm Lab	1
VI	U16MM055	Soft Computing	3
	U16MM056	Soft Computing Lab	1

SEMESTER III

Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
U16PC301	**Software Engineering**	03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
U16PC301	**Software Engineering**	10	10	5	25	40%	50	40%	75

Course Description:

This course covers a collection of methods which embody an "engineering" approach to the development of software. It discusses the nature of software and software projects, software development models, software process maturity, project planning, management, and estimations. It also underlines the topics on software testing and quality assurance.

Pre-requisite: - Basic knowledge of programming like C/C++, Computer Architecture

Course Objectives:

1.	To understand the fundamentals of software process development life cycle.
2.	To learn software design principles
3.	To explain project management in terms of the software development process.
4.	To know about software testing techniques.

Course Outcomes: after the end of this course students will able to

CO1	**Explain**[2] a software engineering process life cycle.
CO2	**Analyze**[4] and translate a specification into a design, and then realize that design practically, using an appropriate software engineering methodology.
CO3	**Prepare**[3] the code from the design and effectively apply relevant standards and perform testing, and quality management and practice
CO4	**Use**[3] modern engineering tools necessary for software project management, time management and software reuse.

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction to software Engineering and Process Models**:	
1	1.1	**Introduction:** The Nature of Software, Software Engineering, Professional Software Development, Layered Technology, Process framework, CMM, Process Patterns and Assessment Prescriptive Models: Waterfall Model, Incremental, RAD Models	9
	1.2	**Evolutionary Process Models:** Prototyping, Spiral and Concurrent Development Model Specialized Models: Component based, Aspect Oriented development, The Unified Process Phases, Agile Development-Agility, Agile Process, Extreme Programming	
2.0		**Requirement Analysis and software design:**	
2	2.1	**Requirement Analysis and System Modeling:** Requirements Engineering, Eliciting Requirements, SRS Validation, Components of SRS, Characteristics of SRS.	9
	2.2	**Object-oriented design using the UML :** Class diagram, Object diagram, Use case diagram, Sequence diagram, Collaboration diagram, State chart diagram, Activity diagram, Component diagram, Deployment diagram	
3.0		**System Design and software measurement and Metrics:**	
3	3.1	**System Design:** System/Software Design, Architectural Design, Low Level Design Coupling and Cohesion, Functional-Oriented Versus Object Oriented Approach, Design Specifications, Verification for Design, Monitoring and Control for Design.	9

	3.2	**Software Measurement and Metrics:** Process Metrics and Project Metrics, Software Measurement, Object Oriented Metrics, Software Project Estimation, Decomposition Techniques, LOC based, FP based and Use case based estimations, Empirical estimation Models	
4.0		**Software Project Management.**	
4	4.1	**Software Project Management:** Estimation in Project Planning Process– Software Scope and Feasibility, Resource Estimation, Empirical Estimation Models – COCOMO II, Estimation for Agile Development, The Make/Buy Decision	9
	4.2	**Project Scheduling** - Basic Principles, Relationship Between People and Effort, Effort Distribution, Time-Line Charts	
5.0		**Risk Management and Software testing**	
5	5.1	Risk Management - Risk strategies, Software risks, Risk Identification, projection, RMMM Quality Concepts	9
	5.2	Software Quality Assurance SQA activities, Software reviews, FTR, Software reliability and measures, SQA plan Software Configuration Management, elements of SCM, SCM Process, Change Control Capability Maturity Model	
	5.3	**Software Testing:** Verification and Validation, Introduction to Testing, Testing Principles, Testing Objectives, Test Oracles, Levels of Testing, White Box Testing/Structural Testing, Functional/Black-Box Testing, Test Plan, Test Case Design	

References:

1. Software Engineering, A Practitioner's Approach, Roger S, Pressman, 2019

2. Software Engineering: principles and Practices, Deepak Jain, OXFORD University Press, 2008
3. Software Engineering, Ian Sommerville, Pearson Education, 2017
4. Fundamentals of Software Engineering, Fourth Edition, Rajib Mall, PHI, 2018
5. Software Engineering: Principles and Practices, Hans Van Vliet, John Wiley & Sons, 2010

- **Internal Assessment (T1, T2 and FET):**

T1 should be based on first two modules and T2 should be based on next two modules, for 10 marks each. Fifth module will be assessed for 5 marks separately.

- **Semester End Examination:**

1. Question paper will comprise of 5 questions, each carrying 10 marks.
2. The duration of end semester examination shall be 2 /3/ 4 hours.
3. The students need to solve all 5 questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules.

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Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U16PC302	**Core Java**	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		
U16PC302	**Core Java**	T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
		10	10	5	25	40%	50	40%	75

Course Description:

The objective of this course is to teach the learner how to use Object Oriented paradigm to develop code and understand the concepts of Core Java and to cover-up with the pre-requisites of Core java

Pre-requisites: Basic understanding of C programming concepts

Course Objectives:

1.	Learn core Java concepts such as data types, control structures, classes, and objects.
2.	Learn how to use advanced programming concepts like encapsulation, inheritance, polymorphism, and abstraction in Java.
3.	Gain proficiency in using Java's tools for handling data like arrays, collections, and strings.
4.	To create user interfaces (UIs) in Java using Swing and JavaFX libraries.

Course Outcomes: after the end of this course students will able to

CO1	**Understand**[2]Object oriented programming concepts using Java.
CO2	**Learn**[2] about handling String and explore commonly used packages.
CO3	**Gain**[3] proficiency in Exception Handling & Threading.
CO4	**Develop**[4] GUI program using AWT package.

Course Contents

Module	Unit	Description	Hours
1.0		**The Java Language &**OOPS:	
1	1.1	Features of Java, Java programming format, Java Tokens, Java Statements, Java Data Types, Typecasting, Arrays	9
	1.2	Introduction, Class, Object, Static Keywords, Constructors, this Key Word, Inheritance, super Key Word, Polymorphism (overloading and overriding), Abstraction, Encapsulation, Abstract Classes, Interfaces	
2.0		**String Manipulations & Packages::**	
2	2.1	String, String Buffer, String Tokenizer	9
	2.2	Introduction to predefined packages (java.lang, java.util, java.io, java.sql, java.swing), User Defined Packages, Access specifiers	
3.0		**Exception Handling & Threading**	
3	3.1	Introduction, Pre-Defined Exceptions, Try-Catch-Finally, Throws, throw, User Defined Exception examples	9
	3.2	Thread Creations, Thread Life Cycle, Life Cycle Methods, Synchronization, Wait() notify() notify all() methods	
4.0		**I/O Streams & Networking:**	
4	4.1	Introduction, Byte-oriented streams, Character- oriented streams, File, Random access File, Serialization :	9
	4.2	Introduction, Socket, Server socket, Client –Server Communication	
5.0		**Wrapper Classes &Framework :**	

5	5.1	Introduction, Byte, Short, Integer, Long, Float, Double, Character, Boolean classes Collection	9
	5.2	Introduction, util Package interfaces, List, Set, Map, List interface & its classes, Set interface & its classes, Map interface & its classes	
	5.3	Inner Classes: Introduction, Member inner class, Static inner class, Local inner class, Anonymous inner class AWT: Introduction, Components, Event-Delegation-Model, Listeners, Layouts, Individual components Label, Button, CheckBox, Radio Button, Choice, List, Menu, Text Field, Text Are	

Text Books:

1 Herbert Schildt, Java The Complete Reference, Ninth Edition, McGraw-Hill Education,

2 E. Balagurusamy, Programming with Java, Tata McGraw-Hill Education India, 2014

References:

1 Programming in JAVA, 2nd Ed, Sachin Malhotra & Saurabh Choudhary, Oxford Press.

2 The Java Tutorials: http://docs.oracle.com/javase/tutorial/

- **Internal Assessment (T1, T2 and FET):**

1. T1 should be based on first two modules and T2 should be based on next two modules, for 10 marks each.
2. Fifth module will be assessed for 5 marks separately.

- **Semester End Examination:**

1. Question paper will comprise of 5 questions, each carrying 10 marks.
2. The duration of end semester examination shall be 2 /3/ 4 hours.
3. The students need to solve all 5 questions.

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Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
U16OE031	**Data Analytics Tools**	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
U16OE031	**Data Analytics Tools**	-	10	5	15	40%	35	40%	50

Course Description:
This course provides an introduction to the fundamental concepts and techniques of data analytics, aimed at beginners with little to no prior experience in the field. Students will learn how to gather, clean, analyze, and visualize data to extract meaningful insights. The course covers basic statistical concepts, data manipulation, and visualization techniques using popular tools and languages such as Python and Excel.

