DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

<table>
<tr><th colspan="5">Scheme: 2023-24, Syllabus: 2024-25</th></tr>
<tr><th colspan="5">Part A - Introduction</th></tr>
<tr><td>Subject</td><td colspan="4">BCA</td></tr>
<tr><td>Semester</td><td colspan="4">VI</td></tr>
<tr><td>Name of the Course</td><td colspan="4">Programming using Python</td></tr>
<tr><td>Course Code</td><td colspan="4">B23-CAP-601</td></tr>
<tr><td>Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/ VAC)</td><td colspan="4">CC-A6</td></tr>
<tr><td>Level of the course (As per Annexure-I</td><td colspan="4">300-399</td></tr>
<tr><td>Pre-requisite for the course (if any)</td><td colspan="4">Knowledge of any Computer Programming Language</td></tr>
<tr><td>Course Learning Outcomes(CLO):</td><td colspan="4">After completing this course, the learner will be able to:
1. understand the basic concepts of Python programming
2. learn various data structures used in Python programming.
3. develop the simple programs of Python using arrays and functions.
4. illustrate the process of data file manipulations using python
5* develop the programs using Python.</td></tr>
<tr><td rowspan="2">Credits</td><td>Theory</td><td>Practical</td><td colspan="2">Total</td></tr>
<tr><td>3</td><td>1</td><td colspan="2">4</td></tr>
<tr><td>Contact Hours</td><td>3</td><td>2</td><td colspan="2">5</td></tr>
<tr><td colspan="3">Max. Marks:100(70(T)+30(P))
Internal Assessment Marks:30(20(T)+10(P))
End Term Exam Marks: 70(50(T)+20(P))</td><td colspan="2">Time: 3 Hrs.(T), 3Hrs.(P)</td></tr>
<tr><th colspan="5">Part B- Contents of the Course</th></tr>
<tr><td colspan="5"><u>Instructions for Paper- Setter</u>
The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus.
Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.
Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.</td></tr>
<tr><th>Unit</th><th colspan="3">Topics</th><th>Contact Hours</th></tr>
</table>

I	Introduction to Python: Python Interpreter, Python as calculator, Python shell, Indentation, identifier and keywords, literals, strings, Operators: Arithmetic, Relational, Logical, comparison, Bitwise, Assignment, Identity operator and Membership operator; Input & output statements; Control statements: Branching, looping, Conditional statement, Exit function	11
II	String Manipulations: Subscript operator, indexing, slicing a string, other functions on strings, string module. Strings and number system: Format functions, converting strings to numbers & Vice Versa. List, Tuples, Sets, Dictionaries: Basic list operators, replacing, inserting, removing an element, searching, Sorting lists, dictionary literals, adding & removing keys, accessing & replacing values, traversing dictionaries.	11
III	Array in Python, Design with Functions: hiding redundancy, complexity, arguments & return values; Formal/Actual arguments, named arguments, program structure and design, Recursive functions, scope & Global statements, Importing modules, Math modules & Random modules.	11
IV	Exception Handling: Exceptions, except clause, try and finally clause, user-defined exceptions. File Handling: Manipulating files & directories, OS & SYS modules, Reading, writing text & numbers from/to file. Graphics: "Turtle" module, drawing colors, shapes, digital images, image file formats.	12
V*	**Practicum**: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • WAP to find the roots of a quadratic equation. • WAP to accept a number 'n' and (a). Check if 'n' is prime (b). Generate all prime numbers till 'n' (c). Generate first 'n' prime numbers (d). This program may be done using functions. • WAP that accepts a character and performs the following: (a). print whether the character is a letter, numeric digit, or special character (b). if the character is a letter, print whether the letter is uppercase or lowercase (c). if the character is a numeric digit, print its name in the text (e.g., if the input is 9, the output is NINE) • WAP to perform the following operations on a string (a). Find the frequency of a character in a string. (b). Replace a character by another character in a string. (c). Remove the first occurrence of a character from a string. (d). Remove all occurrences of a character from a string. • WAP to swap the first n characters of two strings. • Write a function that accepts two strings and returns the indices of all the occurrences of the second string in the first string as a list. If the second string is not present in the first string, then it should return -1. • WAP to create a list of the cubes of only the even integers appearing in the input list (may have elements of other types also) using the following: (a). 'for' loop (b). list comprehension	30

