

# Semester-V

| Part A-Introduction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  |                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|
| Name of the Programme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Computer Science                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                  |                     |
| Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                     |
| Nature of Course/Course Composition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Theory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                     |
| Name of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Data Communication and Networking                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                     |
| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 24L5.5-CSE-501                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                  |                     |
| Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | CC-5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                     |
| Course Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 300-399                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                     |
| Pre-requisite for the course (if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Must have basic knowledge of computer                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                     |
| Course Learning Outcomes (CLOs)<br>After completing this course, the learner will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                           | CLO <sub>1</sub> : Understand basics of data communication and computer networks.<br>CLO <sub>2</sub> : Learn about various network models used in networking.<br>CLO <sub>3</sub> : Learn basics and categories of various transmission media.<br>CLO <sub>4</sub> : Learn various routing techniques and congestion control techniques.                                                                                                                                                          |                  |                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Theory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Practical</b> | <b>Total</b>        |
| Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0                | 4                   |
| Teaching Hours per week                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0                | 4                   |
| Internal Assessment Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0                | 30                  |
| End Term Exam Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0                | 70                  |
| Max. Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0                | 100                 |
| Examination Duration(in Hours)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 03                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                  |                     |
| Part B-Contents of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  |                     |
| <b>Instructions for Paper- Setter:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  |                     |
| The paper setter shall prepare 9 questions selecting two questions from each unit with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question, comprising 7 short answer type questions carrying two marks each (total 14 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to Attempt five questions: the compulsory question no. 1 and 1 question from the each of the four units. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  |                     |
| Units                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Topics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  | Contact Hours/ CLOs |
| I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Introduction to Computer Communications and Networking Technologies; Uses of Computer Networks; Network Devices, Nodes, and Hosts; Types of Computer Networks and their Topologies; Network Architecture and the OSI Reference Model, TCP/IP reference model.                                                                                                                                                                                                                                      |                  | 15/CLO <sub>1</sub> |
| II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Analog and Digital Communications: Concept of data, signal, channel, bit-rate, maximum data-rate of channel, Representing Data as Analog Signals, Representing Data as Digital Signals, Data Rate and Bandwidth, Capacity, Baud Rate; Asynchronous and synchronous transmission, data encoding techniques, Modulation techniques, Digital Carrier Systems; Guided and Wireless Transmission Media; Communication Satellites; Switching and Multiplexing; Dialup Networking; Analog Modem Concepts. |                  | 15/CLO <sub>2</sub> |
| III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Data Link Layer: Framing, Flow Control, Error Control; Error Detection and Correction; Media Access Control: Random Access Protocols, Token Passing Protocols; Token Ring; Introduction to Ethernet, FDDI, Wireless LANs. Network Layer and Routing Concepts: Virtual Circuits and Datagram's; Routing Algorithms: Flooding, Shortest Path Routing, Distance Vector Routing; Internetworking.                                                                                                      |                  | 15/CLO <sub>3</sub> |

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| IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Transport layer: Elements of Transport protocol: Addressing, Connection Establishment, Flow Control, Buffering, Crash recovery. Internet Transport protocol: UDP: Introduction, Real time Transport protocol, Remote Procedure Call. Application Layer: Domain Name System, Electronic Mail, World Wide Web. | 15/CLO <sub>4</sub>               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Total Contact hours</b>                                                                                                                                                                                                                                                                                   | 60                                |
| <b>Evaluation Methods</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                              |                                   |
| <b>InternalAssessment:30Marks</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                              | <b>EndTermExamination:70Marks</b> |
| •Class Participation:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 5                                                                                                                                                                                                                                                                                                            | Written Examination:70            |
| •Seminar/presentation/assignment/quiz/<br>class test etc.:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 10                                                                                                                                                                                                                                                                                                           |                                   |
| •Mid-Term Exam:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 15                                                                                                                                                                                                                                                                                                           |                                   |
| <b>Part C-Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                              |                                   |
| <b>Text Books:</b> <ul style="list-style-type: none"><li>• Michael A. Gallo, William M. Hancock, “Computer Communications and Networking Technologies”, CENGAGE Learning.</li><li>• Andrew S. Tanenbaum, “Computer Networks”, Pearson Education.</li><li>• James F. Kurose, Keith W. Ross, “Computer Networking”, Pearson Education.</li><li>• <b>ReferenceBooks:</b><ul style="list-style-type: none"><li>• Behrouz A Forouzan, “Data Communications and Networking”, McGraw Hill.</li><li>• Gill, Nasib S.: Essentials of Computer and Network Technology, Khanna Book Publishing Co., New Delhi</li></ul></li></ul> |                                                                                                                                                                                                                                                                                                              |                                   |

### Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

| CLOs             | PLO <sub>1</sub> | PLO <sub>2</sub> | PLO <sub>3</sub> | PLO <sub>4</sub> | PLO <sub>5</sub> | PLO <sub>6</sub> | PLO <sub>7</sub> | PLO <sub>8</sub> | PLO <sub>9</sub> | PLO <sub>10</sub> | PLO <sub>11</sub> |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|
| CLO <sub>1</sub> | 1                | 1                | 2                | 1                | 2                | 1                | 3                | 2                | 3                | 1                 | 3                 |
| CLO <sub>2</sub> | 2                | 1                | 2                | 2                | 1                | 3                | 2                | 1                | 1                | 3                 | 3                 |
| CLO <sub>3</sub> | 3                | 2                | 3                | 3                | 3                | 3                | 3                | 3                | 2                | 1                 | 3                 |
| CLO <sub>4</sub> | 3                | 3                | 3                | 2                | 3                | 3                | 1                | 3                | 3                | 3                 | 3                 |

### Content Mapping with NEP thrust areas

| Field                               | Content/s |
|-------------------------------------|-----------|
| Employability/Entrepreneurship      |           |
| Skill Enhancement                   | 60        |
| Communication Development           |           |
| Indian Knowledge System             |           |
| Environmental Awareness             |           |
| Current Issues and Social Awareness |           |
| Women empowerment/Gender issues     |           |
| Public policies                     |           |
| Any Other                           | 60        |

| Part A-Introduction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                        |              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--------------|
| Name of the Programme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Computer Science                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |              |
| Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                        |              |
| Nature of Course/Course Composition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Theory + Practical                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                        |              |
| Name of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Artificial Intelligence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |              |
| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 24L5.5-CSE-502                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |              |
| Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | MCC-10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                        |              |
| Course Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 300-399                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |              |
| Pre-requisite for the course (if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                        |              |
| Course Learning Outcomes (CLOs)<br>After completing this course, the learner will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                                        | CLO <sub>1</sub> : Learn the basic Artificial Intelligence (AI) concept and its application areas.<br>CLO <sub>2</sub> : Acquire the knowledge of heuristic search and approaches for knowledge representations.<br>CLO <sub>3</sub> : Understand the idea of natural language processing and predicate logic along its applications<br>CLO <sub>4</sub> : Apply fundamental concepts of Artificial Intelligence, Machine Learning, Neural Networks, Natural Language Processing, Robotics, and AI-based Multimedia to design and implement practical AI applications using appropriate computational tools and techniques. |                        |              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Theory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Practical</b>       | <b>Total</b> |
| Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1                      | 4            |
| Teaching Hours per week                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2                      | 5            |
| Internal Assessment Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 5                      | 30           |
| End Term Exam Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 20                     | 70           |
| Max. Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 75                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 25                     | 100          |
| Examination Duration (in Hours)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2                      |              |
| Part B-Contents of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                        |              |
| <b><u>Instructions for Theory Paper-Setter</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                        |              |
| The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no.1 and 1 question from the each of the three units. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                        |              |
| <b><u>Instructions for Practical Examiner</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                        |              |
| Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                        |              |
| Unit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Topics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Contact Hours/<br>CLOs |              |
| I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Introduction to Artificial Intelligence Definition of artificial intelligence (AI) Brief history and evolution of AI Strong AI vs Weak AI. Turing Test and Intelligent Agents. Components of AI Applications of AI in various fields                                                                                                                                                                                                                                                                                                                                                                                        | 15/CLO <sub>1</sub>    |              |
| II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Introduction to Machine Learning Classification of Machine Learning Application of Machine Learning Deep learning Knowledge representation techniques 15 III Neural Networks: ANN, RNN and CNN, Introduction to NLP, Text preprocessing techniques, Introduction to expert system                                                                                                                                                                                                                                                                                                                                           | 15/CLO <sub>2</sub>    |              |
| III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Introduction to robotics; Applications of AI in robotics Types of robots (industrial robots, autonomous vehicles, drones, etc.). AI applications in multimedia AI in Image Processing AI in Video Editing and Production AI in Animation and 3D Modelling AI in voice acting and dubbing AI in Design and Art Creation Ethics and Legal Implications of AI in Multimedia                                                                                                                                                                                                                                                    | 15/CLO <sub>3</sub>    |              |

|                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |
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| Practical                                                                                                                                                                                                                                                       | <p>The following activities be carried out/discussed in the lab during the period of the semester.</p> <ul style="list-style-type: none"><li>• Implement an Intelligent Agent for a Simple Environment</li><li>• Implement the Turing Test Using a Simple Chatbot</li><li>• Implement Breadth First Search (BFS) and Depth First Search (DFS)</li><li>• Develop a Rule-Based Expert System</li><li>• Implement Linear Regression for Prediction</li><li>• Implement Decision Tree Classification</li><li>• Implement K-Nearest Neighbour (KNN) Classification</li><li>• Implement K-Means Clustering</li><li>• Implement an Artificial Neural Network (ANN)</li><li>• Implement a Convolutional Neural Network (CNN) for Image Classification</li><li>• Implement a Recurrent Neural Network (RNN) for Sequence Prediction</li><li>• Perform NLP Text Preprocessing</li><li>• Implement Sentiment Analysis Using NLP</li><li>• Develop a Voice-Based AI Assistant</li><li>• Implement AI-Based Image Processing</li><li>• Implement AI-Based Video Analysis and Object Detection</li><li>• Implement AI-Assisted Animation, 3D Modelling and Art Creation</li><li>• Implement an AI-Based Robotics Simulation and Study Ethical Issues</li></ul> | 30/CLO <sub>4</sub>               |
|                                                                                                                                                                                                                                                                 | <b>Total Contact hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 75                                |
| <b>Evaluation Methods</b>                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |
| <b>InternalAssessment:30Marks</b>                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>EndTermExamination:70Marks</b> |
| • Class Participation:                                                                                                                                                                                                                                          | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Written Examination:70            |
| • Seminar/presentation/assignment/quiz/ class test etc.:                                                                                                                                                                                                        | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |
| • Mid-Term Exam:                                                                                                                                                                                                                                                | 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |
| <b>Part C-Learning Resources</b>                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |
| <b>Recommended Books/e-resources/LMS:</b>                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |
| <ul style="list-style-type: none"><li>• E.Richand K. Knight, Artificial Intelligence, TMH.</li><li>• D.W.Patterson, Introduction to AI and Expert Systems,PHI.</li><li>• Nils J Nilsson, Artificial Intelligence-A new Synthesis, Har court Asia Ltd.</li></ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |

#### Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

| CLOs             | PLO <sub>1</sub> | PLO <sub>2</sub> | PLO <sub>3</sub> | PLO <sub>4</sub> | PLO <sub>5</sub> | PLO <sub>6</sub> | PLO <sub>7</sub> | PLO <sub>8</sub> | PLO <sub>9</sub> | PLO <sub>10</sub> | PLO <sub>11</sub> |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|
| CLO <sub>1</sub> | 3                | 1                | 2                | 1                | 2                | 1                | 3                | 2                | 3                | 1                 | 3                 |
| CLO <sub>2</sub> | 1                | 2                | 1                | 3                | 1                | 2                | 2                | 3                | 1                | 3                 | 3                 |
| CLO <sub>3</sub> | 3                | 3                | 2                | 1                | 3                | 2                | 3                | 3                | 2                | 2                 | 3                 |
| CLO <sub>4</sub> | 3                | 3                | 3                | 2                | 3                | 3                | 3                | 3                | 3                | 3                 | 3                 |

#### Content Mapping with NEP thrust areas

| Field                               | Content/s |
|-------------------------------------|-----------|
| Employability/Entrepreneurship      |           |
| Skill Enhancement                   | <b>60</b> |
| Communication Development           |           |
| Indian Knowledge System             |           |
| Environmental Awareness             |           |
| Current Issues and Social Awareness |           |
| Women empowerment/Gender issues     |           |
| Public policies                     |           |
| Any Other                           | <b>60</b> |

| <b>Part A-Introduction</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                            |
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| Name of the Programme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Computer Science                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                            |
| Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                            |
| Nature of Course/Course Composition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Theory+ Practical                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                            |
| Name of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Web Development using PHP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  |                            |
| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 24L5.5-CSE-503                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                            |
| Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | DSE-2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                            |
| Course Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 300-399                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                  |                            |
| Pre-requisite for the course (if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                            |
| Course Learning Outcomes (CLOs)<br>After completing this course, the learner will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p>CLO<sub>1</sub> Explain and apply the fundamental concepts of PHP, including PHP syntax, data types, variables, operators, control statements, strings, arrays, and user-defined functions to develop basic web applications.</p> <p>CLO<sub>2</sub> Develop interactive PHP applications using forms, super global variables, file and directory handling, file upload/download, image generation, and object-oriented programming concepts such as inheritance, polymorphism, abstraction, and interfaces.</p> <p>CLO<sub>3</sub> Develop and integrate database-driven PHP applications using MySQL and apply advanced PHP techniques including file handling, FTP/SMTP, email, configuration, error handling, and debugging.</p> <p>CLO<sub>4</sub>: Develop and implement PHP-based applications using programming constructs, strings, arrays, session management, input validation, and file handling to solve basic web programming problems.</p> |                  |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Theory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Practical</b> | <b>Total</b>               |
| Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1                | 4                          |
| Teaching hours per week                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2                | 5                          |
| Internal Assessment Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 5                | 30                         |
| End Term Exam Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 20               | 70                         |
| Max. Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 75                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 25               | 100                        |
| Examination Duration(in Hours)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2                |                            |
| <b>Part B-Contents of the Course</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                            |
| <b><u>Instructions for Theory Paper-Setter</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                            |
| <p>The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no.1 and 1 question from the each of the three units.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                            |
| <b><u>Instructions for Practical Examiner</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                            |
| <p>Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.</p>                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                            |
| <b>Units</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Topics</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  | <b>Contact Hours/ CLOs</b> |
| I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <p><b>Introduction to PHP:</b> Evolution of PHP &amp; its comparison with other web programming languages, Interfaces to External systems, Hardware and Software requirements.</p> <p><b>Basic PHP Development:</b> PHP Scripting, Working of PHP scripts, Basic PHP syntax, PHP data types, Operators, Variable manipulation, Dynamic variables, Variable scope, and Accessing variable with the global statement Static vs. Dynamic Optimization, Google Caffeine.</p> <p><b>Control Statements:</b> if( ) and else if( ) condition Statement, The switch statement, Using while ( ) Loop, The do while statement, Using the for ( ) Loop, Breaking out of loops, Nesting loops.</p> <p><b>String &amp; Arrays:</b> Formatting String for Presentation, Formatting String</p>                                                                                                                                                                              |                  | 15/CLO <sub>1</sub>        |

|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
|           | for Storage, Joining and Splitting String, Comparing String, Matching and replace Substring. Arrays: Anatomy of an Array, Creating index based and Associative array, Accessing array Elements, Looping with Index based array, Looping with associative array using each( ) and foreach( ) loops, Library functions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |
| II        | <p><b>Functions:</b> Function definition, Creation, Returning values, User-defined functions, Dynamic function, Function calls with the static statement, default arguments, passing arguments to a function by value.</p> <p><b>Forms:</b> Working with Forms, Super global variables, Super global array, Importing user input, Accessing user input, Handling Html Form With PHP, Using hidden fields, Redirecting the user.</p> <p><b>Working with File and Directories:</b> Understanding file &amp; directory, Opening and closing a file, Copying ; renaming and deleting a file, Working with directories, Building a text editor, File Uploading &amp; Downloading.</p> <p>Generating Images with PHP: Basics computer Graphics, Creating Image, Manipulating Image , Using text in Image.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 15/CLO <sub>2</sub> |
| III       | <p><b>Object Oriented concept using PHP:</b> Classes, Objects, Polymorphism, Inheritance, Interface, Abstraction, Constructor, Destructor.</p> <p><b>PHP with MySQL:</b> Creating Connection, Selecting Database, Perform Database (query), Use returned data, close connections, file handling in PHP – reading and writing from and to FILE.</p> <p><b>Advance PHP Techniques:</b> Introduction about FTP/SMTP server, Math functions, File upload, File Download, E-mail with PHP, PHP configuration file, Error tackling and debugging.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 15/CLO <sub>3</sub> |
| Practical | <ul style="list-style-type: none"> <li>• Write and execute a PHP program demonstrating basic PHP syntax, variables, constants, data types, and operators.</li> <li>• Develop a PHP program using conditional statements and control structures such as if, else if, switch, for, while, and do-while loops.</li> <li>• Create a PHP program to demonstrate string manipulation, including string formatting, concatenation, splitting, comparison, searching, and substring replacement.</li> <li>• Write a PHP program to create and manipulate indexed and associative arrays, and demonstrate array traversal using for and foreach loops.</li> <li>• Develop PHP programs using user-defined functions, including functions with return values, default arguments, and passing arguments by value.</li> <li>• Design an HTML form and PHP program to accept user input and process it using super global variables such as \$_GET, \$_POST, and \$_REQUEST.</li> <li>• Develop a PHP application demonstrating hidden fields, form validation, session/user redirection, and handling of form data.</li> <li>• Write a PHP program for file handling to create, open, read, write, copy, rename, and delete files, and perform basic directory operations.</li> <li>• Develop a simple text editor using PHP that allows users to create, read, modify, and save text files.</li> </ul> | 30/CLO <sub>4</sub> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |                                         |              |              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------------------------------------|--------------|--------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"><li>• Create a PHP application for file uploading and downloading, including appropriate validation and error handling.</li><li>• Develop a PHP program to create and manipulate images, including drawing basic shapes and adding text to an image.</li><li>• Write a PHP program demonstrating Object-Oriented Programming concepts, including classes, objects, constructors, destructors, inheritance, polymorphism, interfaces, and abstraction.</li><li>• Develop a PHP application to connect PHP with MySQL, create/select a database, execute SQL queries, retrieve records, display results, and close the database connection.</li><li>• Create a PHP-MySQL CRUD application to insert, display, update, and delete records from a database using HTML forms and PHP.</li><li>• Develop a PHP application demonstrating advanced PHP techniques, such as email sending, mathematical functions, file upload/download, PHP configuration, error handling, and debugging.</li></ul> |             |                                         |              |              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Contact Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 75          |                                         |              |              |
| <b>Evaluation Methods</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |                                         |              |              |
| <b>Internal Assessment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>TH-25</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>PR-5</b> | <b>EndTermExamination:70</b>            | <b>TH-50</b> | <b>PR-20</b> |
| Class Participation:                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0           | Lab record                              | NA           | 05           |
| Seminar/presentation/assignment/quiz/class test etc.:                                                                                                                                                                                                                                                                                                                                                                                                                                      | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | NA          | Viva-Voce                               | NA           | 05           |
| Seminar/Demonstration/Viva-voce/Lab records etc.:                                                                                                                                                                                                                                                                                                                                                                                                                                          | NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 5           | Written Examination                     | 50           | NA           |
| Mid-Term Exam:                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | NA          | Write-up and execution of the practical | NA           | 10           |
| <b>Part C-Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |                                         |              |              |
| <b>Recommended Books/e-resources/LMS:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |                                         |              |              |
| <ul style="list-style-type: none"><li>• Matt Doyle: Beginning PHP 5.3, Willey Publishing.</li><li>• Steve Suehring, JavaScript Step by Step, Microsoft Press, PHI.</li><li>• Harwani: Developing Web Applications in PHP and AJAX, McGraw Hill</li><li>• P.J. Deitel &amp; H.M. Deitel: Internet and World Wide Web- How to Program, Pearson.</li><li>• Web Technologies, Black Book, Dream tech Press.</li><li>• Steven Holzner: PHP- The Complete Reference, Tata McGraw Hill.</li></ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |                                         |              |              |

#### Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

| CLOs             | PLO <sub>1</sub> | PLO <sub>2</sub> | PLO <sub>3</sub> | PLO <sub>4</sub> | PLO <sub>5</sub> | PLO <sub>6</sub> | PLO <sub>7</sub> | PLO <sub>8</sub> | PLO <sub>9</sub> | PLO <sub>10</sub> | PLO <sub>11</sub> |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|
| CLO <sub>1</sub> | 1                | 1                | 2                | 1                | 2                | 1                | 3                | 2                | 3                | 1                 | 3                 |
| CLO <sub>2</sub> | 2                | 2                | 1                | 2                | 2                | 3                | 2                | 3                | 1                | 3                 | 2                 |
| CLO <sub>3</sub> | 3                | 3                | 3                | 3                | 3                | 2                | 2                | 3                | 3                | 3                 | 3                 |
| CLO <sub>4</sub> | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 2                 | 3                 |

#### Content Mapping with NEP thrust areas

| Field                               | Content/s |
|-------------------------------------|-----------|
| Employability/Entrepreneurship      |           |
| Skill Enhancement                   | 75        |
| Communication Development           |           |
| Indian Knowledge System             |           |
| Environmental Awareness             |           |
| Current Issues and Social Awareness |           |
| Women empowerment/Gender issues     |           |
| Public policies                     |           |
| Any Other                           | 75        |

| Part A–Introduction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---------------------|
| Name of the Programme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Computer Science                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |           |                     |
| Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |                     |
| Nature of Course/Course Composition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Theory+ Practical                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |                     |
| Name of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Web Development using ASP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |                     |
| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 24L5.5-CSE-504                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |           |                     |
| Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | DSE-2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |                     |
| Course Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 300-399                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |           |                     |
| Pre-requisite for the course (if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                     |
| Course Learning Outcomes (CLOs)<br>After completing this course, the learner will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p>CLO<sub>1</sub>: Explain and apply the fundamentals of the .NET Framework, CLR, C# programming, ASP.NET Web Forms, standard controls, HTML controls, list controls, rich controls and validation controls.</p> <p>CLO<sub>2</sub>: Develop interactive ASP.NET Web Forms applications incorporating file handling, file uploading, ADO.NET database connectivity, data binding and GridView operations.</p> <p>CLO<sub>3</sub>: Design and implement database-driven ASP.NET web applications using XML processing, authentication and authorization while applying appropriate web application security practices.</p> <p>CLO<sub>4</sub>: Develop and implement C# and ASP.NET web applications using programming constructs, Web Forms controls, input validation, and database connectivity to create functional, data-driven applications.</p> |           |                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Theory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Practical | Total               |
| Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1         | 4                   |
| Teaching hours per week                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2         | 5                   |
| Internal Assessment Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 5         | 30                  |
| End Term Exam Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 20        | 70                  |
| Max. Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 75                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 25        | 100                 |
| Examination Duration(in Hours)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2         |                     |
| Part B-Contents of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                     |
| <b><u>Instructions for Theory Paper-Setter</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                     |
| The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 markseach. Examinees will be required to attempt four questions: the compulsory questionno.1 and 1 question from the each of the three units. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                     |
| <b><u>Instructions for Practical Examiner</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                     |
| Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                     |
| Units                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Topics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           | Contact Hours/ CLOs |
| I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Overview of .NET framework: Common Language Runtime (CLR), Framework Class Library- C# Fundamentals: Primitive types and Variables – Operators – Conditional statements -Looping statements – Creating and using Objects – Arrays – String operations.<br>Introduction to ASP.NET - IDE-Languages supported Components -Working with Web Forms – Web form standard controls: Properties and its events – HTML controls                                                                                                                                                                                                                                                                                                                                                                                                                                 |           | 15/CLO <sub>1</sub> |

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| II                   | List Controls: Properties and its events.<br>Rich Controls: Properties and its events – validation controls: Properties and its events– File Stream classes - File Modes – File Share – Reading and Writing to files – Creating, Moving, Copying and Deleting files – File uploading                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 15/CLO <sub>2</sub> |
| III                  | ADO.NET Overview – Database Connections – Commands – Data Reader – Data Adapter - Data Sets - Data Controls and its Properties - Data Binding<br>Grid View control: Deleting, editing, Sorting and Paging. XML classes – Web form to manipulate XML files - Website Security - Authentication - Authorization – Creating a Web application                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 15/CLO <sub>3</sub> |
| Practical            | <ul style="list-style-type: none"> <li>• Write a C# program to perform arithmetic, relational and logical operations using different primitive data types.</li> <li>• Write a C# program using if-else, switch, for, while, do-while and foreach statements.</li> <li>• Write a C# program to perform array and string operations and demonstrate the creation and use of classes and objects.</li> <li>• Create an ASP.NET Web Form using Label, TextBox, Button, CheckBox and RadioButton controls to accept and display student information.</li> <li>• Create a Web Form using HTML controls and demonstrate their properties and event handling.</li> <li>• Create a Web Form using DropDownList, ListBox, CheckBoxList and RadioButtonList controls and display the selected values.</li> <li>• Create a Web Form using Calendar and other rich controls and demonstrate their important properties and events.</li> <li>• Create a student registration form and validate user input using RequiredFieldValidator, RangeValidator, CompareValidator and RegularExpressionValidator.</li> <li>• Write a C# program using FileStream, StreamReader and StreamWriter to create, read from and write data to a text file.</li> <li>• Create an ASP.NET application to create, copy, move and delete files and directories.</li> <li>• Create an ASP.NET Web Form that allows the user to select and upload a file to the server and displays the uploaded file information.</li> <li>• Create an ASP.NET application to connect to a database using SqlConnection and execute SQL commands using SqlCommand.</li> <li>• Create an ASP.NET application to retrieve records from a database using DataReader, DataAdapter and DataSet.</li> <li>• Create an ASP.NET application to display database records in a GridView and implement inserting, editing, deleting, sorting and paging operations.</li> <li>• Create a secure ASP.NET Web application that reads/manipulates XML data and implements user authentication and authorization.</li> </ul> | 30/CLO <sub>4</sub> |
| <b>Contact Hours</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 75                  |

| <b>Evaluation Methods</b>                             |              |             |                                         |              |              |
|-------------------------------------------------------|--------------|-------------|-----------------------------------------|--------------|--------------|
| <b>Internal Assessment</b>                            | <b>TH-25</b> | <b>PR-5</b> | <b>EndTermExamination:70</b>            | <b>TH-50</b> | <b>PR-20</b> |
| Class Participation:                                  | 5            | 0           | Lab record                              | NA           | 05           |
| Seminar/presentation/assignment/quiz/class test etc.: | 5            | NA          | Viva-Voce                               | NA           | 05           |
| Seminar/Demonstration/Viva-voce/Lab records etc.:     | NA           | 5           | Written Examination                     | 50           | NA           |
| Mid-TermExam:                                         | 15           | NA          | Write-up and execution of the practical | NA           | 10           |
| <b>Part C-Learning Resources</b>                      |              |             |                                         |              |              |

**Recommended Books/e-resources/LMS:**

- Svetlin Nakov, Vesel in Kolev & Co, Fundamentals of Computer Programming with C#, Faber publication, 2019.
- Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill, 2015.
- Herbert Schildt, The Complete Reference C#.NET, Tata McGraw-Hill, 2015.
- Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtech pres, 2013.
- Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach & Associates Inc. 2016.
- Denielle Otey, Michael Otey, ADO.NET: The Complete reference, McGraw Hill, 2008.

**Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes**

| CLOs             | PLO <sub>1</sub> | PLO <sub>2</sub> | PLO <sub>3</sub> | PLO <sub>4</sub> | PLO <sub>5</sub> | PLO <sub>6</sub> | PLO <sub>7</sub> | PLO <sub>8</sub> | PLO <sub>9</sub> | PLO <sub>10</sub> | PLO <sub>11</sub> |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|
| CLO <sub>1</sub> | 1                | 2                | 3                | 1                | 2                | 3                | 3                | 2                | 3                | 1                 | 3                 |
| CLO <sub>2</sub> | 2                | 2                | 1                | 2                | 1                | 3                | 2                | 3                | 1                | 3                 | 3                 |
| CLO <sub>3</sub> | 3                | 3                | 2                | 3                | 3                | 2                | 1                | 2                | 3                | 3                 | 3                 |
| CLO <sub>4</sub> | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 2                 | 3                 |