Pre-requisites: Microsoft Excel

Course Objectives:

1.	Understand the fundamental concepts of data analytic.
2.	Learn how to collect, clean, and reprocess data for analysis.
3.	Discover proficiency in basic statistical analysis techniques.
4.	To evaluate data visualization techniques to effectively communicate insights.

Course Outcomes: after the end of this course students will able to

CO1	**Obtain**[2] clean/process, and transform data
CO2	**Analyze**[4] and interpret data using an ethically responsible approach
CO3	**Apply**[3] computing theory, languages, and algorithms, as well as mathematical and statistical models, and the principles of optimization to appropriately formulate and use data analyses
CO4	**Interpret**[4] data findings effectively to any audience, orally, visually, and in written formats

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction to Data Analytics**:	
1	1.1	Overview of data analytics and its importance Introduction to key concepts: data, information, knowledge Types of data: structured vs. unstructured, qualitative vs. quantitative	6
	1.2	Introduction to tools and software used in data analytics.	
2.0		**Data Collection and Cleaning :**	
2	2.1	Methods for data collection: surveys, web scraping, APIs Data cleaning and preprocessing techniques Handling missing data and outliers Introduction to data wrangling tools (e.g., pandas in Python, Excel functions)	6
	2.1	Introduction to data wrangling tools (e.g., pandas in Python, Excel functions)	
3.0		**Basic Statistical Analysis :**	
3	3.1	Descriptive statistics: mean, median, mode, variance, standard deviation Probability distributions: normal distribution, binomial distribution Inferential statistics: hypothesis testing, confidence intervals	6
4.0		**Data Visualization**	
4	4.1	Importance of data visualization: Introduction to data visualization libraries (e.g., matplotlib,seaborn) Types of plots and charts: bar plots, histograms, scatter plots, box plots Principles of effective data visualization	6
5.0		**Introduction to Python for Data Analytics :**	

5	5.1	Introduction to Python programming language Basics of data manipulation with pandas library, Data visualization using matplotlib and seaborn	6
	5.2	Introduction to Excel for Data Analytics Introduction to Microsoft Excel for data analysis, Data manipulation and analysis using Excel functions and formulas	
	5.3	Creating charts and graphs in Excel	

Text Books:

1 "Data Science from Scratch: First Principles with Python" by Joel Grus

2 "Python for Data Analysis" by Wes McKinney

3 "Practical Statistics for Data Scientists: 50 Essential Concepts" by Peter Bruce and Andrew Bruce

References:

1 "Excel 2019 Bible" by Michael Alexander and Richard Kusleika

2 "Storytelling with Data: A Data Visualization Guide for Business Professionals" by Cole Nussbaumer Knaflic

3 "Practical Statistics for Data Scientists: 50 Essential Concepts" by Peter Bruce and Andrew Bruce

Evaluation Scheme

- **Internal Assessment (T2 and FET):**

1. T2 should be based on first three modules, for 10 marks each.
2. Fourth and fifth module will be assessed for 5 marks separately.

- **Semester End Examination:**

1. Question paper will comprise of 4 questions.
2. The duration of end semester examination shall be 2 hours.
3. The students need to solve all 4 questions.
4. Question No.1 will be compulsory, based on entire syllabus and carries 5 marks.
5. Remaining question (Q.2 to Q.4) will be selected from all the modules caries 5 marks each.

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Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U16MM021	**Statistical Computing**	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		
U16MM021	**Statistical Computing**	T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
		10	10	5	25	40%	50	40%	75

Course Description:
This course explores statistical computing techniques essential for data science applications, covering topics such as data manipulation, statistical analysis, and computational methods. Students will delve into practical exercises and case studies to gain hands-on experience in utilizing statistical tools for data-driven decision-making.

Pre-requisites: Basic understanding of statistics and python programming concepts.

Course Objectives:

1.	Learn statistical methods for analyzing data.
2.	Understand how to use computing tools for data analysis.
3.	Apply statistical techniques to solve real-world problems.
4.	Gain practical skills in statistical computing for data science.

Course Outcomes:

CO1	**Introduce**[2]Statistical Computing with a focus on understanding foundational concepts.
CO2	**Learn**[2]basic understanding of Descriptive Statistics and Data Visualization through and key concepts
CO3	**Apply**[3] Statistical Inference and Hypothesis Testing to analyze data and draw conclusions.
CO4	**Evaluate**[4]advanced techniques and synthesize data for predictive modeling.

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction to Statistical Computing**	
1	1.1	Overview of statistical computing concepts and applications in data science Introduction to Python programming language for statistical analysis Basics of data types, variables, and data structures in Python	9
	1.2	Introduction to statistical libraries and packages (e.g., NumPy, pandas, scipy)	
2.0		**Descriptive Statistics and Data Visualization**	
2	2.1	Understanding descriptive statistics: mean, median, mode, standard deviation, etc. Data visualization techniques using Python libraries like Matplotlib and Seaborn	9
	2.2	Hands-on exercises on generating various types of plots for data exploration	
3.0		**Statistical Inference and Hypothesis Testing**	
3	3.1	Basics of statistical inference and hypothesis testing principles Performing hypothesis tests (e.g., t-test, chi-square test) using Python's statistical libraries	9
	3.2	Interpretation of test results and drawing conclusions	
4.0		**Regression Analysis and Predictive Modeling**	
4	4.1	Introduction to regression analysis: simple linear regression, multiple linear regression Implementing regression models using Python packages like Statsmodels and Scikit-learn	9
	4.2	Hands-on projects on building predictive models and evaluating their performance	

5.0		**Machine Learning Fundamentals**	
5	5.1	Overview of machine learning concepts and algorithms Introduction to classification and clustering techniques	9
	5.2	Practical implementation of machine learning models using Python for data science applications	
	5.3	Introduction to cloud-based statistical computing platforms	

Evaluation Scheme

Text Books:

1. "Statistical Computing with Python for Data Science" by Dr. Ramesh Kumar Gupta

References:

1. Gentle, J. E. (2009). Numerical linear algebra for applications in statistics (Vol. 75). Springer Science & Business Media.

2. Hastie, T., Tibshirani, R., & Friedman, J. (2009). The elements of statistical learning: data mining, inference, and prediction (2nd ed.). Springer.

- **Internal Assessment (T1, T2 and FET):**
  1. T1 should be based on first two modules and T2 should be based on next two modules, for 10 marks each.
  2. Fifth module will be assessed for 5 marks separately.
- **Semester End Examination:**
  1. Question paper will comprise of 5 questions, each carrying 10 marks.
  2. The duration of end semester examination shall be 2 /3/ 4 hours.
  3. The students need to solve all 5 questions.
  4. Question No.1 will be compulsory and based on entire syllabus.
  5. Remaining question (Q.2 to Q.5) will be selected from all the modules.

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Evaluation Scheme

1. FEP assessment must be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per ‘credit and grading system’ manual and should be added and averaged.
3. Based on above scheme grading and FEP assessment should be done.

Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
U16MM023	**Information Security**	03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					SemesterEnd Exam (SEE)		
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
U16MM023	**Information Security**	10	10	5	25	40%	50	40%	75

Course Description:

This course provides a comprehensive overview of the field of Information Security. It introduces students to the core principles of securing information systems, including cryptography, network and system security, and application security. The course further covers organizational security policies, risk management strategies, and the legal and ethical dimensions of cyber security.

Pre-requisites:

- Basic knowledge of Computer Networks
- Understanding of Operating Systems fundamentals
- Familiarity with Software Development and Internet technologies

Course Objectives:

1.	To understand the fundamental concepts and principles of information security including the CIA triad and threat landscape.
2.	To explore cryptographic techniques and their application in securing communication.
3.	To analyze security mechanisms used in network, system, and application contexts.
4.	To understand the importance of security policies, risk management frameworks, and legal aspects of cyber security.

Course Outcomes: after the end of this course students will be able to

CO1	**Identify**[3] and analyze information security threats and apply fundamental principles to mitigate them**.**
CO2	**Demonstrate**[2] knowledge of cryptographic methods and select appropriate algorithms for specific scenarios.
CO3	**Classify**[4] basic security controls in networks, systems, and web applications.
CO4	**Apply**[3] security policies, risk management strategies, and comply with relevant cyber laws and ethical practices.