	• WAP to read a file and (a). Print the total number of characters, words, and lines in the file. (b). Calculate the frequency of each character in the file. Use a variable of dictionary type to maintain the count. (c). Print the words in reverse order. (d). Copy even lines of the file to a file named 'File1' and odd lines to another file named 'File2'. • Write a function that prints a dictionary where the keys are numbers between 1 and 5 and the values are cubes of the keys. • Consider a tuple t1= (1, 2, 5, 7, 9, 2, 4, 6, 8, 10). WAP to perform the following operations: (a). Print half the values of the tuple in one line and the other half in the next line. (b). Print another tuple whose values are even numbers in the given tuple. (c). Concatenate a tuple t2= (11,13,15) with t1. (d). Return maximum and minimum values from this tuple • WAP to accept a name from a user. Raise and handle the appropriate exception(s) if the text entered by the user contains digits and/or special characters.	

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory** • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➢ **Practicum** • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	**End-Term Examination:** A three-hour exam for both theory and practicum. **End Term Exam Marks: 70(50(T)+20(P))**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- Sheetal Taneja, Naveen Kumar, Python Programming: A Modular approach, 5th Impression, Pearson.
- Reema Thareja, Python Programming Using Problem Solving Approach, Oxford University Press.
- Mark Lutz, Learning Python (available online at pdf derive).
- Guttag John V, Introduction to Computation and Programming Using Python with Application to Understanding Data, PHI.
- Charles Diorbach, Introduction to Computer Science using Python, Wiley.
- Balaguruswamy E., Introduction to Computing and Problem Solving using Python, 2nd edition, McGraw Hill Education, 2018.
- Brown, Martin C., Python: The Complete Reference, 2nd edition, McGraw Hill Education, 2018.

* Applicable for courses having practical components.

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<table>
<tr><th colspan="5">Scheme: 2023-24, Syllabus: 2024-25</th></tr>
<tr><th colspan="5">Part A - Introduction</th></tr>
<tr><td>Subject</td><td colspan="4">BCA</td></tr>
<tr><td>Semester</td><td colspan="4">VI</td></tr>
<tr><td>Name of the Course</td><td colspan="4">Advanced Web Development</td></tr>
<tr><td>Course Code</td><td colspan="4">B23-CAP-602</td></tr>
<tr><td>Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/ VAC)</td><td colspan="4">CC-B6</td></tr>
<tr><td>Level of the course (As per Annexure-I</td><td colspan="4">300-399</td></tr>
<tr><td>Pre-requisite for the course (if any)</td><td colspan="4">B23-CAP-202, B23-CAP-402, B23-CAP-502</td></tr>
<tr><td>Course Learning Outcomes(CLO):</td><td colspan="4">After completing this course, the learner will be able to:
1. gain proficiency in advanced web development frameworks and tools.
2. understand the principles of responsive design and progressive web apps.
3. learn best practices for database management and full-stack development.
4. know about optimization and devops.

5* To work on real-world projects and develop a comprehensive web application.</td></tr>
<tr><td rowspan="2">Credits</td><td>Theory</td><td>Practical</td><td>Total</td></tr>
<tr><td>3</td><td>1</td><td>4</td></tr>
<tr><td>Contact Hours</td><td>3</td><td>2</td><td>5</td></tr>
<tr><td colspan="3">Max. Marks:100(70(T)+30(P))
Internal Assessment Marks:30(20(T)+10(P))
End Term Exam Marks: 70(50(T)+20(P))</td><td colspan="2">Time: 3 Hrs.(T), 3Hrs.(P)</td></tr>
<tr><th colspan="5">Part B- Contents of the Course</th></tr>
<tr><td colspan="5"><u>Instructions for Paper- Setter</u>
Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus.</td></tr>
</table>

Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.
Practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	**Advanced Front-End Development:** Advanced HTML5 & CSS3: Semantic HTML, CSS Grid and Flexbox, CSS Preprocessors (Sass/LESS) JavaScript ES6+: Advanced JavaScript concepts (Promises, Async/Await), ES6+ features (Arrow functions, Template literals, Destructuring)	11
II	Front-End Frameworks: Introduction to React, Angular, Component-based architecture, State management with Redux **Advanced Back-End Development:** Server-Side Programming: Express.js, GraphQL, Middleware, and Authentication (JWT, OAuth)	11
III	Database Management: Advanced SQL concepts, NoSQL databases (Firebase), ORMs (Sequelize) **Full-Stack Development:** Integrating Front-End and Back-End: Building a full-stack application, Handling asynchronous operations, Real-time applications with WebSockets	11
IV	**Performance Optimization**: Code splitting and lazy loading, Caching strategies, Optimizing images and assets **Deployment and DevOps:** Deployment Strategies: CI/CD pipelines, Containerization with Docker, Deployment platforms (Heroku, AWS, Netlify) DevOps and Monitoring: Infrastructure as code (Terraform, Ansible), Monitoring and logging (Prometheus, Grafana)	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • **Front-End Projects:** Develop a responsive web application using React/Angular. • **Back-End Projects:** Build and deploy a RESTful API using Node.js and Express.js. • **Full-Stack Projects:** Create a full-stack application integrating front-end and back-end. • **Optimization Projects:** Implement performance optimization techniques on existing projects. • **Deployment Projects:** Set up a CI/CD pipeline and deploy a web application to a cloud platform.	30
Suggested Evaluation Methods		
Internal Assessment: ➢ **Theory** • Class Participation: 5		**End Term Examination:** A three-hour

• Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➢ **Practicum** • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	exam for both theory and practicum.
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • "JavaScript: The Good Parts" by Douglas Crockford • "You Don't Know JS" by Kyle Simpson • "Learning React" by Alex Banks and Eve Porcello	

*Applicable for courses having practical components.

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<tr><th colspan="4">Part A - Introduction</th></tr>
<tr><td>Subject</td><td colspan="3">BCA</td></tr>
<tr><td>Semester</td><td colspan="3">VI</td></tr>
<tr><td>Name of the Course</td><td colspan="3">Artificial Intelligence</td></tr>
<tr><td>Course Code</td><td colspan="3">B23-CAP-603</td></tr>
<tr><td>Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/ VAC)</td><td colspan="3">CC-C6</td></tr>
<tr><td>Level of the course (As per Annexure-I</td><td colspan="3">300-399</td></tr>
<tr><td>Pre-requisite for the course (if any)</td><td colspan="3">Basic understanding of computer systems and programming.</td></tr>
<tr><td>Course Learning Outcomes(CLO):</td><td colspan="3">After completing this course, the learner will be able to:
1. learn the basic Artificial Intelligence (AI) concept and its application areas.
2. acquire the knowledge of heuristic search and approaches for knowledge representations.
3. understand the idea of natural language processing and predicate logic
4. gain the knowledge of learning technologies & build expert systems.
5*. Understand the practical aspects of artificial intelligence.</td></tr>
<tr><td rowspan="2">Credits</td><td>Theory</td><td>Practical</td><td>Total</td></tr>
<tr><td>3</td><td>1</td><td>4</td></tr>
<tr><td>Contact Hours</td><td>3</td><td>2</td><td>5</td></tr>
<tr><td colspan="2">Max. Marks:100(70(T)+30(P))
Internal Assessment Marks:30(20(T)+10(P))
End Term Exam Marks: 70(50(T)+20(P))</td><td colspan="2">Time: 3 Hrs.(T), 3Hrs.(P)</td></tr>
<tr><th colspan="4">Part B- Contents of the Course</th></tr>
<tr><td colspan="4"><u>Instructions for Paper-Setter</u>
The examiner will set a total of nine questions. Out of which the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus.
The candidate will have to attempt five questions in all, selecting one question from each unit. The first question will be compulsory.</td></tr>
</table>

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Artificial Intelligence (AI), Importance of AI, AI and its Related Field, AI Techniques, Criteria for success. Problem Space and Search: Problem as a State Space Search, Production System and its Characteristics, Issues in the Design of the Search Problem.	11
II	Heuristic search techniques: Generate and test, hill climbing, best first search technique, problem reduction, constraint satisfaction. Knowledge Representation: Definition and Importance of Knowledge, Knowledge Representation, Various Approaches Used in Knowledge Representation, Issues in Knowledge Representation.	11
III	Using Predicate Logic: Representing Simple Facts in Logic, Representing Instances and is-a Relationship, Computable Function and Predicate, Natural Language Processing: Introduction, Syntactic Processing, Semantic Processing, Discourse and Pragmatic Processing.	11
IV	Learning: Introduction to Learning, Rote Learning, Learning by Taking Advice, Learning in Problem-Solving, Learning from Example-Induction, Explanation-Based Learning. Expert System: Introduction, Representing Using Domain-Specific Knowledge, Expert System Shells.	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: Problem Solving and Search Algorithms • Implementing uninformed search algorithms (Breadth-First Search, Depth-First Search) • Implementing informed search algorithms (A*, Greedy Best-First Search) Knowledge Representation and Reasoning • Implementing basic logic representation (Propositional and Predicate Logic) • Building simple inference engines • Developing rule-based systems for decision-making Introduction to Expert Systems • Understanding the components of expert systems • Designing knowledge bases using rule-based systems Expert Systems Applications • Developing expert systems for specific domains (e.g., medical diagnosis, financial advisory) • Case studies of successful expert systems	30