**Content Mapping with NEP thrust areas**

| Field                               | Content/s |
|-------------------------------------|-----------|
| Employability/Entrepreneurship      |           |
| Skill Enhancement                   | 75        |
| Communication Development           |           |
| Indian Knowledge System             |           |
| Environmental Awareness             |           |
| Current Issues and Social Awareness |           |
| Women empowerment/Gender issues     |           |
| Public policies                     |           |
| Any Other                           | 75        |

| <b>Part A-Introduction</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------|
| Name of the Programme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Computer Science                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                |              |
| Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                |              |
| Nature of Course/Course Composition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Theory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                |              |
| Name of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Animation Technology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                |              |
| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 24L5.5-CSE-505                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                |              |
| Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | DSE-3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                |              |
| Course Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 300-399                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                |              |
| Pre-requisite for the course (if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |              |
| Course Learning Outcomes (CLOs)<br>After completing this course, the learner will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>CLO<sub>1</sub>: Explain the fundamental concepts, history, principles, types, techniques, applications and importance of animation, including web animation, 3D animation and special effects.</p> <p>CLO<sub>2</sub>: Apply 2D animation techniques using Flash, including timeline-based animation, frame-by-frame animation, twining, layers and basic ActionScript to create animated content.</p> <p>CLO<sub>3</sub>: Develop and evaluate 3D animation concepts using skeleton and kinetic animation, texturing, lighting, camera tracking, motion capture and script-based animation techniques with appropriate software tools.</p> <p>CLO<sub>4</sub>: Design and develop animation projects by applying concept development, story development, audio-video integration, colour models, gamma correction, production planning and budgeting techniques for animated productions.</p> |                                |              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Theory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Practical</b>               | <b>Total</b> |
| Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0                              | 4            |
| Teaching hours per week                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0                              | 4            |
| Internal Assessment Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0                              | 30           |
| End Term Exam Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0                              | 70           |
| Max. Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0                              | 100          |
| Examination Duration(in Hours)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0                              |              |
| <b>Part B-Contents of the Course</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |              |
| <b><u>Instructions for Theory Paper-Setter</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |              |
| The paper setter shall prepare 9 questions selecting two questions from each unit with consideration given to the Course Learning Outcomes. Among these, question number1will be compulsory question, comprising 7 short answer type questions carrying two marks each (total 14 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt five questions: the compulsory question no. 1 and 1 question from the each of the four units. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |              |
| <b>Units</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Topics</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Contact Hours/<br/>CLOs</b> |              |
| I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Animation –What, why, need, History of Animation, Uses of Animation, Types of Animation – Principles of Animation, Some Techniques of Animation – Animation on the WEB – 3D Animation – Special Effects.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 15/CLO <sub>1</sub>            |              |
| II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Creating Animation in Flash: Introduction to Flash Animation – Introduction to Flash – Working with the Timeline and Frame-based Animation - Working with the Timeline and Tween-based Animation – Understanding Layers – Action script.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 15/CLO <sub>2</sub>            |              |
| III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 3D Animation & its Concepts, Types of 3D Animation, Skeleton & Kinetic, 3D Animation – Texturing & Lighting of 3D Animation, 3D Camera Tracking, Applications & Software of 3D Animation. Motion Caption, Formats, Methods, Usages, Expression, Motion.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 15/CLO <sub>3</sub>            |              |

|    |                                                                                                                                                                                                                                                                    |                     |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| IV | Capture Software, Script Animation Usage, Different Language of Script Animation, Software. Concept Development, Story Developing, Audio & Video, Color Model, Device Independent Color Model, Gamma and Gamma Correction, Production Budgets, 3D Animated Movies. | 15/CLO <sub>4</sub> |
|    | <b>Contact Hours</b>                                                                                                                                                                                                                                               | 60                  |

| <b>Evaluation Methods</b>                             |              |             |                                         |              |              |
|-------------------------------------------------------|--------------|-------------|-----------------------------------------|--------------|--------------|
| <b>Internal Assessment</b>                            | <b>TH-25</b> | <b>PR-5</b> | <b>EndTermExamination:70</b>            | <b>TH-50</b> | <b>PR-20</b> |
| Class Participation:                                  | 5            | 0           | Lab record                              | NA           | 05           |
| Seminar/presentation/assignment/quiz/class test etc.: | 5            | NA          | Viva-Voce                               | NA           | 05           |
| Seminar/Demonstration/Viva-voce/Lab records etc.:     | NA           | 5           | Written Examination                     | 50           | NA           |
| Mid-Term Exam:                                        | 15           | NA          | Write-up and execution of the practical | NA           | 10           |

| <b>Part C-Learning Resources</b>                                                                                                                                                                       |  |  |  |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|
| <b>Recommended Books/e-resources/LMS:</b>                                                                                                                                                              |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>PRINCIPLES OF MULTIMEDIA – Ranjan Parekh, 2007, TMH.</li> <li>Multimedia Technologies – Ashok Banerji, Ananda Mohan Ghosh – McGraw Hill Publication.</li> </ul> |  |  |  |  |  |

#### **Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes**

| CLOs             | PLO <sub>1</sub> | PLO <sub>2</sub> | PLO <sub>3</sub> | PLO <sub>4</sub> | PLO <sub>5</sub> | PLO <sub>6</sub> | PLO <sub>7</sub> | PLO <sub>8</sub> | PLO <sub>9</sub> | PLO <sub>10</sub> | PLO <sub>11</sub> |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|
| CLO <sub>1</sub> | 1                | 2                | 3                | 1                | 2                | 3                | 2                | 1                | 3                | 2                 | 3                 |
| CLO <sub>2</sub> | 2                | 2                | 1                | 2                | 1                | 3                | 2                | 3                | 1                | 3                 | 3                 |
| CLO <sub>3</sub> | 3                | 3                | 2                | 3                | 3                | 2                | 1                | 3                | 2                | 3                 | 3                 |
| CLO <sub>4</sub> | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 2                 | 3                 |

#### **Content Mapping with NEP thrust areas**

| <b>Field</b>                        | <b>Content/s</b> |
|-------------------------------------|------------------|
| Employability/Entrepreneurship      |                  |
| Skill Enhancement                   | 75               |
| Communication Development           |                  |
| Indian Knowledge System             |                  |
| Environmental Awareness             |                  |
| Current Issues and Social Awareness |                  |
| Women empowerment/Gender issues     |                  |
| Public policies                     |                  |
| Any Other                           | 75               |

| Part A-Introduction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------------|
| Name of the Programme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Computer Science                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                  |                        |
| Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                        |
| Nature of Course/Course Composition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Theory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                        |
| Name of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Multimedia Technology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                        |
| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 24L5.5-CSE-506                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                  |                        |
| Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | DSE-3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                        |
| Course Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 300-399                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                  |                        |
| Pre-requisite for the course (if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Basic understanding of computer systems and programming.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                  |                        |
| Course Learning Outcomes (CLOs)<br>After completing this course, the learner will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                       | CLO1: Mastertools for 2D/3D animation, image editing, and audio-video processing.<br>CLO2: Design and create interactive multimedia applications, games, and web content.<br>CLO3: Analyze encoding algorithms, data compression (JPEG, MPEG), and file formats.<br>CLO4: Evaluate digital media effectiveness and apply design principles for engaging user experiences.                                                                                                                                                                                                        |                  |                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Theory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Practical</b> | <b>Total</b>           |
| Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0                | 4                      |
| Teaching Hours per week                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0                | 4                      |
| Internal Assessment Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0                | 30                     |
| End Term Exam Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0                | 70                     |
| Max. Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0                | 100                    |
| Examination Duration(in Hours)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 03                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                        |
| Part B-Contents of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                        |
| <b><u>Instructions for Theory Paper-Setter</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                        |
| The paper setter shall prepare 9 questions selecting two questions from each unit with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question, comprising 7 short answer type questions carrying two marks each (total 14 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt five questions: the compulsory question no. 1 and 1 question from each of the four units. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                        |
| Units                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Topics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  | Contact Hours/<br>CLOs |
| I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Introduction</b><br>Multimedia: meaning, Various facts of multimedia: audio, text, graphics, animation, video<br>Classification of multimedia technology<br>Multimedia: hardware/software essentials, different categories of multimedia software.                                                                                                                                                                                                                                                                                                                            |                  | 15/CLO <sub>1</sub>    |
| II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Working with Audio, Text</b><br>Multimedia Audio: Introduction, digital audio and sound card fundamentals, sound card functionalities, audio jacks, connectors, digital audio playback, audio editing.<br>Multimedia Text: Introduction, designing text for multimedia, hypermedia, hypertext.                                                                                                                                                                                                                                                                                |                  | 15/CLO <sub>2</sub>    |
| III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Working with Graphics and Video</b><br>Multimedia Graphics: Introduction, basic concepts of color displays, color depth, Resolution, Digital Imaging, Camera specification, Graphics editing concepts.<br>Multimedia Video: Introduction, video in multimedia projects, digital video fundamental, full motion and full screen videos, digital video files sizes, digital video production techniques – video production in multimedia, shooting the sequences, video capture techniques, video capture boards, video capture software, Editing video, embedding sound clips. |                  | 15/CLO <sub>3</sub>    |

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| IV | <b>Multimedia Animation, Project and Authoring</b><br>Multimedia Animation: introduction, classifications, two-dimensional animation And three-dimensional animation technology, animation development process, names of animation software tools for 2D and 3D Multimedia project design. concepts–introduction, concept and design, various facets, media content design and development, interface design and development process. Multimedia authoring: introduction, authoring methodologies, characteristics of authoring tools, Commercial authoring tools. | 15/CLO <sub>4</sub> |
|    | <b>Total Contact hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 60                  |

| Evaluation Methods                                                                                                                                                                                                                               |       |      |                                         |       |       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|-----------------------------------------|-------|-------|
| Internal Assessment                                                                                                                                                                                                                              | TH-25 | PR-5 | EndTermExamination:70                   | TH-50 | PR-20 |
| Class Participation:                                                                                                                                                                                                                             | 5     | 0    | Lab record                              | NA    | 05    |
| Seminar/presentation/assignment/quiz/class test etc.:                                                                                                                                                                                            | 5     | NA   | Viva-Voce                               | NA    | 05    |
| Seminar/Demonstration/Viva-voce/Lab records etc.:                                                                                                                                                                                                | NA    | 5    | Written Examination                     | 50    | NA    |
| Mid-Term Exam:                                                                                                                                                                                                                                   | 15    | NA   | Write-up and execution of the practical | NA    | 10    |
| Part C-Learning Resources                                                                                                                                                                                                                        |       |      |                                         |       |       |
| <b>Recommended Books/e-resources/LMS:</b> <ul style="list-style-type: none"> <li>PRINCIPLES OF MULTIMEDIA – Ranjan Parekh, 2007, TMH.</li> <li>Multimedia Technologies – Ashok Banerji, Ananda Mohan Ghosh – McGraw Hill Publication.</li> </ul> |       |      |                                         |       |       |

#### Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

| CLOs             | PLO <sub>1</sub> | PLO <sub>2</sub> | PLO <sub>3</sub> | PLO <sub>4</sub> | PLO <sub>5</sub> | PLO <sub>6</sub> | PLO <sub>7</sub> | PLO <sub>8</sub> | PLO <sub>9</sub> | PLO <sub>10</sub> | PLO <sub>11</sub> |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|
| CLO <sub>1</sub> | 2                | 2                | 1                | 3                | 2                | 1                | 3                | 1                | 3                | 3                 | 3                 |
| CLO <sub>2</sub> | 1                | 2                | 3                | 2                | 1                | 3                | 2                | 3                | 2                | 3                 | 3                 |
| CLO <sub>3</sub> | 3                | 3                | 3                | 1                | 2                | 3                | 3                | 3                | 3                | 3                 | 3                 |
| CLO <sub>4</sub> | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 2                 | 3                 |

#### Content Mapping with NEP thrust areas

| Field                               | Content/s |
|-------------------------------------|-----------|
| Employability/Entrepreneurship      |           |
| Skill Enhancement                   | 60        |
| Communication Development           |           |
| Indian Knowledge System             |           |
| Environmental Awareness             |           |
| Current Issues and Social Awareness |           |
| Women empowerment/Gender issues     |           |
| Public policies                     |           |
| Any Other                           | 60        |

## Semester-VI

| Part A–Introduction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|
| Name of the Programme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Computer Science                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                     |
| Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | VI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                  |                     |
| Nature of Course/Course Composition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Theory+ Practical                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                     |
| Name of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Programming using Python                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  |                     |
| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 24L5.5-CSE-601                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                     |
| Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | CC-6, MCC-11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                     |
| Course Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 300-399                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                  |                     |
| Pre-requisite for the course (if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Must have basic knowledge of computer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                  |                     |
| Course Learning Outcomes (CLOs)<br>After completing this course, the learner will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <p>CLO<sub>1</sub>: Explain and apply Python programming fundamentals, including variables, data types, operators, input/output, control statements, strings, lists, tuples, sets, dictionaries, and arrays.</p> <p>CLO<sub>2</sub>: Develop modular and reusable Python programs using functions, recursion, arguments, scope, modules, and built-in libraries such as Math and Random.</p> <p>CLO<sub>3</sub>: Implement Python applications using exception handling, file and directory operations, and Turtle graphics to solve practical programming problems.</p> <p>CLO<sub>4</sub>: Apply fundamental Python programming concepts, including operators, control structures, strings, data structures, file handling, and the Turtle module, to develop and implement basic Python programs for solving computational problems.</p> |                  |                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Theory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Practical</b> | <b>Total</b>        |
| Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1                | 4                   |
| Teaching hours per week                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2                | 5                   |
| Internal Assessment Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 5                | 30                  |
| End Term Exam Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 20               | 70                  |
| Max. Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 75                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 25               | 100                 |
| Examination Duration (in Hours)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2                |                     |
| Part B-Contents of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                     |
| <b><u>Instructions for Theory Paper - Setter</u></b><br>The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                     |
| <b><u>Instructions for Practical Examiner</u></b><br>Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                     |
| Units                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Topics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                  | Contact Hours/ CLOs |
| 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.<br>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.                                                                                                                                                                                                                                                      |                  | 15/CLO <sub>1</sub> |

|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| II        | 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.<br>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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 15/CLO <sub>2</sub> |
| III       | Exception Handling: Exceptions, except clause, try and finally clause, user defined exceptions.<br>File Handling: Manipulating files & directories, OS & SYS modules, Reading, Writing text & numbers from/to file.<br>Graphics: "Turtle" module, drawing colors, shapes, digital images, image file formats.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 15/CLO <sub>3</sub> |
| Practical | <ul style="list-style-type: none"> <li>Write a Python program to perform arithmetic, relational, logical, bitwise, assignment, identity and membership operations.</li> <li>Write a Python program to demonstrate input and output statements and conditional statements.</li> <li>Write a Python program to demonstrate branching and looping statements using if, for, while, and break/exit.</li> <li>Write a Python program to perform string indexing, slicing and various string manipulations.</li> <li>Write a Python program to demonstrate string formatting and conversion between strings and numbers.</li> <li>Write a Python program to perform various operations on lists such as inserting, replacing, removing, searching and sorting elements.</li> <li>Write a Python program to demonstrate operations on tuples and sets.</li> <li>Write a Python program to create, update, delete, search and traverse elements of a dictionary.</li> <li>Write a Python program to perform basic operations on arrays.</li> <li>Write a Python program using user-defined functions with formal, actual and named arguments and return values.</li> <li>Write a Python program to demonstrate recursive functions, local/global scope and the global statement.</li> <li>Write a Python program to import and use Math, Random and user-defined modules.</li> <li>Write a Python program to handle exceptions using try, except and finally, including a user-defined exception.</li> <li>Write a Python program to create, read, write and manipulate files and directories using the os and sys modules.</li> <li>Write a Python program using the Turtle module to draw different colors, lines and geometric shapes.</li> </ul> | 30/CLO <sub>4</sub> |
|           | <b>Contact Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 75                  |

| Evaluation Methods                                    |       |      |                                         |       |       |
|-------------------------------------------------------|-------|------|-----------------------------------------|-------|-------|
| Internal Assessment                                   | TH-25 | PR-5 | EndTermExamination:70                   | TH-50 | PR-20 |
| Class Participation:                                  | 5     | 0    | Lab record                              | NA    | 05    |
| Seminar/presentation/assignment/quiz/class test etc.: | 5     | NA   | Viva-Voce                               | NA    | 05    |
| Seminar/Demonstration/Viva-voce/Lab records etc.:     | NA    | 5    | Written Examination                     | 50    | NA    |
| Mid-Term Exam:                                        | 15    | NA   | Write-up and execution of the practical | NA    | 10    |
| <b>Part C-Learning Resources</b>                      |       |      |                                         |       |       |

**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).
- Gutttag John V, Introduction to Computation and Programming Using Python with Application to Understanding Data,
- Charles Diorbach, Introduction to Computer Science using Python, Wiley.

**Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes**

| CLOs             | PLO <sub>1</sub> | PLO <sub>2</sub> | PLO <sub>3</sub> | PLO <sub>4</sub> | PLO <sub>5</sub> | PLO <sub>6</sub> | PLO <sub>7</sub> | PLO <sub>8</sub> | PLO <sub>9</sub> | PLO <sub>10</sub> | PLO <sub>11</sub> |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|
| CLO <sub>1</sub> | 1                | 2                | 2                | 1                | 2                | 1                | 3                | 2                | 3                | 2                 | 3                 |
| CLO <sub>2</sub> | 2                | 2                | 1                | 2                | 1                | 3                | 3                | 3                | 1                | 3                 | 3                 |
| CLO <sub>3</sub> | 3                | 3                | 2                | 3                | 3                | 2                | 2                | 3                | 2                | 3                 | 3                 |
| CLO <sub>4</sub> | 3                | 3                | 2                | 3                | 3                | 3                | 3                | 1                | 3                | 3                 | 3                 |

**Content Mapping with NEP thrust areas**

| Field                               | Content/s |
|-------------------------------------|-----------|
| Employability/Entrepreneurship      |           |
| Skill Enhancement                   | <b>75</b> |
| Communication Development           |           |
| Indian Knowledge System             |           |
| Environmental Awareness             |           |
| Current Issues and Social Awareness |           |
| Women empowerment/Gender issues     |           |
| Public policies                     |           |
| Any Other                           | <b>75</b> |

| <b>Part A–Introduction</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------------------|
| Name of the Programme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Computer Science                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                            |
| Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | VI                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                            |
| Nature of Course/Course Composition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Theory+ Practical                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                            |
| Name of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Linux and Shell Programming                                                                                                                                                                                                                                                                                                                                                                                                                                   |                  |                            |
| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 24L5.5-CSE-602                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                            |
| Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | MCC-12                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                            |
| Course Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 300-399                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                  |                            |
| Pre-requisite for the course (if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Must have basic knowledge of computer                                                                                                                                                                                                                                                                                                                                                                                                                         |                  |                            |
| Course Learning Outcomes (CLOs)<br>After completing this course, the learner will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | CLO <sub>1</sub> : Understand Linux architecture.<br>CLO <sub>2</sub> : Use various Linux commands that are used to manipulate system operations.<br>CLO <sub>3</sub> : Acquire knowledge of Linux File System and Understand and make effective use of I/O and shell scripting language to solve problems.<br>CLO <sub>4</sub> : To implement the programs based on various shell commands and programs in Linux.                                            |                  |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Theory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Practical</b> | <b>Total</b>               |
| Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1                | 4                          |
| Teaching hours per week                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2                | 5                          |
| Internal Assessment Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 25                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 5                | 30                         |
| End Term Exam Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 50                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 20               | 70                         |
| Max. Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 75                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 25               | 100                        |
| Examination Duration(in Hours)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2                |                            |
| <b>Part B-Contents of the Course</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                            |
| <b><u>Instructions for Theory Paper -Setter</u></b><br>The paper setter shall prepare 7 questions selecting two questions from each of the three units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 4 short answer type questions carrying two marks each (total 08 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt four questions: the compulsory question no. 1 and 1 question from the each of the three units. |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                            |
| <b><u>Instructions for Practical Examiner</u></b><br>Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes. The maximum marks for the write-up and execution of the practical will be 10.                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                            |
| <b>Units</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Topics</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                  | <b>Contact Hours/ CLOs</b> |
| I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Introduction to Linux: Linux distributions, Overview of Linux operating system, Linux architecture, Features of Linux, Accessing Linux system, Starting and shutting down system, logging in and logging out, Comparison of Linux with other operating systems.                                                                                                                                                                                               |                  | 15/CLO <sub>1</sub>        |
| II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Commands in Linux: General-purpose commands, File oriented commands, directory-oriented commands, Communication-oriented commands, process-oriented commands, etc. Regular expressions & Filters in Linux: Simple filters viz. more, wc, diff, sort, uniq, grep; Introducing regular expressions.                                                                                                                                                             |                  | 15/CLO <sub>2</sub>        |
| III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Linux file system: Linux files, inodes and structure and file system, file system components, standard file system, file system types. Processes in Linux: Starting and Stopping Processes, Initialization Processes, Mechanism of process creation, and Job control in Linux using at, batch, cron & time. Shell Programming: vi editor, shell variables, I/O in shell, control structures, loops, subprograms, creating & executing shell scripts in Linux. |                  | 15/CLO <sub>3</sub>        |

