NIRMA UNIVERSITY
Institute of Technology
B. Tech. Computer Science and Engineering
Semester- III

Course Code	2CS301
Course Title	Data Structures and Algorithms

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

Course Code	2CS302
Course Name	Object Oriented Programming

L	T	P	C
2	0	4	4

Course Learning Outcomes:

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

Course Code	2CS303
Course Title	Digital Electronics

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

Course Code	2CS304
Course Title	Digital Communications

L	T	P	C
2	1	0	3

Course Learning Outcomes:

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

Course Code	2CS305
Course Name	Discrete Mathematics

L	T	P	C
2	1	0	3

Course Learning Outcomes:

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

Course Code	2HS342
Course Name	Principles of Economics

L	T	P	C
2	0	0	2

Course Learning Outcomes:

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 concepts of engineering projects

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

Course Code	2CS401
Course Title	Computer Architecture

L	T	P	C
3	1	0	4

Course Learning Outcomes:

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

Course Code	2CS402
Course Title	Database Management Systems

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

Course Code	2CS403
Course Title	Operating Systems

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

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

Course Code	2CS404
Course Name	Programming for Scientific Computing

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

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

Course Code	2CS405
Course Title	Web Technologies

L	T	P	C
0	0	4	2

Course Learning Outcomes:

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

Course Code	2MA402
Course Title	Probability and Statistics

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. 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

Course Code	2HS341
Course Title	Principles of Management

L	T	P	C
2	0	0	2

Course Learning Outcomes:

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

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

NIRMA UNIVERSITY
Institute of Technology
B. Tech. Computer Science and Engineering
Semester – V

Course Code	**2CS501**
Course Title	**Machine Learning**

L	**T**	**P**	**C**
3	0	2	4

Course Learning Outcomes:

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

1. comprehend statistical methods as basis of machine learning domain
2. apply variety of learning algorithms for appropriate applications
3. implement machine learning techniques to solve problems in applicable domains
4. evaluate and compare algorithms based on different metrics and parameters.

Course Code	**2CS502**
Course Title	**Computer Networks**

L	**T**	**P**	**C**
3	0	2	4

Course Learning Outcomes:

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

1. comprehend the functionality of different layers of computer network architectures
2. analyze protocols related to various network architecture layers
3. design computer network configurations
4. simulate various protocols for different types of networks.

Course Code	**2CS503**
Course Title	**Design and Analysis of Algorithms**

L	**T**	**P**	**C**
2	1	2	4

Course Learning Outcomes:

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

1. comprehend notion of algorithmic complexity and logic of fundamental algorithms
2. apply fundamental algorithms in real life problem solving
3. identify and evaluate suitable data structures to solve a problem effectively and efficiently.

Course Code	2CS504
Course Title	Software Engineering

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

1. explain various phases of software development lifecycle
2. analyse and document the requirement specifications for a software project
3. develop the process model using standard tools and methodologies
4. implement a quality software project through effective team-building, planning, scheduling and risk assessment.

Nirma University
Institute of Technology
B.Tech. in Computer Science and Engineering
Semester- VI

Course Code	**2CS601**
Course Title	**Theory of Computation**

L	T	P	C
3	1	0	4

Course Learning Outcomes:

At the end 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.

Semester- VI
Department Elective-I

Course Code	**2CSDE51**
Course Title	**Mobile Communications**

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. comprehend the key concepts and techniques of wireless and mobile communication
2. explain the architecture and develop applications of current and next generation wireless networks
3. apply concepts of wireless networks to design of ad hoc networks and sensor networks.

Course Code	2CSDE52
Course Title	Optimization Techniques

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. relate key concepts and applications of various optimization techniques
2. identify the appropriate optimization technique for the given problem
3. formulate appropriate objective functions and constraints to solve real life optimization problems.

Course Code	2CSDE53
Course Title	Information Retrieval Systems

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. correlate 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

Course Code	2CSDE54
Course Title	Information and Network Security

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. illustrate principles and problems of cryptosystems for encryption, digital signing and authentication
2. apply methods to create core cryptographic algorithms
3. evaluate techniques to protect as well as attack a network.

Course Code	2CSDE55
Course Title	Agile Software Development

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. appraise the business value of adopting Agile approaches and development practices
2. apply design principles, refactoring version control and continuous integration to achieve Agility
3. implement testing activities within an Agile project using various testing strategies.

Course Code	2CSDE56
Course Title	Graph Theory

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. explain the concept of formal graph-theoretic definitions and notations
2. apply basic theoretical concepts in solving real-life problems and address optimization issues
3. analyse real-life problems to match with applications in computer science

Course Code	2CSDE57
Course Title	Embedded Systems

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. comprehend the general structure of embedded systems, their design requirements and applications
2. analyze and evaluate real-time scheduling strategies as per the application specific needs
3. apply suitable communication protocols for designing embedded systems.