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory** • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5	**End-Term Examination:** A three-hour exam for both

• Mid-Term Exam: 10 ➢ **Practicum** • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	theory and practicum. **End Term Exam Marks: 70(50(T)+20(P))**
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • E. Rich and K. Knight, Artificial Intelligence, TMH. • D.W. Patterson, Introduction to AI and Expert Systems, PHI. • Nils J Nilsson, Artificial Intelligence -A new Synthesis, Harcourt Asia Ltd.	

*Applicable for courses having practical components.

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<table>
<tr><th colspan="4">Scheme: 2024-25, Syllabus: 2024-25</th></tr>
<tr><th colspan="4">Part A - Introduction</th></tr>
<tr><td>Subject</td><td colspan="3">BCA</td></tr>
<tr><td>Semester</td><td colspan="3">VI</td></tr>
<tr><td>Name of the Course</td><td colspan="3">Basics of Data Science using Python</td></tr>
<tr><td>Course Code</td><td colspan="3">B23-CAP-604</td></tr>
<tr><td>Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/ VAC)</td><td colspan="3">CC-M6</td></tr>
<tr><td>Level of the course (As per Annexure-I</td><td colspan="3">300-399</td></tr>
<tr><td>Pre-requisite for the course (if any)</td><td colspan="3">Must have basic knowledge of computer</td></tr>
<tr><td>Course Learning Outcomes(CLO):</td><td colspan="3">After completing this course, the learner will be able to:
1. understand the fundamental concepts of data science and the role of Python in data analysis.
2. To learn data cleaning, preparation, and visualization techniques using Python.
3. To apply statistical analysis and predictive modeling using Python.
4. To explore advanced Python libraries and data analysis tools.
5*. to implement the programs based on data science in Python.</td></tr>
<tr><td rowspan="2">Credits</td><td>Theory</td><td>Practical</td><td>Total</td></tr>
<tr><td>3</td><td>1</td><td>4</td></tr>
<tr><td>Contact Hours</td><td>3</td><td>2</td><td>5</td></tr>
<tr><td colspan="2">Max. Marks:100(70(T)+30(P))
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<tr><th colspan="4">Part B- Contents of the Course</th></tr>
<tr><td colspan="4"><u>Instructions for Paper- Setter</u>
Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The</td></tr>
</table>

examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus.
The candidate will have to attempt five questions in all, selecting one question from each unit. The first question will be compulsory.
The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Data Science: Definition, importance, and applications. Overview of Python: Python programming basics, data types, and structures. Introduction to Python Libraries: NumPy, pandas, and matplotlib. Basic Data Manipulation: Reading and writing data files, basic operations with pandas DataFrame.	11
II	Data Import and Export: Handling CSV, Excel, and other file formats. Data Cleaning Techniques: Handling missing values, duplicates, and data inconsistencies. Data Transformation: Data type conversion, normalization, and scaling. Data Visualization: Creating and customizing plots using matplotlib and Seaborn.	11
III	Descriptive Statistics: Calculating mean, median, mode, standard deviation, and variance using pandas. Inferential Statistics: Conducting hypothesis testing, t-tests, and chi-square tests. Regression Analysis: Implementing simple linear regression and multiple regression using scikit-learn. Predictive Modeling: Introduction to basic predictive models such as decision trees and logistic regression.	11
IV	Advanced Python Libraries: Exploring advanced pandas, NumPy, and scikit-learn features. Data Analysis Tools: Time series analysis, clustering, and classification using scikit-learn. What-If Analysis Tools: Sensitivity analysis and scenario analysis using Python.	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: Introduction to Python for Data Science • Setting up the Python environment (Anaconda, Jupyter Notebook) • Introduction to libraries: NumPy, pandas, Matplotlib, and Seaborn Data Manipulation with pandas • Importing and exporting data • Data cleaning and preprocessing • Data transformation and aggregation Data Visualization • Creating basic plots with Matplotlib • Advanced visualization with Seaborn Exploratory Data Analysis (EDA) • Descriptive statistics and data summarization	30