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction to Information Security**	
1	1.1	Fundamentals of Information Security - Definition and objectives of information security, Principles: Confidentiality, Integrity, Availability (CIA Triad) Security vs. Privacy, Threats, vulnerabilities, and risks	9
	1.2	Types of Attacks and Security Services Active vs. Passive attacks, Malware: Viruses, Worms, Trojans, Ransomware, Social engineering and phishing, Security services: Authentication, Access Control, Data Confidentiality, Non-repudiation	
2.0		**Cryptography**	
2	2.1	Introduction to Cryptography Basic concepts: Plaintext, Ciphertext, Encryption, Decryption, Symmetric vs. Asymmetric encryption, Cryptanalysis and cryptographic attacks	9
	2.2	Cryptographic Techniques Symmetric key algorithms: DES, AES, Asymmetric key algorithms: RSA, Diffie-Hellman	
3.0		**Network Security**	
3	3.1	OSI and TCP/IP model security concerns, Firewalls: Types and architecture, Intrusion Detection Systems (IDS) and Intrusion Prevention Systems (IPS)	9

	3.2	Secure Communication Protocols SSL/TLS,HTTPS, SFTP, and VPN	
4.0		**System and Application Security**	
4	4.1	System Security Operating system security basics, Securing file systems and user authentication, Patch management and hardening systems	9
	4.2	Application Security Common vulnerabilities (OWASP Top 10), Secure software development lifecycle (SSDLC)	
5.0		**Security Policies, Risk Management, and Cyber Laws**	
5	5.1	Security Policies and Risk Management Developing security policies and procedures, Risk analysis and assessment, Business Continuity and Disaster Recovery Planning (BCDR).	9
	5.2	Cyber Laws and Ethics Overview of IT Act 2000 (India), Intellectual property rights and digital forensics, Ethics in cyber security	

Text Books	
1	"Cryptography and Network Security" by William Stallings *Publisher: Pearson Education*
2	"Principles of Information Security" by Michael E. Whitman and Herbert J. Mattord *Publisher: Cengage Learning*
3	"Network Security Essentials: Applications and Standards" by William Stallings *Publisher: Pearson Education*
References	
1	"Information Security: Principles and Practice" by Mark Stamp *Publisher: Wiley*
2	"Computer Security: Principles and Practice" by William Stallings and Lawrie Brown *Publisher: Pearson*
3	"Cyber security and Cyber Laws" by Alfred Basta and Nadine Basta *Publisher: Cengage Learning*

- **Internal Assessment (T1, T2 and FET):**
  1. T1 should be based on first two modules and T2 should be based on next two

modules, for 10 marks each.

2. Fifth module will be assessed for 5 marks separately.

- **Semester End Examination:**
  1. Question paper will comprise of 5 questions, each carrying 10 marks.
  2. The duration of end semester examination shall be 2 /3/ 4 hours.
  3. The students need to solve all 5 questions.
  4. Question No.1 will be compulsory and based on entire syllabus.
  5. Remaining question (Q.2 to Q.5) will be selected from all the modules.

Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U16MM025	**Artificial Neural Networks**	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		
U16MM025	**Artificial Neural Networks**	T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
		10	10	5	25	40%	50	40%	75

Course Description:
This course provides a comprehensive introduction to Artificial Neural Networks (ANNs), a fundamental component of modern machine learning and artificial intelligence. Students will explore the theoretical foundations, architecture, and practical applications of neural networks in areas such as pattern recognition, computer vision, natural language processing, and time series prediction.

Pre-requisites: Knowledge of Python or R

Course Objectives:

1.	To learn foundations of artificial neural networks, including the biological inspiration, structure, and functioning of artificial neurons
2.	To Explore the architecture and learning algorithms of neural network models
3.	To Utilize deep learning frameworks to design, train, and evaluate neural network models on real-world datasets
4.	To Apply neural networks to solve complex problems.

Course Outcomes: after the end of this course students will be able to

CO1	**Understand**[2] the principles of Neural Networks .
CO2	**Identify**[3]different types of models of artificial neural networks 3
CO3	**Analyse**[4]the feed-forward neural networks.
CO4	**Illustrate**[2] SVM application to image classification.

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction to Neural Networks**	
1	1.1	Biological Neuron Model, Neural Communication, Learning in Biological Neurons Biological Vs Artificial Neurons.	9
	1.2	Learning Rules: Hebbian, Delta, Perceptron, Competitive	
2.0		**Basics of Artificial Neural Networks**	
2	2.1	Characteristics of Neural Networks, Historical Development of Neural Network Principles, Artificial Neural Networks: Terminology, Models of Neuron, Activation Functions Topology.	9
	2.2	Types of learning, Supervised, Unsupervised, Reinforcement learning, knowledge representation and acquisition	
3.0		**Types of Neural Network**	
3	3.1	Feed forward Neural Network: Introduction, Analysis of Pattern Association Networks, Analysis of Pattern Classification Networks.	9
	3.2	Feedback Neural Networks: Introduction, Analysis of Linear Auto associative FF Networks, Analysis of Pattern Storage Networks.	
4.0		**Supervised Learning Network**	
4	4.1	Perceptron Network, Perceptron Learning Rule, Architecture, Perceptron Training Algorithm, ADALINE, MADALINE, Back Propagation Network, BP Learning Rule, Input Layer Computation,	9
	4.2	Hidden Layer Computation, Output Layer Computation, Radial Basis Function Demonstration through MATLAB	
5.0		**Support Vector Machines and Radial basis function:**	
5	5.1	Learning from Examples, Statistical Learning Theory, Support Vector Machines, SVM application to Image Classification,.	9
	5.2	Radial Basis Function Regularization theory, Generalized RBF Networks, Learning in RBFNs, RBF application to face recognition	

Text Books	
1	B. Yegnanarayana - Artificial neural network PHI Publication.2005
2	S. Raj sekaran, Vijayalakshmi Pari - Neural networks, Fuzzy logic and Genetic Algorithm
3	S. Haykin, "Neural networks and Learning Machines", Pearson Education, 3rd Edition, 2013.
References	
1	Kevin L. Priddy, Paul E. Keller – Artificial neural networks: An Introduction - SPIE Press, 2005
2	Mohammad H. Hassoun – Fundamentals of artificial neural networks - MIT Press ,1995
3	B.Vegnanarayana, "Artificial neural networks", Prentice Halll of India, 1998.

Evaluation Scheme

- **Internal Assessment (T1, T2 and FET):**
  1. T1 should be based on first two modules and T2 should be based on next two modules, for 10 marks each.
  2. Fifth module will be assessed for 5 marks separately.
- **Semester End Examination**:
  1. Question paper will comprise of 5 questions, each carrying 10 marks.
  2. The duration of end semester examination shall be 2 /3/ 4 hours.
  3. The students need to solve all 5 questions.
  4. Question No.1 will be compulsory and based on entire syllabus.
  5. Remaining question (Q.2 to Q.5) will be selected from all the modules.

Lab Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U16VS303	**Python Programming**	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	04	-	-	02	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (POE)		
U16VS303	**Python Programming**	Term Work	Min pass %	Marks	Min pass %	Total (Marks)
		25	40	25	40	50

Course Outcomes: After the end of this course students will be able to

CO1	**Understand**[2] the steps involved in compiling, linking and debugging C code, feel more confident about writing the C functions, write some complex programs
CO2	**Develop**[3] the logic for the given problem, recognize and understand the syntax and construction of C code, gains experience of C
CO3	**Apply**[3] the alternate ways to provide the solution to a given problem.

List of Experiments

1. Installing python and setting up environment. Simple statements like printing the names, numbers, mathematical calculations, etc.
2. Simple programs containing variable declaration and arithmetic operations
3. Programs based on conditional constructs
4. Programs based on loops
5. Programs related to string manipulation
6. Programs related to Lists, Tuples

7. Programs related to dictionaries
8. Programs to read & write file.
9. Programs to do searching and sorting
10. Program to demonstrate use of class methods
11. Program to demonstrate method overloading.
12. Program to implement stack
13. Program to implement of Circular Queue.
14. Program to demonstrate constructor.
15. Program to demonstrate destructor.
16. Program to implement inheritance.

Text Book:

. arles Dierbach, Introduction to Computer Science using Python, Wiley, 2013

mes Payne , Beginning Python: Using Python 2.6 and Python 3, Wiley India, 2010

ul Gries , Jennifer Campbell, Jason Montojo, Practical Programming: An Introduction

mputer Science Using Python 3, Pragmatic Bookshelf, 2/E 2014

References:

1. Adesh Pandey, Programming Languages – Principles and Paradigms, Narosa, 2008 A. Lukaszewski, MySQL for Python: Database Access Made Easy, Pact Publisher, 2010
2. Paul Gries , Jennifer Campbell, Jason Montojo, Practical Programming: An Introduction to ComputerScience Using Python 3, Pragmatic Bookshelf, 2/E 2014

Evaluation Scheme

1. Termwork assessment shall be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per ‘credit and grading system’ manual and should be added and averaged.
3. Based on above scheme grading and Termwork assessment should be done.

