

**NIRMA UNIVERSITY**  
**Institute of Technology**  
**B. Tech. Computer Science and Engineering**

**Semester – III**

<b>Course Code</b>	<b>2CS301</b>
<b>Course Title</b>	<b>Data Structures and Algorithms</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
3	0	2	4

**Course Learning Outcome:**

At the end of the course, students will be able to -

1. analyse various data structures and their applicability
2. comprehend and implement various techniques for searching and sorting
3. identify the appropriate data structure to design efficient algorithm for the given application

<b>Course Code</b>	<b>2CS302</b>
<b>Course Name</b>	<b>Object Oriented Programming</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
2	0	4	4

**Course Learning Outcomes (CLO):**

At the end of the course, students will be able to –

1. interpret the basic principles of object oriented programming
2. develop computer programs to solve real world problems based on object-oriented principles
3. implement multi-threaded applications with basic input-output operations and exception handling

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
2	0	2	3

<b>Course Code</b>	<b>2CS303</b>
<b>Course Title</b>	<b>Digital Electronics</b>

### Course Learning Outcomes (CLOs):

At the end of the course, students will be able to -

1. describe the basic building blocks of various digital circuits
2. design combinational logic and sequential logic circuits using basic components
3. identify digital components in computer organization

L	T	P	C
2	1	0	3

<b>Course Code</b>	<b>2CS304</b>
<b>Course Title</b>	<b>Digital Communications</b>

### Course Learning Outcomes (CLO):

At the end of the course, students will be able to –

1. explain data/signal transmission over communication media
2. analyze various spread spectrum, multiplexing, and modulation techniques
3. apply concepts of data communication to solve various problems

L	T	P	C
2	1	0	3

<b>Course Code</b>	<b>2CS305</b>
<b>Course Name</b>	<b>Discrete Mathematics</b>

### Course Learning Outcome:

At the end of the course, students will be able to

1. interpret the preliminaries of discrete mathematics
2. comprehend role of discrete mathematics in theoretical computer science
3. recognize the importance of formal approach for solving computing problems

L	T	P	C
2	0	0	2

<b>Course Code</b>	<b>HSXXX</b>
<b>Course Title</b>	<b>Principles of Economics</b>

## Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

1. interpret the various basic economic principles
2. relate the economic fundamentals with engineering practices
3. infer the macro-economic aspects of engineering projects

## Semester – IV

L	T	P	C
3	1	0	4

<b>Course Code</b>	<b>2CS401</b>
<b>Course Title</b>	<b>Computer Architecture</b>

## Course Learning Outcomes (CLO):

At the end of the course, students will be able to –

1. outline and describe the basics of various architectural units of the Computer System
2. apply the knowledge of combinational and sequential logical circuits to mimic a simple computer architecture
3. design various architectural units of a basic computer system

L	T	P	C
3	0	2	4

<b>Course Code</b>	<b>2CS402</b>
<b>Course Title</b>	<b>Database Management Systems</b>

## Course Outcomes (COs):

At the end of the course, students will be able to -

1. relate various aspects of the relational database like models, functional dependencies and normalization
2. evaluate various storage and retrieval methods to correlate with relational model through appropriate indexing

- interpret transaction processing, concurrency and recovery protocols for effective database management.

L	T	P	C
3	0	2	4

<b>Course Code</b>	<b>2CS403</b>
<b>Course Title</b>	<b>Operating Systems</b>

### **Course Learning Outcomes (CLO):**

At the end of the course, students will be able to -

- illustrate basic components of operating systems
- comprehend the mechanism of operating Systems to handle processes, memory and file management
- demonstrate competence in recognizing and using operating system features

L	T	P	C
2	0	2	3

<b>Course Code</b>	<b>2CS404</b>
<b>Course Name</b>	<b>Programming for Scientific Computing</b>