|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                     |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Practical | <p>Practicum:</p> <p>Students are advised to do laboratory/practical practice not limited to but including the following types of problems:</p> <ul style="list-style-type: none"> <li>• Basic Linux Commands</li> <li>• Basic Shell Programming</li> <li>• Generation of Fibonacci series</li> <li>• Finding the factorial of a given number</li> <li>• Checking whether a number is an Armstrong number</li> <li>• Designing an Arithmetic Calculator</li> <li>• Generation of a Multiplication Table</li> <li>• Base Conversion</li> <li>• Decimal to Binary</li> <li>• Binary to Decimal</li> <li>• Finding Information About the Login Name and File Name</li> <li>• Shell Script to Exchange the Contents of Two Variables</li> <li>• Shell Script to Accept Three Subject Marks and Declare the Result</li> <li>• Shell Script to Find the Area of:<br/>Square, Rectangle, Circle, Triangle</li> </ul> | 30/CLO <sub>4</sub> |
|           | <b>Contact Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 75                  |

| Evaluation Methods                                    |       |      |                                         |       |       |
|-------------------------------------------------------|-------|------|-----------------------------------------|-------|-------|
| Internal Assessment                                   | TH-25 | PR-5 | EndTermExamination:70                   | TH-50 | PR-20 |
| Class Participation:                                  | 5     | 0    | Lab record                              | NA    | 05    |
| Seminar/presentation/assignment/quiz/class test etc.: | 5     | NA   | Viva-Voce                               | NA    | 05    |
| Seminar/Demonstration/Viva-voce/Lab records etc.:     | NA    | 5    | Written Examination                     | 50    | NA    |
| Mid-Term Exam:                                        | 15    | NA   | Write-up and execution of the practical | NA    | 10    |

| Part C-Learning Resources                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>Recommended Books/e-resources/LMS:</b> <ul style="list-style-type: none"> <li>• Sheetal Taneja, Naveen Kumar, Python Programming: A Modular approach, 5th Impression, Pearson.</li> <li>• Reema Thareja, Python Programming Using Problem Solving Approach, Oxford University Press.</li> <li>• Mark Lutz, Learning Python (available online at pdf derive).</li> <li>• Charles Diiorbach, Introduction to Computer Science using Python, Wiley.</li> </ul> |  |

### Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

| CLOs             | PLO <sub>1</sub> | PLO <sub>2</sub> | PLO <sub>3</sub> | PLO <sub>4</sub> | PLO <sub>5</sub> | PLO <sub>6</sub> | PLO <sub>7</sub> | PLO <sub>8</sub> | PLO <sub>9</sub> | PLO <sub>10</sub> | PLO <sub>11</sub> |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|
| CLO <sub>1</sub> | 1                | 1                | 2                | 1                | 2                | 1                | 3                | 2                | 3                | 1                 | 2                 |
| CLO <sub>2</sub> | 2                | 2                | 1                | 2                | 3                | 3                | 2                | 3                | 1                | 3                 | 3                 |
| CLO <sub>3</sub> | 3                | 3                | 2                | 3                | 3                | 2                | 3                | 3                | 2                | 2                 | 3                 |
| CLO <sub>4</sub> | 2                | 3                | 2                | 3                | 3                | 3                | 3                | 1                | 3                | 2                 | 3                 |

### Content Mapping with NEP thrust areas

| Field                               | Content/s |
|-------------------------------------|-----------|
| Employability/Entrepreneurship      |           |
| Skill Enhancement                   | 75        |
| Communication Development           |           |
| Indian Knowledge System             |           |
| Environmental Awareness             |           |
| Current Issues and Social Awareness |           |
| Women empowerment/Gender issues     |           |
| Public policies                     |           |
| Any Other                           | 75        |

| Part A-Introduction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                          |                            |                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------|
| Name of the Programme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Computer Science                                                                                                                                                                                                                                                                                                                                                                         |                            |                     |
| Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | VI                                                                                                                                                                                                                                                                                                                                                                                       |                            |                     |
| Nature of Course/Course Composition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Theory                                                                                                                                                                                                                                                                                                                                                                                   |                            |                     |
| Name of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Mobile Application Development                                                                                                                                                                                                                                                                                                                                                           |                            |                     |
| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 24L5.5-CSE-603                                                                                                                                                                                                                                                                                                                                                                           |                            |                     |
| Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DSE-4                                                                                                                                                                                                                                                                                                                                                                                    |                            |                     |
| Course Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 300-399                                                                                                                                                                                                                                                                                                                                                                                  |                            |                     |
| Pre-requisite for the course (if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Basic understanding of computer systems and programming.                                                                                                                                                                                                                                                                                                                                 |                            |                     |
| Course Learning Outcomes (CLOs)<br>After completing this course, the learner will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | CLO <sub>1</sub> : Build enterprise level mobile applications with Kotlin on Android<br>CLO <sub>2</sub> : Understand both the basic and advanced concepts of Kotlin<br>CLO <sub>3</sub> : Understand why use Kotlin over Java<br>CLO <sub>4</sub> : Install and configure Android Studio                                                                                                |                            |                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Theory                                                                                                                                                                                                                                                                                                                                                                                   | Practical                  | Total               |
| Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 4                                                                                                                                                                                                                                                                                                                                                                                        | 0                          | 4                   |
| Teaching Hours per week                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 4                                                                                                                                                                                                                                                                                                                                                                                        | 0                          | 4                   |
| Internal Assessment Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 30                                                                                                                                                                                                                                                                                                                                                                                       | 0                          | 30                  |
| End Term Exam Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 70                                                                                                                                                                                                                                                                                                                                                                                       | 0                          | 70                  |
| Max. Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 100                                                                                                                                                                                                                                                                                                                                                                                      | 0                          | 100                 |
| Examination Duration (in Hours)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 03                                                                                                                                                                                                                                                                                                                                                                                       |                            |                     |
| Part B-Contents of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                          |                            |                     |
| <b>Instructions for Paper- Setter:</b><br>The paper setter shall prepare 9 questions, selecting two questions from each unit, with due consideration given to the Course Learning Outcomes (CLOs). Question No. 1 shall be compulsory and will comprise 7 short-answer questions, carrying 2 marks each, for a total of 14 marks. These questions shall cover the entire syllabus. The remaining questions shall carry 14 marks each. Examinees shall be required to attempt five questions in total: Question No. 1 (compulsory), and One question from each of the four units. |                                                                                                                                                                                                                                                                                                                                                                                          |                            |                     |
| Units                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Topics                                                                                                                                                                                                                                                                                                                                                                                   |                            | Contact Hours/ CLOs |
| I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Introduction: Mobile operating system, Operating system structure, Constraints and Restrictions, Hardware configuration with mobile operating system, Features: Multitasking Scheduling, Memory Allocation, File System Interface, Keypad Interface, I/O Interface, Protection and Security, Multimedia features                                                                         |                            | 15/CLO <sub>1</sub> |
| II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Introduction to Mobile development IDE's, Introduction to Worklight basics, Optimization, pages and fragments, Writing a basic program- in Worklight Studio, Client technologies, Client side debugging, Creating adapters, Invoking adapters from Worklight Client application, Common Controls, Using Java in adapters, Programming exercise with Skins, Understanding Apache Cordova. |                            | 15/CLO <sub>2</sub> |
| III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Understanding Apple iOS development, Android development, Shell Development, Creating Java ME application, Exploring the Worklight Server, Working with UI frameworks, Authentication, Push notification, SMS Notifications, Globalization.                                                                                                                                              |                            | 15/CLO <sub>3</sub> |
| IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Android: Introduction to Android, Architecture, memory management, communication protocols, application development methods, deployment. iOS: Introduction to iOS, Architecture, memory management, communication protocols, application development methods, deployment.                                                                                                                |                            | 15/CLO <sub>4</sub> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Total Contact hours                                                                                                                                                                                                                                                                                                                                                                      |                            | 60                  |
| Evaluation Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                          |                            |                     |
| InternalAssessment:30Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                          | EndTermExamination:70Marks |                     |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|------------------------|
| • Class Participation:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 5  | Written Examination:70 |
| • Seminar/presentation/assignment/quiz/<br>class test etc.:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 10 |                        |
| • Mid-Term Exam:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 15 |                        |
| <b>Part C-Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |                        |
| <b>Recommended Books/e-resources/LMS:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                        |
| <ul style="list-style-type: none"><li>• Anubhav Pradhan and Anil V. Deshpande, Mobile Apps Development, Edition: I.</li><li>• Jeff McWherter and Scott Gowell, Professional Mobile Application Development, John Wiley &amp; Sons, 2012.</li><li>• Barry Burd, Android Application Development All-in-One For Dummies, Edition: I.</li><li>• Teach Yourself Android Application Development in 24 Hours, Edition: I, SAMS Publications.</li><li>• Neal Goldstein and Tony Bove, iPhone Application Development All-in-One For Dummies, John Wiley &amp; Sons.</li><li>• Henry Lee and Eugene Chuvyrov, Beginning Windows Phone App Development, Apress, 2012.</li><li>• Jochen Schiller, Mobile Communications, Addison-Wesley, 2nd Edition, 2004.</li><li>• Ivan Stojmenovic and Cacute, Handbook of Wireless Networks and Mobile Computing, Wiley, 2002. ISBN: 0-471-41902-8.</li></ul> |    |                        |

#### Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

| CLOs             | PLO <sub>1</sub> | PLO <sub>2</sub> | PLO <sub>3</sub> | PLO <sub>4</sub> | PLO <sub>5</sub> | PLO <sub>6</sub> | PLO <sub>7</sub> | PLO <sub>8</sub> | PLO <sub>9</sub> | PLO <sub>10</sub> | PLO <sub>11</sub> |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|
| CLO <sub>1</sub> | 2                | 1                | 1                | 3                | 2                | 1                | 3                | 2                | 3                | 3                 | 3                 |
| CLO <sub>2</sub> | 2                | 2                | 3                | 2                | 1                | 3                | 2                | 3                | 2                | 3                 | 2                 |
| CLO <sub>3</sub> | 3                | 3                | 2                | 1                | 3                | 3                | 1                | 3                | 2                | 3                 | 3                 |
| CLO <sub>4</sub> | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 2                 | 3                 |

#### Content Mapping with NEP thrust areas

| Field                               | Content/s |
|-------------------------------------|-----------|
| Employability/Entrepreneurship      |           |
| Skill Enhancement                   | <b>60</b> |
| Communication Development           |           |
| Indian Knowledge System             |           |
| Environmental Awareness             |           |
| Current Issues and Social Awareness |           |
| Women empowerment/Gender issues     |           |
| Public policies                     |           |
| Any Other                           | <b>60</b> |

| Part A-Introduction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|
| Name of the Programme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Computer Science                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                  |                     |
| Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | VI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                     |
| Nature of Course/Course Composition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Theory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  |                     |
| Name of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Data Ware Housing & Data Mining                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                     |
| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 24L5.5-CSE-604                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                     |
| Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | DSE-4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                  |                     |
| Course Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 300-399                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                  |                     |
| Pre-requisite for the course (if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Basic understanding of computer systems and programming.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                     |
| Course Learning Outcomes (CLOs)<br>After completing this course, the learner will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <p>CLO<sub>1</sub>: Explain the fundamental concepts, characteristics, functionalities, advantages, applications, and architecture of data warehouses, and distinguish between OLTP systems and data warehouse systems.</p> <p>CLO<sub>2</sub>: Analyze different data warehouse development methodologies, types, architectures, components, and tools, including top-down, bottom-up, and federated data warehouse architectures.</p> <p>CLO<sub>3</sub>: Explain and apply fundamental data mining concepts, functionalities, task primitives, classification of data mining systems, and the integration of data mining systems with databases and data warehouses.</p> <p>CLO<sub>4</sub>: Apply data preprocessing techniques such as data cleaning, data integration, data transformation, data reduction, discretization, and concept hierarchy generation to prepare data for effective mining and analysis.</p> |                  |                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Theory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Practical</b> | <b>Total</b>        |
| Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0                | 4                   |
| Teaching Hours per week                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0                | 4                   |
| Internal Assessment Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0                | 30                  |
| End Term Exam Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0                | 70                  |
| Max. Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0                | 100                 |
| Examination Duration (in Hours)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 03                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                     |
| Part B-Contents of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                     |
| <b><u>Instructions for Paper- Setter:</u></b><br>The paper setter shall prepare 9 questions, selecting two questions from each unit, with due consideration given to the Course Learning Outcomes (CLOs). Question No. 1 shall be compulsory and will comprise 7 short-answer questions, carrying 2 marks each, for a total of 14 marks. These questions shall cover the entire syllabus. The remaining questions shall carry 14 marks each. Examinees shall be required to attempt five questions in total: Question No. 1 (compulsory), and One question from each of the four units. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                     |
| Units                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Topics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  | Contact Hours/ CLOs |
| I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Introduction to Data Warehouse: OLTP Systems, Differences between OLTP Systems and Data Warehouse, Characteristics of Data Warehouse, Functionality of Data Warehouse, Advantages and Applications of Data Warehouse.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                  | 15/CLO <sub>1</sub> |
| II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Top- Down and Bottom-Up Development Methodology, Tools for Data warehouse development, Data Warehouse Types, Data Warehouse Architecture, and Components of Data warehouse Architecture, Introduction to Federated Data Warehouse Architecture.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  | 15/CLO <sub>2</sub> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                          |                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| III                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining. | 15/CLO <sub>3</sub>               |
| IV                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Data Preprocessing: Introduction to Data Preprocessing, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.                                                                             | 15/CLO <sub>4</sub>               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Total Contact hours</b>                                                                                                                                                                                                                               | 60                                |
| <b>Evaluation Methods</b>                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                          |                                   |
| <b>InternalAssessment:30Marks</b>                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                          | <b>EndTermExamination:70Marks</b> |
| • Class Participation:                                                                                                                                                                                                                                                                                                                                                                                                                                  | 5                                                                                                                                                                                                                                                        | Written Examination:70            |
| • Seminar/presentation/assignment/quiz/<br>class test etc.:                                                                                                                                                                                                                                                                                                                                                                                             | 10                                                                                                                                                                                                                                                       |                                   |
| • Mid-Term Exam:                                                                                                                                                                                                                                                                                                                                                                                                                                        | 15                                                                                                                                                                                                                                                       |                                   |
| <b>Part C-Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                          |                                   |
| <b>Recommended Books/e-resources/LMS:</b>                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                          |                                   |
| <ul style="list-style-type: none"><li>• Jiawei Han &amp; Micheline Kamber, Data Mining – Concepts and Techniques, Morgan Kaufmann Publishers.</li><li>• Sam Aanhory &amp; Dennis Murray, Data Warehousing in the Real World, Pearson Education.</li><li>• Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Introduction to Data Mining, Pearson Education.</li><li>• Paulraj Ponnaiah, Data Warehousing Fundamentals, Wiley Student Edition.</li></ul> |                                                                                                                                                                                                                                                          |                                   |

#### Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

| CLOs             | PLO <sub>1</sub> | PLO <sub>2</sub> | PLO <sub>3</sub> | PLO <sub>4</sub> | PLO <sub>5</sub> | PLO <sub>6</sub> | PLO <sub>7</sub> | PLO <sub>8</sub> | PLO <sub>9</sub> | PLO <sub>10</sub> | PLO <sub>11</sub> |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|
| CLO <sub>1</sub> | 1                | 2                | 3                | 3                | 2                | 1                | 3                | 2                | 3                | 3                 | 3                 |
| CLO <sub>2</sub> | 2                | 1                | 2                | 2                | 1                | 3                | 2                | 1                | 2                | 2                 | 3                 |
| CLO <sub>3</sub> | 3                | 3                | 1                | 1                | 3                | 3                | 1                | 3                | 2                | 3                 | 3                 |
| CLO <sub>4</sub> | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 2                 | 3                 |

#### Content Mapping with NEP thrust areas

| Field                               | Content/s |
|-------------------------------------|-----------|
| Employability/Entrepreneurship      |           |
| Skill Enhancement                   | <b>60</b> |
| Communication Development           |           |
| Indian Knowledge System             |           |
| Environmental Awareness             |           |
| Current Issues and Social Awareness |           |
| Women empowerment/Gender issues     |           |
| Public policies                     |           |
| Any Other                           | <b>60</b> |

| Part A-Introduction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                    |                  |                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------------|
| Name of the Programme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Computer Science                                                                                                                                                                                                                                                                                                                                   |                  |                        |
| Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | VI                                                                                                                                                                                                                                                                                                                                                 |                  |                        |
| Nature of Course/Course Composition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Theory                                                                                                                                                                                                                                                                                                                                             |                  |                        |
| Name of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Ethical Hacking                                                                                                                                                                                                                                                                                                                                    |                  |                        |
| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 24L5.5-CSE-605                                                                                                                                                                                                                                                                                                                                     |                  |                        |
| Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DSE-5                                                                                                                                                                                                                                                                                                                                              |                  |                        |
| Course Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 300-399                                                                                                                                                                                                                                                                                                                                            |                  |                        |
| Pre-requisite for the course (if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                    |                  |                        |
| Course Learning Outcomes (CLOs)<br>After completing this course, the learner will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | CLO <sub>1</sub> : Understand ethical hacking concepts and methodologies.<br>CLO <sub>2</sub> : Identify and analyze system and network vulnerabilities.<br>CLO <sub>3</sub> : Perform basic penetration testing and security assessment.<br>CLO <sub>4</sub> : Apply security measures and understand modern hacking trends.                      |                  |                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Theory</b>                                                                                                                                                                                                                                                                                                                                      | <b>Practical</b> | <b>Total</b>           |
| Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 4                                                                                                                                                                                                                                                                                                                                                  | 0                | 4                      |
| Teaching Hours per week                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 4                                                                                                                                                                                                                                                                                                                                                  | 0                | 4                      |
| Internal Assessment Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 30                                                                                                                                                                                                                                                                                                                                                 | 0                | 30                     |
| End Term Exam Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 70                                                                                                                                                                                                                                                                                                                                                 | 0                | 70                     |
| Max. Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 100                                                                                                                                                                                                                                                                                                                                                | 0                | 100                    |
| Examination Duration (in Hours)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 03                                                                                                                                                                                                                                                                                                                                                 |                  |                        |
| Part B-Contents of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                    |                  |                        |
| <b>Instructions for Paper- Setter:</b><br>The paper setter shall prepare 9 questions selecting two questions from each unit with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question, comprising 7 short answer type questions carrying two marks each (total 14 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt five questions: the compulsory question no.1 and 1 question from the each of the four units. |                                                                                                                                                                                                                                                                                                                                                    |                  |                        |
| Unit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Topics                                                                                                                                                                                                                                                                                                                                             |                  | Contact Hours/<br>CLOs |
| I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Introduction to Ethical Hacking and Cyber Security: Definition of hacking and types of hackers, Ethical hacking vs. unethical hacking, Scope and limitations of ethical hacking, Cybercrime and cyber laws, Phases of hacking, Legal implications and code of ethics, Introduction to security policies and compliance                             |                  | 15/CLO <sub>1</sub>    |
| II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Footprinting and Network Scanning: Footprinting techniques, Passive and active information gathering, WHOIS, NSLookup, Google hacking, Network scanning techniques, Nmap, IP scanning, Port scanning, Vulnerability scanning basics, Introduction to network mapping tools                                                                         |                  | 15/CLO <sub>2</sub>    |
| III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | System Hacking and Malware: Password cracking techniques, Keyloggers and spyware, Privilege escalation, Trojans, viruses, and worms, Backdoors and remote access tools, Buffer overflows (basic understanding), Antivirus evasion techniques (theory only), Safe practices to avoid infections                                                     |                  | 15/CLO <sub>3</sub>    |
| IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Web and Wireless Security Basics: Common web application attacks (XSS, SQL injection, CSRF), Introduction to web vulnerability scanners (e.g., OWASP ZAP), Securing web applications (basic methods), Wireless network vulnerabilities, Types of Wi-Fi attacks (WEP cracking, rogue APs), Introduction to WPA/WPA2 security, Basic countermeasures |                  | 15/CLO <sub>4</sub>    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Total Contact hours</b>                                                                                                                                                                                                                                                                                                                         |                  | 60                     |