4. OE/POE shall be based on all Termwork and work carried out during semester.

*****

Lab Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U16PC303	**Core Java Lab**	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (SEE)		
U16PC303	**Core Java Lab**	Term work	Min pass	Marks	Min pass	Total (Marks)
		25	40%	-	-	25

Course Outcomes: after the end of this course students will able to

1	**List**[1]classes and applets in java programming.
2	**Understand**[2]Object oriented programming concepts using Java
3	**Apply**[3]Knowledge for getting input, its processing and getting suitable output
4	**Analyse**[4]GUI program using AWT package.

List of Experiments

1. Accept integer values for a, b and c which are coefficients of quadratic equation. Find the solution of quadratic equation.
2. Accept two n x m matrices. Write a Java program to find addition of these matrices
3. Accept n strings. Sort names in ascending order.

4. Create a package: Animals. In package animals create interface Animal with suitable behaviors. Implement the interface Animal in the same package animals
5. Demonstrate Java inheritance using extends keyword
6. Demonstrate method overloading and method overriding in Java
7. Demonstrate creating your own exception in Java.
8. Using various swing components design Java application to accept a student's resume. (Design form)
9. Write a Java List example and demonstrate methods of Java List interface.
10 Design simple calculator GUI application using AWT components

Text Books:	
1	Herbert Schildt, Java The Complete Reference, Ninth Edition, McGraw-Hill Education,
2	E. Balagurusamy, Programming with Java, Tata McGraw-Hill Education India, 2014
References:	
1	Programming in JAVA, 2nd Ed, Sachin Malhotra & Saurabh Choudhary, Oxford Press
2	The Java Tutorials: http://docs.oracle.com/javase/tutorial/

Evaluation Scheme

1. FEP assessment must be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per 'credit and grading system' manual and should be added and averaged.
3. Based on above scheme grading and FEP assessment should be done.

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Lab Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
U16MM022	**Statistical Computing Lab**	-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (SEE)		
		Term work	Min pass	Marks	Min pass	Total (Marks)
U16MM022	**Statistical Computing Lab**	25	40%	-	-	25

Course Outcomes: after the end of this course students will able to

CO1	Introduce Statistical Computing with a focus on **understanding**[1] foundational concepts.
CO2	**Develop**[4] Descriptive Statistics and Data Visualization through describing and explaining key concepts.
CO3	**Apply**[3] Statistical Inference and Hypothesis Testing to analyze data and draw conclusions.
CO4	**Apply**[3] advanced techniques to synthesize data for predictive modeling.

List of Experiments

1. Program to calculate the Mean (average), Mode and Median of a dataset.
2. Program to compute the standard deviation of a dataset.
3. Program to compute the variance of a dataset
4. Program to calculate the correlation coefficient between two variables in a dataset
5. Program to perform hypothesis testing (e.g., t-test, chi-square test) on a dataset.
6. Program to implement simple linear regression to predict one variable based on another.

7. Program to implement multiple linear regression to predict one variable based on multiple predictors.
8. Program to implement logistic regression for binary classification problems.
9. Program to perform K-Means clustering on a dataset to identify natural groupings.
10. Program to implement PCA for dimensionality reduction and feature extraction.

Text Books:	
1	"Statistical Computing with Python for Data Science" by Dr. Ramesh Kumar Gupta
References:	
1	Gentle, J. E. 2009. Numerical linear algebra for applications in statistics (Vol. 75). Springer Science & Business Media.
2	Hastie, T., Tibshirani, R., & Friedman, J. 2009. The elements of statistical learning: data mining, inference, and prediction (2^{nd} ed.). Springer.

Evaluation Scheme

1. FEP assessment must be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per 'credit and grading system' manual and should be added and averaged.
3. Based on above scheme grading and FEP assessment should be done.

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Lab Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U16MM024	Information Security Lab	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (SEE)		
U16MM024	**Information Security Lab**	Term work	Min pass	Marks	Min pass	Total (Marks)
		25	40%	-	-	25

Course Outcomes: After the end of this course students will be able to

CO1	**Demonstrate**[2] the use of cryptographic algorithms (e.g., DES, AES, RSA, Hashing) .
CO2	**Analyze**[4] basic network and system security tools such as firewalls, VPNs, IDS/IPS,

List of Experiments

Experiments based on above theory content.

Text Books

1 "Cryptography and Network Security" by William Stallings
Publisher: Pearson Education
2 "Principles of Information Security" by Michael E. Whitman and Herbert J. Mattord
Publisher: Cengage Learning
3 "Network Security Essentials: Applications and Standards" by William Stallings
Publisher: Pearson Education

References

1 "Information Security: Principles and Practice" by Mark Stamp
Publisher: Wiley
2 "Computer Security: Principles and Practice" by William Stallings and Lawrie Brown
Publisher: Pearson

3 "Cyber security and Cyber Laws" by Alfred Basta and Nadine Basta
Publisher: Cengage Learning

Evaluation Scheme

1. FEP assessment must be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per 'credit and grading system' manual and should be added and averaged.
3. Based on above scheme grading and FEP assessment should be done.

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Lab Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U16MM026	Artificial Neural Networks Lab	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (SEE)		
U16MM026	Artificial Neural Networks Lab	Term work	Min pass	Marks	Min pass	Total (Marks)
		25	40%	-	-	25

List of Experiments

Experiments based on course content of **Artificial Neural Networks(U16MM025)**

Text Books	
1	B. Yegnanarayana - Artificial neural network PHI Publication.2005
2	S. Raj sekaran, Vijayalakshmi Pari - Neural networks, Fuzzy logic and Genetic Algorithm
3	S. Haykin, “Neural networks and Learning Machines”, Pearson Education, 3rd Edition, 2013.
References	
1	Kevin L. Priddy, Paul E. Keller – Artificial neural networks: An Introduction - SPIE Press, 2005
2	Mohammad H. Hassoun – Fundamentals of artificial neural networks - MIT Press ,1995
3	B.Vegnanarayana, “Artificial neural networks”, Prentice Halll of India, 1998.

Evaluation Scheme

1. FEP assessment must be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per ‘credit and grading system’ manual and should be added and averaged.
3. Based on above scheme grading and FEP assessment should be done.

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SEMESTER IV

Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
U16PC401	**Android Application Development**	03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
U16PC401	**Android Application Development**	10	10	5	25	40%	50	40%	75

Course Description:
This course includes the development of mobile applications, learning how to integrate them with other services, and creating intuitive, reliable mobile apps using Android services and components. Android with the help of Java will be used as a basis for teaching programming techniques and design patterns related to the development of mobile applications which will create a seamless user interface that works with different mobile screens.

Pre-requisites: Core Java (U16PC302), Database Management System (U16PC202)

Course Objectives:

1.	To install and configure Android Studio and facilitate students in understanding Android SDK.
2.	To help students to gain a basic understanding of Android application development.
3.	To inculcate working knowledge of the Android Studio development tool.
4.	Explain and use key Android programming concepts and Build enterprise-level mobile applications with Android.

Course Outcomes: after the end of this course students will able to

CO1	**Explain**[2] Android architecture and the tools for developing Android Applications**.**
CO2	**Identify**[1] appropriate layouts and input controls for Android applications.
CO3	**Develop**[5]android applications for file management, menu handling and navigation.
CO4	**Demonstrate**[3] database operations and deployment of android applications.

Course Contents

Module	Unit	Description	Hours
1.0		**Android Overview and Android Development Environment**	
1	1.1	Overview of Android, History of android, Android Versions, Android Architecture, Activity, Activity life cycle, Activity Back Stack.	9
	1.2	Introduction to AndroidSDK, Android Emulator, creating a Project, Project Directory Structure, Android Manifest File, and User Permissions.	
2.0		**Layouts and Intents**	
2	2.1	XML, Android View Hierarchies, Linear Layout, Relative Layout, Table Layout, Frame Layout.	9
	2.2	Intent, Implicit Intent and Explicit Intent, Calling Intent on an activity	
3.0		**Input Controls, Events and Dialogs, Menus, Navigation and Location:**	
3	3.1	TextView, EditText, Button, Checkbox, Radio Group, Radio Button, Spinner,EventListeners,ImageView,VideoView,DatePicker,TimePicker,Toast, AlertDialog.	9
	3.2	Menus, Options menu, Context menu, Popup menu, Handling menu click events, Location Manager, fetching location of the device, Loading Google Maps, Google Maps Activity, Navigating through Google Maps.	
4.0		**File Handling**	
4	4.1	Android Storage System, Android storage internal structure, File access modes	9
	4.2	Openingandwritingafile,readingafile,deletingafile,locatingafilein Android Studio, Shared Preference.	
5.0		**Android Database and App Market**	

	5.1	SQLite Database, Database Helper,- SQLite Open Helper, The Database Schema and Its Creation,	9
	5.2	CRUD Operations, Cursors, Example, Publish app to the Android Playstore.	