### **Course Learning Outcomes (CLO):**

At the end of the course, students will be able to –

- write computational programs at a high level of abstraction
- use standard programming constructs like repetition, selection, functions, composition, modules, aggregated data
- implement and evaluate the results of scientific computing problems, using established program libraries

L	T	P	C
2	0	2	3

<b>Course Code</b>	<b>MAXXX</b>
<b>Course Name</b>	<b>Probability and Statistics</b>

### **Course Learning Outcomes (CLO):**

At the end of the course, students will be able to –

- relate the concepts of probability and statistics and their need in engineering

2. apply concepts and methods of probability and statistics in simulation and modeling of various computer science problems
3. perform probabilistic and statistical analysis of data related to computer science research and projects

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

<b>Course Code</b>	<b>HSXXX</b>
<b>Course Title</b>	<b>Principles of Management</b>

### **Course Learning Outcomes (CLO):**

At the end of the course, students will be able to-

1. interpret the various theories and processes of management
2. relate with different functional areas of management
3. appreciate the role and need of managers in different organisations

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

<b>Course Code</b>	<b>2CS405</b>
<b>Course Title</b>	<b>Web Technologies</b>

### **Course Learning Outcome (CLOs):**

At the end of the course, students will be able to –

1. explain tagging techniques for web development
2. apply the concepts of web technology in designing static and dynamic web pages
3. design interactive web pages incorporating validation techniques

## **Semester V**

**CE501**

**Theory of Computation**

**[3 1 0 4]**

### **Course Learning Outcome:**

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

1. understand formal language theory and its application to computer science
2. apply mathematical preliminaries to develop the basic components of language design

3. design simple computational machines using the concepts of language theory
4. correlate computability with formal computational machines

**CE502** **Database Management Systems** [3 1 2 5]

**Course Learning Outcome:**

After successful completion of this course, student will be able to

1. understand preliminaries of database management system concepts and its applications
2. conceptualize and formalize relation amongst various entities of the database
3. understand and design optimal way of storage and retrieval, in correlation with relational model through appropriate indexing and normalization
4. create optimal query using structured query language
5. understand advanced DBMS concepts like transaction processing, concurrency control and recovery

**CE503** **Computer Networks** [3 1 2 5]

**Course Learning Outcomes**

After successful completion of this course, student will be able to

1. understand the significance and concepts of computer networks
2. conceptualize and appreciate the layered model for computer networking
3. identify basic protocols and design issues for layered model.
4. design and implement protocols related to various networking layers

**CE504** **Operating Systems** [3 1 2 5]

**Course Learning Outcome:**

After successful completion of this course, student will be able to

1. identify basic components of operating system
2. conceptualize synchronization amongst various components of a typical operating system
3. understand and simulate activities of various operating system components
4. correlate basic concepts of operating system with an existing operating system
5. design miniature prototypes of operating system components

**IT502** **Web Designing** [2 0 2 3]

**Course Learning Outcome:**

After successful completion of this course, student will be able to

1. understand the basic structure of web designing technology
2. apply the concepts of web technology in designing static and dynamic web pages
3. design interactive web pages incorporating validation techniques

**CE505** **Mini Project- II** [0 0 2 1]

**Course Learning Outcome:**

After successful completion of the course, students will be able to

1. practice acquired knowledge within the chosen area of technology for project development

2. identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
3. reproduce, improve and refine technical aspects for engineering projects
4. work as an individual or in a team in development of technical projects
5. communicate and report effectively project related activities and findings

**Semester VI CE601 Design and Analysis of Algorithms [3 1 0 4]**

**Course Learning Outcome:**

After successful completion of this course, student will be able to

1. understand need of complexity analysis of the algorithm
2. analyze and formalize behavior of algorithms in different scenarios
3. identify and evaluate suitable data structure to solve a problem effectively and efficiently
4. compare and evaluate various problem solving approaches based on algorithmic complexity with respect to relevant applications