	• Detecting and handling missing values • Identifying patterns and correlations in data Descriptive Statistics • Implementing regression using Sci-kit learn • Implementing predictive modelling and decision tress • Implementing basic statistics and various tests used in statistics • Implementing various data analysis tools	
Suggested Evaluation Methods		
Internal Assessment: ➢ **Theory** • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➢ **Practicum** • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		**End Term Examination:** A three hour exam for both theory and practicum.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • "Python Data Science Handbook: Essential Tools for Working with Data" by Jake VanderPlas. • "Python for Data Analysis: Data Wrangling with pandas, NumPy, and IPython" by Wes McKinney. • "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron. • "Data Science from Scratch: First Principles with Python" by Joel Grus. • "Think Stats: Exploratory Data Analysis" by Allen B. Downey.		

*Applicable for courses having practical component.

Session:2023-24			
Part A-Introduction			
Subject	B.Com. Vocational (Computer Applications)		
Semester	VI		
Name of the Course	Networking and ERP		
Course Code	B23-VOC-329		
Course Type:(CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course(if any)	Nil		
Course Learning Outcomes (CLO):	**After completing this course, the learner will be able to:** 1. Understand of networking concepts and basic terminology along with its hardware components. 2. Understand and characterize various types of computer networks. 3. Conceptualize the various design issues related to Network Architecture. 4. Understand the concept of ERP system. 5*. Implement and understand various network algorithms		
Credits	**Theory**	**Practical**	**Total**
	3	1	4
Contact Hours	3	2	5
Internal Assessment Marks	20	10	30
End-Term Exam Marks	50	20	70
Exam Time	3 Hrs.	3 Hrs.	--

Part B-Contents of the Course

Instructions for Paper-Setter

Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Computer Networks: Concept, goals applications, types of computer networks and their topologies; Network Design: Issues and protocols; Computer communications and networking models; Communication service methods and data transmission modes; OSI reference model, OSI service types, functions of layers of OSI model.	12
II	Physical layer: Analog and digital communication concepts; Copper media; Fiber-optic media; Wireless communications; Satellite communication: Speed and capacity of a communication channel; Multiplexing; Switching; Data link layer: The IEEE and the data link layer, framing techniques; Flow control; MAC.	11
III	Network H/W: Connectors, transceiver, repeater, Hub bridge, Switches, Routers gateway; Network hardware components; Network layer: Overview, internetworking concepts; Routers and switches; Routing protocol concepts; Routing algorithms: Flooding, shortest path routing; Encryption method; Network security issue, Security threats.	11
IV	Enterprise: Concept and functions; Process approach to business; Types of information in business; Systems approach to information management; Integrated data model; ERP: Concept, origin, need, reasons of growth, ERP technologies- Management information system; Decision support system; Executive information system; Supply chain management system; ERP modules, implementing ERP solutions.	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: • Performing various network commands based on syllabus. • Understanding network models concepts. • Understanding routing. • Understanding various concepts of network topologies.	30

Suggested Evaluation Methods

Internal Assessment:		**End Term Exam:**
➢ **Theory 20**		Theory: 50
• Class Participation:	05	Practicum: 20
• Seminar/presentation/assignment/quiz/class test etc.	05	
• Mid-Term Exam:	10	
➢ **Practicum 10**		
• Class Participation	NA	
• Seminar/Demonstration/Viva-voce/Lab records etc.	10	
• Mid-Term Exam	NA	

Part C-Learning Resources
Recommended Books/e-resources/LMS: • Andrew S. Tanenbaum, Computer Networks, PHI. • Behrouz A Forouzan, Data Communications and Networking, Mc-Graw Hill. • Bret Wagner, Ellen Monk Enterprise Resource Planning, Cengage Learning. • Michael A. Gallo, William M. Hancock, Computer Communications and Networking Technologies, CENGAGE learning. • Vinod Kumar Garg, N.K. Venkitakrishnan, Enterprise Resource Planning: Concepts and Practice, Prentice Hall of India Pvt. Ltd. • William Stallings, Data and Computer Communications, PHI.

*Applicable for courses having practical component.