Text Books:	
1	Phillips, B., Stewart, C., & Marsicano, K. 2017. Android Programming: The Big Nerd Ranch Guide (3rd ed.). Big Nerd Ranch Guides Publisher.
2	Meier, R. 2012. Professional Android 4 Application Development. Wiley India Publications.
3	Jackson, W. 2012. Android Apps for Absolute Beginners (2nd ed.). Apress Publishers.
References:	
1	Ableson, W. F., Sen, R., King, C., & Ortiz, C. E. (2011). Android in Action (3rd ed.). Manning Publications.

Evaluation Scheme:

- **Internal Assessment (T1, T2 and FET):**

1. T1 should be based on first two modules and T2 should be based on next two modules, for 10 marks each.
2. Fifth module will be assessed for 5 marks separately.

- **Semester End Examination:**

1. Question paper will comprise of 5 questions, each carrying 10 marks.
2. The duration of end semester examination shall be 2 /3/ 4 hours.
3. The students need to solve all 5 questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules.

Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U16PC402	**Computer Network**	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		
U16PC402	**Computer Network**	T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
		10	10	5	25	40%	50	40%	75

Course Description:
This course introduces computer networks, with a special focus on the Internet architecture and protocols. The course includes topics such as network architectures, addressing, naming, forwarding, routing, communication reliability, the client-server model, web, email and other application layer protocols.

Prerequisite: Fundamental of Networking

Course Objectives:

1.	Understand the basic principles of computer networking, including protocols, topologies, and network components.
2.	Learn how to design, implement, and troubleshoot computer networks to meet specific business requirements.
3.	Gain hands-on experience with network devices, such as routers, switches, and firewalls.
4.	Understand the importance of network security and learn how to implement security measures to protect data and prevent unauthorized access.

Course Outcomes: after the end of this course students will able to

CO1	**Identify**[2] the design issues of network and algorithm techniques
CO2	**Explain**[2] the fundamental concepts of computer networks
CO3	**Summarize**[4] the different functionalities of layers.
CO4	**Apply** [3] various error detection/correction mechanism and the role/ use of addressing

Course Contents

Module	Unit	Description	Hours
1.0		**Basics of Computer Networks**	
1	1.1	Computer Networks, Advantages and Disadvantages of Computer Networks, Interconnection Devices: Hub, Bridges, Switch, Routers, Repeater, Gateway, etc.	9
	1.2	Hardware Required for LAN- NIC card, Cables.	
2.0		**Introduction to Data Link Layer**	
2	2.1	Introduction to Data Link Layer: Link layer addressing, Data Link Layer Design Issues. Error detection and correction: Block coding, cyclic codes, checksum, forward error correction, error correcting codes, error detecting codes.	9
	2.2	Data Link Control: DLC services, data link layer protocols, HDLC, Point-to point protocol.	
3.0		**Media Access Control**	
3	3.1	Media Access Control: Random access, controlled access, channelization Wired LANs – Ethernet: Ethernet Protocol, standard Ethernet, fast Ethernet, gigabit Ethernet, 10 gigabit Ethernet	9
	3.2	Wired Network: Telephone Network, Cable Network, SONET, ATM Wireless LANs: Introduction, IEEE 802.11 project, Bluetooth, WiMAX Cellular telephony, Satellite networks.	
4.0		**Introduction to Network Layer**	

4	4.1	Introduction to Network Layer: Network layer services, packet switching, network layer performance, IPv4 addressing, forwarding of IP packets	9
	4.2	Network Layer Protocols: Internet Protocol, ICMPv4, Mobile IP Unicast Routing: Introduction, routing algorithms, unicast routing protocols	
5.0		**Introduction to Application Layer**	
5	5.1	Introduction to Application Layer: Client Server Programming, Iterative Programming.	9
	5.2	Standard Client-Server Protocols: WWW, HTTP, FTP, Electronic Mail, TELNET, Secure Cell, DNS, SNMP	
	5.3	Quality of Service: Data Flow to improve QoS, Flow control to improve QoS, Integrated service (Intserv), Differentiated Service (Diffserv).	

Text Books:

1	Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI
2	William Stallings, "Data and Computer Communications", Eighth Edition, PearsonEducation, 2011.

References:

1	Peterson, L. L., & Davie, B. S. (2011). Computer Networks: A Systems Approach (5th ed.). Morgan Kaufmann Publishers Inc.
2	Mir, N. F. (2007). Computer and communication networks. (1st ed.). PearsonEducation.
3	Author, A. A. (Year). Title of the article. Journal Name, Volume(Issue), Page numbers.
4	Forouzan, B. A. (2018). Data Communications and Networking (5th ed.). TMH.
5	Tanenbaum, A. S., & Wetherall, D. J. (2018). Computer Networks (5th ed.). Pearson Education.

Evaluation Scheme

- **Internal Assessment (T1, T2 and FET):**

1. T1 should be based on first two modules and T2 should be based on next two modules, for 10 marks each.
2. Fifth module will be assessed for 5 marks separately.

- **Semester End Examination:**

1. Question paper will comprise of 5 questions, each carrying 10 marks.
2. The duration of end semester examination shall be 2 /3/ 4 hours.
3. The students need to solve all 5 questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules.

Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
U16OE041	**Web Designing Tools**	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
U16OE041	**Web Designing Tools**	-	10	5	15	0%	35	40%	50

Course Description:

This course will introduce students to web designing tools, static and dynamic pages, applets, user interactive components, multimedia components, and important web design concepts. Students will learn how to create static and dynamic pages, incorporate interactive components, and optimize multimedia content for web delivery. Recommended books will provide additional resources for further learning.

Pre-requisites: Knowledge of HTML, CSS, and basic programming.

Course Objectives:

1.	To provide an overview of web designing tools and the difference between static and dynamic pages.
2.	To teach students how to create static pages using HTML and CSS, and best practices for designing them.
3.	To introduce students to dynamic pages, JavaScript, AJAX, and server-side scripting languages for creating interactive content.
4.	To familiarize students with applets, user interactive components, and multimedia components in web design, and how to incorporate them in web pages.

Course Outcomes: after the end of this course students will able to

CO1	**Identify**[1] different web designing tools and their purposes.
CO2	**Define**[2] the difference between static and dynamic pages.
CO3	**Apply**[3] applets and user interactive components in web design.
CO4	**Describe**[4] the importance of multimedia components in web designining.

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction to Web Designing Tools**	
1	1.1	- Overview of web designing tools - Difference between static and dynamic pages - Introduction to applets and user interactive components	6
	1.2	- Introduction to multimedia components - Other important components in web designing	
2.0		**Static Pages**	
2	2.1	- Understanding static pages and their importance - Introduction to HTML for creating static pages - CSS for styling static pages	6
	2.2	- Best practices for designing static pages - Hands-on exercises for creating static pages	
3.0		**Dynamic Pages**	
3	3.1	- Introduction to dynamic pages and their advantages - Basics of JavaScript for creating dynamic pages - Working with AJAX for dynamic content loading	6
	3.2	- Introduction to server-side scripting languages like PHP or ASP.NET - Hands-on exercises for creating dynamic pages	
4.0		**Applets and User Interactive Components**	

4	4.1	- Understanding applets and their usage in web design - Introduction to frameworks like jQuery for user interaction - Creating forms and validating user input	6
	4.2	- Using JavaScript libraries for interactive components - Hands-on exercises for creating user interactive components	
5.0		**Multimedia Components**	
5	5.1	- Importance of multimedia components in web design - Working with images, audio, and video in web pages	6
	5.2	- Embedding multimedia content using HTML5 elements	
	5.3	- Optimizing multimedia content for web delivery - Hands-on exercises for incorporating multimedia components	

Text Books:

1.	"Web Design with HTML, CSS, JavaScript and jQuery Set" by Jon Duckett
2.	"JavaScript: The Good Parts" by Douglas Crockford, "PHP and MySQL for Dynamic Web Sites" by Larry Ullman
3.	"JavaScript & jQuery: The Missing Manual" by David Sawyer McFarland

References:

1	Jon Duckett (2014) - "Web Design with HTML, CSS, JavaScript and jQuery Set"
2	Jennifer Niederst Robbins (2018) - "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics"

Evaluation Scheme

- **Internal Assessment (T2 and FET):**

1. T2 should be based on first three modules, for 10 marks each.
2. Fourth and fifth module will be assessed for 5 marks separately.