**IT601 Software Engineering [3 0 2 4]**

**Course Learning Outcome:**

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

1. understand various phases of software development lifecycle
2. analyze the requirements systematically and develop the model using standard tools and methodologies
3. apply key aspects of software engineering processes for the development of a complex software system
4. develop a quality software project through effective team-building, planning, scheduling and risk assessment
5. keep abreast of current trends in the area of software engineering

**CE602 Mini Project- III [0 0 2 1]**

**Course Learning Outcome:**

After successful completion of the course, students will be able to

1. practice acquired knowledge within the chosen area of technology for project development
2. identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
3. reproduce, improve and refine technical aspects for engineering projects
4. work as an individual or in a team in development of technical projects
5. communicate and report effectively project related activities and findings

**Elective I CE611 .net Technologies [3 0 2 4]**

**Course Learning Outcome:**

After successful completion of this course, student will be able to

1. understand the importance and architecture of multi-tier Client Server systems
2. analyze and evaluate various components of .net framework
3. design web based client server applications using .net technologies and relevant tools

**CE621 Java Technologies [3 0 2 4]**

**Course Learning Outcome:**

After successful completion of this course, student will be able to

1. describe and interpret the basics of Java technologies
2. apply the concepts of java technologies to design interactive applications
3. demonstrate applications of java technologies for developing secured distributed applications

**CE631 Objective C Programming [3 0 2 4]**

**Course Learning Outcome:**

After successful completion of this course, student will be able to

1. understand concepts of object oriented programming for mobile operating systems
2. apply the concepts of objective C to design the variety of interactive mobile applications
3. design the data centric application for mobile devices

**CE641 Embedded C Programming [3 0 2 4]**

**Course Learning Outcome:**

After successful completion of this course, student will be able to

1. understand concepts of Embedded system
2. understand concepts of Operating system
3. analyze and design program for embedded system

**CE651 LAMP Technologies [3 0 2 4]**

**Course Learning Outcome:**

After successful completion of this course, student will be able to

1. understand the importance of open source technologies
2. describe and interpret the basics of LAMP technology
3. correlate the Linux, Apache, MySQL and PHP for building an application
4. design and develop applications using open source technologies

**CE661 Mobile Application Development Technologies [3 0 2 4]**

**Course learning Outcomes:**

After successful completion of this course, student will be able to

1. understand the building blocks of mobile applications
2. apply various tools and technologies to conceptualize the variety of mobile applications
3. design and develop the data centric applications for mobile devices

**IT764 System Software [3 0 2 4]**

**Course Learning Outcome:**

After successful completion of this course, student will be able to

1. understand relationship between system software and machine architecture
2. design and implement various phases of program execution
3. understand implementation of device drivers and system software tools

**Elective II IT612 Advanced Computer Networks [3 1 0 4]**

**Course Learning Outcome:**

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

1. understand architectures of high speed network systems of wired and wireless medium
2. analyze the process of congestion and traffic management in high speed networks
3. identify various factors that lead to QoS based provisioning of data on communication networks
4. design networks with advanced communication requirements and features





2. understand the external factors that impact the business strategy
3. understand optimization principles that guide effective allocation of resources

**IT692**

**Software Testing**

**[3 1 0 4]**

**Course Learning Outcomes:**

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

1. realize the importance of software testing
2. apply modern software testing processes in relation to software development
3. create test strategies and plans, design test cases, prioritize and execute them,
4. manage incidents and risks within a project
5. contribute to efficient delivery of software solutions and implement improvements in the software development processes.