| Evaluation Methods                                                                                                                                                                                                                                        |    |                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----------------------------|
| InternalAssessment:30Marks                                                                                                                                                                                                                                |    | EndTermExamination:70Marks |
| • Class Participation:                                                                                                                                                                                                                                    | 5  | Written Examination:70     |
| • Seminar/presentation/assignment/quiz/<br>class test etc.:                                                                                                                                                                                               | 10 |                            |
| • Mid-Term Exam:                                                                                                                                                                                                                                          | 15 |                            |
| Part C–Learning Resources                                                                                                                                                                                                                                 |    |                            |
| <b>Recommended Books/e-resources/LMS:</b>                                                                                                                                                                                                                 |    |                            |
| <ul style="list-style-type: none"><li>• Cyber Security and Cyber Laws by Nina Godbole, Sunit Belapure Publisher: Wiley India</li><li>• Ethical Hacking and Cyber Securityby R. K. Jain</li><li>• Introduction to Cyber Security by Anand Shinde</li></ul> |    |                            |

### Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

| CLOs             | PLO <sub>1</sub> | PLO <sub>2</sub> | PLO <sub>3</sub> | PLO <sub>4</sub> | PLO <sub>5</sub> | PLO <sub>6</sub> | PLO <sub>7</sub> | PLO <sub>8</sub> | PLO <sub>9</sub> | PLO <sub>10</sub> | PLO <sub>11</sub> |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|
| CLO <sub>1</sub> | 1                | 1                | 2                | 3                | 2                | 1                | 3                | 3                | 1                | 3                 | 3                 |
| CLO <sub>2</sub> | 2                | 2                | 3                | 2                | 3                | 2                | 2                | 3                | 2                | 1                 | 3                 |
| CLO <sub>3</sub> | 2                | 3                | 3                | 3                | 1                | 2                | 1                | 3                | 2                | 3                 | 3                 |
| CLO <sub>4</sub> | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 3                 | 3                 |

### Content Mapping with NEP thrust areas

| Field                               | Content/s |
|-------------------------------------|-----------|
| Employability/Entrepreneurship      |           |
| Skill Enhancement                   | <b>60</b> |
| Communication Development           |           |
| Indian Knowledge System             |           |
| Environmental Awareness             |           |
| Current Issues and Social Awareness |           |
| Women empowerment/Gender issues     |           |
| Public policies                     |           |
| Any Other                           | <b>60</b> |

| Part A-Introduction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                |           |                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---------------------|
| Name of the Programme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Computer Science                                                                                                                                                                                                                                                                                                                                               |           |                     |
| Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | VI                                                                                                                                                                                                                                                                                                                                                             |           |                     |
| Nature of Course/Course Composition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Theory                                                                                                                                                                                                                                                                                                                                                         |           |                     |
| Name of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Cyber Forensics and Investigations                                                                                                                                                                                                                                                                                                                             |           |                     |
| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 24L5.5-CSE-606                                                                                                                                                                                                                                                                                                                                                 |           |                     |
| Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | DSE-5                                                                                                                                                                                                                                                                                                                                                          |           |                     |
| Course Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 300-399                                                                                                                                                                                                                                                                                                                                                        |           |                     |
| Pre-requisite for the course (if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                |           |                     |
| Course Learning Outcomes (CLOs)<br>After completing this course, the learner will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | CLO <sub>1</sub> : Understand cyber forensic principles and investigation processes.<br>CLO <sub>2</sub> : Collect, preserve, and analyze digital evidence.<br>CLO <sub>3</sub> : Perform basic network and system forensic analysis.<br>CLO <sub>4</sub> : Apply forensic tools and techniques in real-world scenarios.                                       |           |                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Theory                                                                                                                                                                                                                                                                                                                                                         | Practical | Total               |
| Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 4                                                                                                                                                                                                                                                                                                                                                              | 0         | 4                   |
| Teaching Hours per week                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 4                                                                                                                                                                                                                                                                                                                                                              | 0         | 4                   |
| Internal Assessment Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 30                                                                                                                                                                                                                                                                                                                                                             | 0         | 30                  |
| End Term Exam Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 70                                                                                                                                                                                                                                                                                                                                                             | 0         | 70                  |
| Max. Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 100                                                                                                                                                                                                                                                                                                                                                            | 0         | 100                 |
| Examination Duration (in Hours)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 03                                                                                                                                                                                                                                                                                                                                                             |           |                     |
| Part B-Contents of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                |           |                     |
| <b><u>Instructions for Paper- Setter:</u></b><br>The paper setter shall prepare 9 questions selecting two questions from each unit with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question, comprising 7 short answer type questions carrying two marks each (total 14 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt five questions: the compulsory question no.1and 1question from the each of The four units. |                                                                                                                                                                                                                                                                                                                                                                |           |                     |
| Unit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Topics                                                                                                                                                                                                                                                                                                                                                         |           | Contact Hours/ CLOs |
| I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Fundamentals of Cyber Forensics:</b><br>Introduction to Cyber Forensics and Digital Investigation Need and Scope of Digital Forensics Types of Cyber Crimes and Digital Evidence Characteristics and Types of Digital Evidence Forensic Readiness and Investigation Process Legal and Ethical Issues in Digital Forensics Overview of Cyber Laws and IT Act |           | 15/CLO <sub>1</sub> |
| II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Computer Forensics and Evidence Acquisition:</b><br>Computer Forensics Fundamentals Forensic Investigation Process and Methodology Evidence Collection and Preservation Techniques Chain of Custody Disk Imaging and Cloning File Systems (FAT, NTFS, EXT) and Data Recovery Forensic Tools and Software                                                    |           | 15/CLO <sub>2</sub> |
| III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Network and Web Forensics:</b><br>Network Forensics Concepts and Techniques Monitoring and Analysis of Network Traffic Log Analysis and Intrusion Detection Email Forensics and Web Forensics Investigation of Web Attacks (Phishing, SQL Injection, etc.) Wireless Network Forensics                                                                       |           | 15/CLO <sub>3</sub> |
| IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Advanced Forensics and Incident Response:</b><br>Mobile and Cloud Forensics Malware Forensics and Analysis Incident Response and Handling Digital Evidence Reporting and Documentation Forensic Tools (EnCase, FTK, Wireshark, Autopsy) Challenges in Cyber Forensics Emerging Trends in Digital Forensics                                                  |           | 15/CLO <sub>4</sub> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Total Contact hours</b>                                                                                                                                                                                                                                                                                                                                     |           | 60                  |
| Evaluation Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                |           |                     |

| InternalAssessment:30Marks                                                                                                                                                                                                                                                                                                                                                                                                                                        |    | EndTermExamination:70Marks |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----------------------------|
| ● Class Participation:                                                                                                                                                                                                                                                                                                                                                                                                                                            | 5  | Written Examination:70     |
| ● Seminar/presentation/assignment/quiz/<br>class test etc.:                                                                                                                                                                                                                                                                                                                                                                                                       | 10 |                            |
| ● Mid-Term Exam:                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 15 |                            |
| Part C-Learning Resources                                                                                                                                                                                                                                                                                                                                                                                                                                         |    |                            |
| <b>Recommended Books/e-resources/LMS:</b>                                                                                                                                                                                                                                                                                                                                                                                                                         |    |                            |
| <ul style="list-style-type: none"><li>● Mangesh M. Ghonge et al., Cyber Security and Digital Forensics, Publisher: Wiley-Scrivener.</li><li>● S. Murugan and Dejeey, Cyber Forensics, Publisher: Oxford University Press India.</li><li>● Meenal Dhal et al., Handbook of Digital Forensics and Cyber Crime, Publisher: Indian Academic Publisher.</li><li>● Gaytri Gupta, A Textbook of Cyber Forensic Analytics, Publisher: S. K. Kataria &amp; Sons.</li></ul> |    |                            |

### Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes

| CLOs             | PLO <sub>1</sub> | PLO <sub>2</sub> | PLO <sub>3</sub> | PLO <sub>4</sub> | PLO <sub>5</sub> | PLO <sub>6</sub> | PLO <sub>7</sub> | PLO <sub>8</sub> | PLO <sub>9</sub> | PLO <sub>10</sub> | PLO <sub>11</sub> |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|
| CLO <sub>1</sub> | 1                | 1                | 2                | 3                | 2                | 1                | 3                | 3                | 1                | 3                 | 3                 |
| CLO <sub>2</sub> | 2                | 2                | 3                | 2                | 3                | 2                | 2                | 3                | 2                | 1                 | 3                 |
| CLO <sub>3</sub> | 2                | 3                | 3                | 3                | 1                | 2                | 1                | 3                | 2                | 3                 | 3                 |
| CLO <sub>4</sub> | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 3                | 3                 | 3                 |

### Content Mapping with NEP thrust areas

| Field                               | Content/s |
|-------------------------------------|-----------|
| Employability/Entrepreneurship      |           |
| Skill Enhancement                   | 60        |
| Communication Development           |           |
| Indian Knowledge System             |           |
| Environmental Awareness             |           |
| Current Issues and Social Awareness |           |
| Women empowerment/Gender issues     |           |
| Public policies                     |           |
| Any Other                           | 60        |