- **Semester End Examination:**

1. Question paper will comprise of 4 questions.
2. The duration of end semester examination shall be 2 hours.
3. The students need to solve all 4 questions.
4. Question No.1 will be compulsory, based on entire syllabus and carries 5 marks.
5. Remaining question (Q.2 to Q.4) will be selected from all the modules caries 5 marks each.

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Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U16MM031	**Python for Data Science**	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (ESE)		
U16MM031	**Python for Data Science**	T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
		10	10	5	25	40%	50	40%	75

Course Description:

This course provides a comprehensive introduction to Python programming, focusing on data types, structures, and data cleaning techniques. Students will also learn data visualization using Matplotlib and Seaborn, as well as Pandas for data analysis and machine learning basics. In addition, the course covers Natural Language Processing fundamentals and an overview of deep learning concepts, including text preprocessing and neural network training.

Pre-requisites: Basic programming knowledge and familiarity with Python programming language.

Course Objectives:

1.	Understand the basics of Python programming language, including installation and setup of the Python environment, and using Jupyter notebooks for coding.
2.	Identify and work with different data types and data structures in Python, such as variables, lists, tuples, dictionaries, sets, and NumPy arrays.
3.	Learn techniques for data cleaning and preprocessing, including handling missing values, removing duplicates, data normalization, and scaling.
4.	Explore data visualization using Matplotlib, Seaborn, and Plotly to create informative and visually appealing plots and graphs.

Course Outcomes: after the end of this course students will able to

CO1	**Understand**[2] the fundamentals of Python programming language.
CO2	**Gain**[4] the skills to clean and preprocess data effectively with handling missing values and normalizing data.
CO3	**Visualize**[2] data using libraries creating both static and interactive visualizations.
CO4	**Aquire**[2] knowledge of Pandas, machine learning concepts, and basics of Natural Language Processing and Deep Learning

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction to Python for Data Science**	
1	1.1	Overview of Python programming language Installation and setup of Python environment Using Jupyter notebooks for coding	9
	1.2	Data Types and Data Structures in Python Variables and data types in Python Lists, tuples, dictionaries, and sets Working with NumPy ,arrays	
2.0		**Data Cleaning and Preprocessing**	
2	2.1	Handling missing values Removing duplicates	9
	2.2	Data normalization and scaling	
3.0		**Data Visualization**	
3	3.1	Plotting with Matplotlib Data visualization with Seaborn	9
	3.2	Creating interactive visualizations with Plotly	
4.0		**Introduction to Pandas and Machine Learning**	
4	4.1	Introduction to Pandas library Data wrangling and analysis with Pandas Overview of machine learning Supervised and unsupervised learning Linear regression and classification algorithms	9
	4.2	Model evaluation and validation Cross-validation and model selection Evaluating model performance Hyperparameter tuning	

5.0		**Introduction to Natural Language Processing and Deep Learning**	
5	5.1	Basics of NLP Text preprocessing	9
	5.2	Text classification with NLTK Overview of deep learning	
	5.3	Introduction to neural networks Building and training deep learning models	

Text Books:

1 "Python for Data Analysis" by Wes McKinney

2 "Python Data Science Handbook" by Jake VanderPlas

3 "Data Science from Scratch" by Joel Grus

References:

1 Lane, H., Howard, H., & Hapke, R. (2019). Natural Language Processing in Action. Manning Publica

2 Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep Learning. MIT Press.

Evaluation Scheme

- **Internal Assessment (T1, T2 and FET):**
  1. T1 should be based on first two modules and T2 should be based on next two modules, for 10 marks each.
  2. Fifth module will be assessed for 5 marks separately.
- **Semester End Examination**:
  1. Question paper will comprise of 5 questions, each carrying 10 marks.
  2. The duration of end semester examination shall be 2 /3/ 4 hours.
  3. The students need to solve all 5 questions.
  4. Question No.1 will be compulsory and based on entire syllabus.
  5. Remaining question (Q.2 to Q.5) will be selected from all the modules.

Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
U16MM033	**Cyber Security Awareness**	03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					SemesterEnd Exam (SEE)		
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
U16MM033	**Cyber Security Awareness**	10	10	5	25	40%	50	40%	75

Course Description:
This course offers a comprehensive understanding of cyber security principles and cybercrime. It covers core topics such as types of cyber threats and attacks, e-commerce security, social engineering, virus/malware threats, cybercrime categories, investigation techniques, and relevant Indian cyber laws. Students will gain knowledge of both technical and legal aspects of cyber security to prepare them for modern challenges in the digital world.

Pre-requisites:

1. Basic knowledge of Computer Fundamentals
2. Introduction to Networking Concepts (OSI & TCP/IP)

Course Objectives:

1.	To explain the fundamentals of cyber security and the importance of safeguarding information systems.
2.	To classify different types of cybercrimes, attacks, and social engineering techniques.
3.	To describe cybercrime investigation tools, evidence handling, and tracking methods.
4.	To introduce legal policies and cyber laws applicable in India and globally.

Course Outcomes: after the end of this course students will be able to

CO1	**Understand**[2] core concepts of cyber security, attack types, and network protocol layers.
CO2	**Identify**[3] various types of cybercrimes and understand methods used by attackers.
CO3	**Apply**[3] basic investigation techniques such as email tracking, IP tracing, and password recovery
CO4	**Interpret**[2] key sections of cyber laws, digital evidence procedures, and ethical responsibilities under Indian Law

Course Contents

Module	Unit	Description	Hours
1.0		**Cyber Security Fundamentals**	
1	1.1	What is Cyber Security? Importance and scope in the modern digital world, Key security concepts: Threats, Vulnerabilities, Risks	9
	1.2	ISO/OSI and TCP/IP Protocol ,Types of Attacks , E-commerce Security, Security threats, OWASP top Ten.	
2.0		**Cyber Crime Overview:**	
2	2.1	Introduction and Overview of Cyber Crime - Nature and Scope of Cyber Crime - Types of Cyber Crime	9
	2.2	Social Engineering - Categories of Cyber Crime -Property Cyber Crime.	
3.0		**Cyber Crime Issues**	
3	3.1	Unauthorized Access to Computers -Computer Intrusions - White collar Crimes - Viruses and Malicious Code	9
	3.2	Internet Hacking and Cracking - Virus Attacks– Software Privacy- Mail Bombs -Exploitation - Stalking and Obscenity in Internet	
4.0		**Cyber Crime Investigations**	
4	4.1	Introduction to Cyber Crime investigations, Investigations Tools, E-Mail Investigation –Tracking - IP Tracking - E-Mail, Recovery	9
	4.2	Encryption and Decryption Methods - - Recovering Deleted Evidences - Password Cracking.	
5.0		**Cyber Laws & Act**	

5	5.1	Laws and Ethics - Digital Evidence Controls - Evidence Handling Procedures.	9
	5.2	Basics of Indian Evidence ACT IPC and CrPC - Electronic Communication Privacy ACT - Legal Policies.	

Text Books	
1	"Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives" *Author:* Nina Godbole & Sunit Belapure
2	"Cyber Law & Ethics" *Author:* Dr. V.K. Jain
3	"Computer Security Principles and Practice" *Author: William Stallings & Lawrie Brown*
References	
1	"Information Systems Security: Security Management, Metrics, Frameworks and Best Practices" *Author:* Nina Godbole
2	"Cyber Crime and Security" *Author: Pavan Duggal*
3	"Fighting Cyber Crime" *Author:* M. Laxmikanth

- **Evaluation Scheme**
- **Internal Assessment (T1, T2 and FET):**

1. T1 should be based on first two modules and T2 should be based on next two modules, for 10 marks each.
2. Fifth module will be assessed for 5 marks separately.

- **Semester End Examination**:

1. Question paper will comprise of 5 questions, each carrying 10 marks.
2. The duration of end semester examination shall be 2 /3/ 4 hours.
3. The students need to solve all 5 questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules.

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Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
U16MM035	Fuzzy Logic	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					End Semester Exam (ESE)		
U16MM035	Fuzzy Logic	T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
		10	10	5	25	40%	50	40%	75

Course Description: This course introduces fuzzy systems, covering classical and fuzzy sets, membership functions, fuzzification, and defuzzification techniques. Topics include fuzzy classification, arithmetic, logic systems, and rule-based models. Practical applications like clustering, computational models, and string matching are also explored to equip students with tools for analyzing and implementing fuzzy systems.

Pre-requisites: Mathematics, Classification and Clustering techniques, basics of DSS

Course Objectives:

1	Understand the fundamental concepts of classical and fuzzy sets, along with their operations and properties.
2	Learn about membership functions, fuzzification, and defuzzification techniques for handling uncertainty and imprecision.
3	Explore fuzzy classification methods, including clustering and similarity relations.
4	To gain knowledge of fuzzy arithmetic, interval analysis, and the differences between classical and fuzzy logic systems.
5	To learn different fuzzy classification methods.