**Elective III CE613 IT Industry Management [3 1 0 4]**

**Course Learning Outcomes:**

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

1. understand and analyze various components of IT Infrastructure and emerging technologies used in business
2. analyze how to develop and coordinate IT systems strategies, plans and management initiatives within small, medium and large corporate enterprises
3. analyze the performance and operational excellence in business
4. Study concerns in business like ethics, security, finance in corporate IT systems

**CE623**

**Machine Learning**

**[3 1 0 4]**

**Course Learning Outcome:**

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

1. understand machine learning concepts and range of problems that can be handled by machine learning
2. compare and parameterize different learning algorithms
3. apply the machine learning concepts in real life problems

**CE633**

**Data Mining**

**[3 1 0 4]**

**Course Learning Outcomes:**

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

1. identify the key processes of data mining, data warehousing and knowledge discovery process
2. understand the basic principles and algorithms used in practical data mining and their strengths and weaknesses
3. apply data mining techniques to solve problems in other disciplines in a mathematical way

**CE643**

**Parallel and Distributed Computing**

**[3 1 0 4]**

**Course Learning Outcome:**

Upon completion of the course the student should be able to:

1. understand the concepts and issues related to parallel and distributed system
2. understand intricacies of parallel and distributed programming

3. design and develop the programs for parallel and distributed environment
4. manage security, performance reliability and other issues while designing in parallel and distributed environment

**CE653**

**Advance Data Structures**

**[3 1 0 4]**

**Course Learning Outcome:**

After successful completion of this course, student will be able to

1. realize the importance of various data structures from application perspective
2. apply the knowledge of data structures for real-time applications
3. optimize the working algorithm to solve the given engineering problem efficiently
4. design algorithms for various engineering applications

**CE663**

**Natural Language Processing**

**[3 1 0 4]**

**Course Learning Outcome:**

After successful completion of this course, student will be able to

1. understand the importance and concepts of Natural Language Processing(NLP)
2. correlate the NLP with formal analysis of phrase structured languages
3. analyze NLP components formally along with semantics and sentiments
4. apply NLP in development of tools of contemporary need.

## Semester VII

	L	T	P	C
	3	-	2	4
<b>Course Code</b>	<b>IT724</b>			
<b>Course Title</b>	<b>Artificial Intelligence</b>			

**Course Learning Outcome(CLOs):**

At the end of the course, students will be able to-

1. identify the significance and domains of Artificial Intelligence and knowledge representation,
2. discuss and demonstrate the design concepts of control and search strategies in AI Applications,
3. design applications using Artificial Intelligence.

**IT794** **Compiler Construction** **[3 0 2 4]**

**Course Learning Outcome:**

After successful completion of this course, student will be able to

- understand the functionalities of various compilation phases
- apply language theory concepts in various phases of compiler design
- design and develop a miniature compiler

**CE702** **Minor Project** **[0 0 4 2]**

**Course Learning Outcome:**

After successful completion of the course, students will be able to

6. practice acquired knowledge within the chosen area of technology for project development
7. identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
8. reproduce, improve and refine technical aspects for engineering projects
9. work as an individual or in a team in development of technical projects
10. report project related activities effectively to peers and mentors

**CE703** **Open Source Development Lab** **[0 0 2 1]**

**Course Learning Outcomes:**

After successful completion of this course, student will be able to

1. understand basics of various open source Content Management System
2. study various open source packages and databases
3. use and develop open source packages to contribute in open source community

**SP701** **Practical Training** **[0 0 0 0]**

**Course Learning Outcome:**

After successful completion of the course, student will be able to

1. explore the preferred field of specialization and develop analytical / hardware / software / experimental / observation skills
2. manage the technical content and work prepare and present technical report

**Elective IV IT714 Database Administration [3 0 2 4]**

**Course Learning Outcomes:**

After successful completion of this course, student will be able to

1. understand and apply configuration and administration of database systems
2. analyze system requirement and reorganize database components to achieve better performance
3. develop strategies of regular backup to ensure reliability
4. design database systems and administration suitable for various system requirements

**IT734** **System Administration** **[3 0 2 4]**

**Course Learning Outcomes:**

After successful completion of this course, student will be able to

1. understand and analyse basic configurational aspects of computer based systems

2. understand various system administration issues related to software platforms
3. develop various user policies for ensuring accessibility and security of the system
4. design strategy to schedule regular backup and recovery to ensure system reliability

**IT744** **Digital Image Processing** **[3 0 2 4]**

**Course Learning Outcome:**

After successful completion of this course, student will be able to

1. understand basic image acquisition mechanisms and image formats
2. understand various applications of digital image processing
3. apply mathematical principles and signal processing concepts in digital image enhancement and restoration
4. design and develop various image representation stages for digital image processing applications

**IT754** **Wireless Networks** **[3 0 2 4]**

**Course Learning Outcomes**

After successful completion of this course, student will be able to

1. understand the key concepts and techniques of wireless and mobile communications
2. understand the architecture and applications of current and next generation wireless networks
3. apply concepts of wireless networks in design of adhoc networks and sensor networks

**IT702** **Information Retrieval Systems** **[3 0 2 4]**

**Course Learning outcome:**

After successful completion of this course, student will be able to

1. understand the concepts and various components of Information Retrieval (IR) systems
2. identify design and evaluation parameters for information retrieval systems
3. apply theoretical foundations for development of IR systems
4. develop practical skills to handle and design IR systems

**IT784** **Data Compression** **[3 0 2 4]**

**Course Learning Outcomes:**

After successful completion of this course, student will be able to

1. understand the importance of data compression and its effect on data.
2. study different compression techniques
3. apply suitable compression techniques for different types of data.

**IT7A4** **Network Programming** **[3 0 2 4]** **Course Learning Outcomes**

After successful completion of this course, student will be able to 1.

1. understand the concepts of socket programming
2. develop multi-threaded TCP/UDP client-server programs
3. design applications based on web services
4. develop distributed applications based on RPC, CORBA

**IT7B4** **Web Security** **[3 0 2 4]**

**Course Learning Outcomes:**

After successful completion of the course, students will be able to

1. understand security related issues and controls in web – based systems and applications
2. understand the design issues for developing secured networked systems and applications
3. evaluate web-based system with respect to its security requirement

**IT7C4****Big Data Analytics****[3 0 2 4]****Course Learning Outcomes:**

After successful completion of this course, student will be able to

1. understand the need to integrate structured, semi-structured and unstructured data.
2. understand the significance and challenges of big data.
3. handle big data using different tools and frameworks.
4. apply big data techniques for useful business analytic applications.
5. analyze and design algorithms for mining the data from large volumes.

**IT7D4****Agile Software Development****[3 0 2  
4]****Course Learning Outcome:**

After successful completion of this course, student will be able to

1. understand the background and driving forces for taking an Agile approach to software development
2. understand the business value of adopting Agile approaches and development practices
3. use Test Driven Development with unit tests
4. apply design principles, refactoring, version control and continuous integration to achieve Agility
5. perform testing activities within an Agile project

**IT7E4****Secure Software Engineering****[3 0 2  
4]****Course Learning Outcome:**

After successful completion of this course, student will be able to

1. describe the requirements for integrating security into the software development lifecycle
2. apply the concepts of the Design Principles for Protection Mechanisms, the Principles for Software Security and the Principles for Secure Design on a software development project
3. develop specifications for a software development effort that fully specify functional requirements and identifies the expected execution paths
4. describe software development best practices for minimizing vulnerabilities in programming code
5. conduct a security verification and assessment (static and dynamic) of a software application

**CE801**

**Major Project**

**[0 0 30  
21]**

**Course Learning Outcome:**

After successful completion of the course, student will be able to

1. use various tools and techniques to study existing systems
2. critically analyse existing systems, thereby select and justify parameters to be improved
3. start and manipulate proposed engineering solution as per industry / research / societal need
4. achieve precision in uses of the tools related to their experiments/fabrication
5. reorganize and refine various components of technology to optimize the resources at large
6. appraise the potential of technology for scalability and wide spectrum of applications
7. report project related activities effectively to peers, mentors and society
8. follow and value health, safety and ethical practices during project