Course Outcomes: after the end of this course students will be able to

CO1	**Explain**[2] the difference between classical and fuzzy sets to demonstrate clear conceptual understanding.
CO2	**Apply**[3] standard membership functions to fuzzify data in effective manner.
CO3	**Examine**[4] fuzzy-to-crisp conversion methods, such as lambda-cuts to accurately transform fuzzy data.
CO4	**Compare**[5] defuzzification and classification techniques to reveal method strengths and weaknesses.
CO5	**Calculate**[6] and utilize classification metrics to assess the performance of fuzzy classifiers.

Course Contents			
Module	**Unit**	**Description**	**Hours**
1.0		**Introduction Set Theory :**	
1	1.1	Classical Sets and Fuzzy Sets: Background, Uncertainty and Imprecision, Statistics and Random Processes, Uncertainty in Information, Fuzzy Sets and Membership, Chance versus Ambiguity.	9
	1.2	Classical Sets - Operations on Classical Sets, Properties of Classical (Crisp) Sets, Mapping of Classical Sets to Functions. Fuzzy Sets.	
2.0		**Fuzzy Membership functions:**	
2	2.1	Features of the Membership Function, Standard Forms and Boundaries, Fuzzification, Membership Value Assignments, Intuition, Inference, Rank Ordering, Angular Fuzzy Sets, Inductive, Reasoning.	9
	2.2	Fuzzy- To- Crisp Conversions: Lambda- Cuts for Fuzzy Sets, Lambda- Cuts for Fuzzy Relations, Defuzzification Methods.	
3.0		**Techniques in Fuzzy Logic**	
3	3.1	Classification by Equivalence Relations - Crisp Relations, Fuzzy Relations. Cluster Analysis, Cluster Validity.	9
	3.2	Defuzzification Techniques - Lambda-cut method, Weighted average method, Maxima methods, Centroid methods, Extension Principle - Crisp Functions, Mapping and Relations, Functions of fuzzy.	
4.0		**Fuzzy Arithmetic:**	
4	4.1	Fuzzy Numbers, Interval Analysis in Arithmetic, Approximate Methods of Extension - Vertex method, DSW Algorithm, Restricted DSW Algorithm, Comparisons. Fuzzy Vectors.	9
	4.2	Classical Logic And Fuzzy Logic: Classical Predicate Logic – Tautologies, Contradictions, Equivalence, Exclusive OR and Exclusive NOR.	
5.0		**Fuzzy Classification :**	
5	5.1	Classification By equivalence relations-crisp relations, Fuzzy relations, Cluster analysis, Cluster validity, C-Means clustering, Hard C-Means clustering.	9
	5.2	Fuzzy C-Means algorithm, Classification metric, Hardening the Fuzzy C-Partition.	

Textbooks:

1. Fuzzy Logic with Engineering Applications by Timothy J. Ross, McGraw- Hill, II Edition.
2. George J.KlirBo Yuan - Fuzzy sets and Fuzzy logic theory and Applications, PHI, New Delhi, 1995.

References:

1. Kenneth A. Berman and Jerome L. Paul, "Algorithms", Cengage learning India Edition, New Delhi, 2002.
2. Sara Baase and Allen Van Gelder, "Computer Algorithms – Introduction to Design & Analysis", Third Edition, Pearson Education, New Delhi, 2000

- **Evaluation Scheme**
- **Internal Assessment (T1, T2 and FET):**

1. T1 should be based on first two modules and T2 should be based on next two modules, for 10 marks each.
2. Fifth module will be assessed for 5 marks separately.

- **Semester End Examination**:

1. Question paper will comprise of 5 questions, each carrying 10 marks.
2. The duration of end semester examination shall be 2 /3/ 4 hours.
3. The students need to solve all 5 questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules.

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Lab Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U16PC403	**Android Application Development Lab**	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (SEE)		
U16PC403	**Android Application Development Lab**	Term work	Min pass	Marks	Min pass	Total (Marks)
		25	40%	-	-	25

Course Outcomes: after the end of this course students will able to

CO1	**Analyze**[4] and discover own mobile app for simple needs.
CO2	**Develop**[5] mobile applications using GUI, Layouts, Event Listeners, Navigation and Database

List of Experiments

Experiments based on Course (U16PC401) **Android Application Development**

Text Books	
1	Phillips, B., Stewart, C., & Marsicano, K. (2017). Android Programming: The Big Nerd Ranch Guide (3rd ed.). Big Nerd Ranch Guides Publisher.
2	Meier, R. (2012). Professional Android 4 Application Development. Wiley India Publications.
3	Jackson, W. (2012). Android Apps for Absolute Beginners (2nd ed.). Apress Publishers.
References:	
1	Ableson, W. F., Sen, R., King, C., & Ortiz, C. E. (2011). Android in Action (3rd ed.). Manning Publications.

Evaluation Scheme

1. FEP assessment must be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per 'credit and grading system' manual and should be added and averaged.
3. Based on above scheme grading and FEP assessment should be done.

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Lab course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U16PC404	**Computer Network Lab**	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (SEE)		
U16PC404	**Computer Network Lab**	Term work	Min pass	Marks	Min pass	Total (Marks)
		25	40%	-	-	25

Course Outcomes: after the end of this course students will able to

CO1	**Analyze**[4] basic networking.
CO2	**Demonstrate**[3] the basic network of server, router.
CO3	**Create**[6] a wireless network of multiple PCs using appropriate access point.

List of Experiments

Experiments based on Course (U16PC402) **Computer Network Text**

Book:

1	Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI
2	William Stallings, "Data and Computer Communications", Eighth Edition, Pearson Education, 2011.

Evaluation Scheme

- FEP assessment must be based on the overall performance of the student with every assignment graded from time to time.
- The grades will be converted to marks as per 'credit and grading system' manual and should be added and averaged.
- Based on the above scheme, grading and FEP assessment should be done.

Lab Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U16SE403	**Bootstrap**	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	04	-	-	02	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (POE)		
U16SE403	**Bootstrap**	Term work	Min pass	Marks	Min pass	Total (Marks)
		25	40%	25	40%	50

Course Outcomes: after the end of this course students will able to

CO1	**Design**[2] dropdown menu using Bootstrap plugin.
CO2	**Demonstrate**[3] the Bootstrap various plugins in webpage.
CO3	**Apply**[4] the Bootstrap for creating a web application.

List of Experiments

1. Setup:

1. Create a new HTML file and include Bootstrap CSS and JavaScript files in the document.
2. You can use CDN links or download the files and include them locally.

2. Dropdown Menu:

1. Implement a dropdown menu using Bootstrap's dropdown plugin.
2. Create a navigation bar with a dropdown menu containing multiple links or actions.

3.Modal Dialog:

3. Utilize Bootstrap's modal plugin to create a modal dialog box.
4. Design a button that, when clicked, opens a modal displaying additional content or a form.

4. Carousel:

1. Implement a carousel/slider using Bootstrap's carousel plugin.
2. Include multiple slides with images and captions to showcase featured content or products.

5. Tooltip:

1. Add tooltips to elements on the page using Bootstrap's tooltip plugin.
2. Apply tooltips to buttons, links, or other interactive elements to provide additional information on hover.

6. Popover:

1. Utilize Bootstrap's popover plugin to create interactive popovers.
2. Add popovers to elements to display additional content or actions when **c**licked.

7. **Scrollspy:**

1. Implement a scrollspy using Bootstrap's scrollspy plugin.
2. Create a navigation menu that highlights the corresponding section as the user scrolls through the page.

8. Tabs:

1. Utilize Bootstrap's tab plugin to create tabbed navigation.
2. Design a section with multiple tabs, each containing different content.

9. Collapse:

1. Implement collapsible elements using Bootstrap's collapse plugin.
2. Create accordion-style sections that expand or collapse when clicked.

10. Validation:

1. Ensure that all plugins are functioning correctly and provide a seamless user experience.
2. Test the website across different devices and screen sizes to ensure responsiveness.

Text Book	
1.	Bootstrap: Responsive Web Development, Jake Spurlock, 2013
2.	Learning Web Development with Bootstrap and AngularJS, Stephen Radford, 2015
Reference	
1.	Step by Step Bootstrap 3: A Quick Guide to Responsive Web Development Using Bootstrap 3, Riwanto Megosinarso, 2014.
2.	Bootstrap Site Blueprints Volume II: Maximize the potential of Bootstrap for faster and more responsive web applicationsMatt Lambert, 2016.

Evaluation Scheme

1. Term work assessment shall be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per 'credit and grading system' manual and should be added and averaged.
3. Based on above scheme grading and Term work assessment should be done.
4. OE/POE shall be based on all Term work and work carried out during semester.
5. Based on above scheme grading and FEP assessment should be done.

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Lab Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
U16MM032	**Python for Data Science Lab**	-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (SEE)		
		Term work	Min pass	Marks	Min pass	Total (Marks)
U16MM032	**Python for Data Science Lab**	25	40%	-	-	25

Course Outcomes: after the end of this course students will able to

CO1	**Manipulate**[3] data from CSV files using Python programming
CO2	**Discuss**[2]relationships between variables in a dataset using scatter plots and histograms.
CO3	**Show**[3] relationships between variables in a dataset using scatter plots and histograms
CO4	**Expalin**[2]to clean and preprocess data by removing missing values and filtering specific rows in a dataset for further analysis.

List of Experiments

Experiments based on Course (U16MM031) **Python for Data Science**

Text Book:	
1	"Data Science from Scratch" by Joel Grus
2	"Python for Data Analysis" by Wes McKinney
3	"Python Data Science Handbook" by Jake VanderPlas
References:	
1	Lane, H., Howard, H., &Hapke, R. (2019). Natural Language Processing in Action. Manning Publications.
2	Goodfellow, I., Bengio, Y., &Courville, A. (2016). Deep Learning. MIT Press..

Evaluation Scheme

1. FEP assessment must be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per 'credit and grading system' manual and should be added and averaged.
3. Based on above scheme grading and FEP assessment should be done.

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Lab Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U16MM034	Cyber Security Awareness Lab	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (SEE)		
U16MM034	Cyber Security Awareness Lab	Term work	Min pass	Marks	Min pass	Total (Marks)
		25	40%	-	-	25

List of Experiments

Experiments based on Course U16MM034 Cyber Security Awareness Lab

Text Books	
1	"Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives" *Author:* Nina Godbole & Sunit Belapure
2	"Cyber Law & Ethics" *Author:* Dr. V.K. Jain
3	"Computer Security Principles and Practice" *Author: William Stallings & Lawrie Brown*
References	
1	"Information Systems Security: Security Management, Metrics, Frameworks and Best Practices" *Author:* Nina Godbole
2	"Cyber Crime and Security" *Author: Pavan Duggal*
3	"Fighting Cyber Crime" *Author:* M. Laxmikanth

Evaluation Scheme

4. FEP assessment must be based on the overall performance of the student with every assignment graded from time to time.
5. The grades will be converted to marks as per ‘credit and grading system’ manual and should be added and averaged.
6. Based on above scheme grading and FEP assessment should be done.

Lab Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U16MM036	Fuzzy Logic Lab	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (SEE)		
U16MM036	Fuzzy Logic Lab	Term work	Min pass	Marks	Min pass	Total (Marks)
		25	40%	-	-	25

List of Experiments

Experiments based on Course U16MM036 Fuzzy Logic Lab

Textbooks:

1. Fuzzy Logic with Engineering Applications by Timothy J. Ross, McGraw- Hill, II Edition.
2. George J.KlirBo Yuan - Fuzzy sets and Fuzzy logic theory and Applications, PHI, New Delhi, 1995.

References:

1. Kenneth A. Berman and Jerome L. Paul, "Algorithms", Cengage learning India Edition,New Delhi, 2002.
2. Sara Baase and Allen Van Gelder, "Computer Algorithms – Introduction to Design & Analysis", Third Edition, Pearson Education, New Delhi, 2000

Evaluation Scheme

1. FEP assessment must be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per 'credit and grading system' manual and should be added and averaged.
3. Based on above scheme grading and FEP assessment should be done.

Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
U03VE004	**Universal Human Values -II**	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
U03VE004	**Universal Human Values – II**	-	10	5	15	40%	35	40%	50

Course Description:
Human civilization is known for the values that it cherishes and practices. Across various times and places, sages, saints, and seers, drawing on their experience, developed practices that placed central importance on values, though the names used by them differed, as their languages varied the spirit was the same. Universal human values are values that human beings cherish and hold in common consciously and otherwise in most places and times and practice them.

Course Objectives:

1.	Describe the meaning, purpose, and relevance of universal human values.
2.	Understand the importance of values in individual, social, career, and national life.
3.	Learn from the lives of great and successful people who followed and practiced human values and achieved self-actualization.

Course Outcomes: after the end of this course students will able to

CO1	Become conscious practitioners of value
CO2	Realize their potential as human beings and conduct themselves properly in the ways of the world.
CO3	Develop integral life skills with values.
CO4	Inculcate and practice them consciously to be a good human being.
CO5	Realize one's potential as a human being

Course Contents

Module	Unit	Description	Hours
1.0		**Love & Compassion (Prem and Karuna)**	
1	1.1	What is love and its forms: love for self, parents, family, friend, spouse, community, nation, humanity and other beings—living and non-living.	5
	1.2	Love and compassion and inter-relatedness: The facilitator needs to explain the relationship between love and compassion and other related feelings and emotions like empathy, sympathy and non-violence.	
	1.3	Individuals who are remembered in history or in collective memory for practicing compassion and love: (e.g., Buddha, Christ)	
	1.4	Narratives and Anecdotes from history, literature including local folklore	
2.0		**Truth (Satya)**	
2	2.1	What is truth? Universal truth, truth as value (arth), truth as fact (saty) (veracity, sincerity, honesty among others	5
	2.2	Individuals who are remembered in history for practicing this value (Raja Harishchandra, Dharmaraj Yudhishthara, Mahatma Buddha, Socrates, Mahatma Gandhi	
	2.3	Narratives and Anecdotes from about truth history, collective memory and literature including local folklore	
3.0		**Non-Violence (Ahimsa)**	
3	3.1	What is non-violence? Its need. Love, compassion, empathy and sympathy for others as pre-requisites for non-violence	5
	3.2	Ahimsa as non-violence and non-killing	
	3.3	Individuals and organizations that are known for their commitment to Nonviolence	
	3.4	Narratives and Anecdotes about non-violence from history, literature including local folklore	
4.0		**Righteousness (Dharma) , Service (Seva)**	

4	4.1	What is righteousness? Righteousness and dharma, Righteousness and Propriety	8
	4.2	Individuals who are remembered in history for practicing righteousness, Narratives and Anecdotes from history, literature including local folklore	
	4.3	What is service? Forms of service, for self, parents, spouse, family, friend, community, persons in distress or disaster, nation, humanity, and other—living beings and non-living things.	
	4.4	Individuals who are remembered in history for practicing this value. Narratives and Anecdotes dealing with instances of service from history, literature including local folklore.	
5.0		**Peace (Shanti), Renunciation (Sacrifice) Tyag**	
5	5.1	What will learners learn/gain if they practice peace? What will learners lose if they don't practice it? Sharing learner's individual and/or group experience(s) about peace, Simulated Situations, Case studies	7
	5.2	What is renunciation? Renunciation and sacrifice. Greed is the main obstruction in the path of renunciation. Self-restraint and Ways of Overcoming greed. Renunciation with action as true renunciation	
	5.3	Individuals who are remembered in history for practicing this value. (Rama, Bhishma, Buddha, Mahavira, Christ, Guru Govind Singh, Bhagat Singh, and Mahatma Gandhi)	
	5.4	Narratives and Anecdotes from history and literature, including local folklore about individuals who are remembered for their sacrifice and renunciation.	

Text Books:	
1	Radha Kumud Mookerji (1989). Ancient Indian Education, Motilal Banarasidass.
2	Swami Satyananda Saraswati (2008). Asana Pranayama Mudra Bandha, Bihar School of yoga.
3	Kireet Joshi (1997). Education for Character Development, Dharma Hinduja Center of Indic Studies. A.L. Basham (1954). The Wonder That Was India, London: Picador Press.
4	Rokeach Milton (1973). The Nature of Human Values. New York: The Free Press.
5	Ghosh, Sri Aurobindo (1998). The Foundations of Indian Culture. Pondicherry: Sri Aurobindo Ashram.

Evaluation Scheme

- **Internal Assessment (T2 and FET):**

1. T2 should be based on the first two modules for 10 marks
2. FET shall be assessed for 5 marks separately.

- **Semester End Examination:**

1. Question paper will comprise of 4 questions.
2. The duration of end semester examination shall be 2 hours.
3. The students need to solve all 4 questions.
4. Question No.1 will be compulsory, based on entire syllabus and carries 5 marks.
5. Remaining question (Q.2 to Q.4) will be selected from all the modules caries 5 marks each.

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