Course Code	2CSDE58
Course Title	High Performance Computing

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. analyse the functionality of Modern Processor.
2. comprehend and implement various optimization techniques for serial code.
3. design the concept of parallel computing paradigm.

Course Code	2CSDE59
Course Title	Complexity Theory

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. comprehend fundamental complexity classes with their complement classes
2. infer algorithmic relationship amongst various classes of problems through reductions and complexity analysis
3. analyse complexity of algorithms for intractable problems.

Semester-VI

Department Elective-II

Course Code	2CSDE60
Course Title	Advanced Java

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

1. describe and interpret the basics of Java technologies.
2. apply the concepts of Java technologies to design console based, GUI based and web based applications
3. develop applications using various Java frameworks
4. create, debug and run multi-tier and enterprise-level Java applications.

Course Code	2CSDE61
Course Title	Deep Learning

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

1. appraise the need of deep learning approaches over machine learning
2. identify the deep learning algorithms which are appropriate for different types of learning tasks in various domains
3. implement deep learning algorithms and solve real-world problems
4. analyze and evaluate various deep learning models.

Course Code	2CSDE62
Course Title	Intrusion Detection Systems

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

1. describe the practical aspects of intrusion detection systems
2. apply machine learning techniques to optimize performance of intrusion detection system
3. correlate user profile, attacks, reactions and responses in network systems
4. implement formal Or-BAC technique for dynamic policy adaptation.

Course Code	2CSDE63
Course Title	System and Database Administration

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

1. analyze and appraise basic configurational aspects of computer systems
2. review the configuration and administration of database systems
3. adapt database components based on system requirements to achieve better performance
4. develop strategies of regular backup to ensure reliability

Course Code	2CSDE64
Course Title	Information Theory and Coding

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

1. interpret and summarize the role of information theory and linear algebra in source coding and channel coding
2. make use of various error control encoding and decoding techniques
3. implement various error control techniques
4. analyze the performance of error control codes.

Course Code	2CSDE65
Course Title	System Programming

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

1. explain the concepts and principles of system programming and understand the roles and scope of a system programmer
2. interpret both theoretical and practical aspects of system programming, and understand techniques for designing and implementing system-level programs
3. apply knowledge of different phases and steps to mimic a simple language translator
4. analyze the working of various system software like assembler, loader, linker, editor and device driver.

Course Code	2CSDE66
Course Title	Internet of Things

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

1. comprehend the architectural components and platforms of IoT ecosystem
2. apply appropriate access technology and protocols as per the application requirement
3. appreciate the role of big data, cloud computing and data analytics in a typical IoT system
4. design applications with suitable lightweight data processing and communication methodologies

Course Code	2CSDE67
Course Title	Cloud Computing

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

1. explain core concepts of cloud computing, its services and models
2. discuss systems, hardware and application virtualization and outline their role in enabling cloud services
3. explore the issues related to cloud computing and its application
4. apply fundamental concepts in cloud infrastructures to build and deploy cloud applications.

Course Code	2CSDE68
Course Title	Parallel Algorithms

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

1. appraise various parallel algorithmic strategies and their comparison with traditional algorithmic strategies
2. simulate different parallel algorithms, techniques and architectures
3. analyze complexity of various parallel algorithms
4. improve the parallel algorithms through debugging and performance tuning.

Semester-VI
Department Elective-III

Course Code	2CSDE69
Course Title	LAMP Technology

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. describe and interpret the basics of open source and LAMP technologies
2. manage web server for different application scenarios
3. design and develop applications using open source technologies.

Course Code	2CSDE70
Course Title	Natural Language Processing

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. discuss about major NLP issues and solutions
2. illustrate computational methods to understand language phenomena of word sense
3. design and develop applications with natural language capabilities.

Course Code	2CSDE71
Course Title	Data Mining

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. interpret data types and infer various data pre-processing techniques for the mining process
2. apply basic principles and algorithms used in practical data mining
3. choose and evaluate data mining algorithms for various real life problems.

Course Code	2CSDE72
Course Title	Secure Software Engineering

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. identify software process vulnerabilities for an organization and interrelate security and software development process
2. design and develop a quality software project through effective team-building, planning, scheduling
3. implement security testing, verification and assessment of a software application.

Course Code	2CSDE73
Course Title	Stochastic Processes and Simulation

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. define basic concepts in the theory of stochastic processes
2. solve simple problems on stochastic processes
3. implement simple stochastic simulation using computer programs.

Course Code	2CSDE74
Course Title	Design of Operating Systems

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. describe the various components of Operating Systems.
2. analyze the different services provided by UNIX Operating System.
3. design and implement various system calls and concurrent processes requiring synchronization.

Course Code	2CSDE75
Course Title	Advanced Data Structures

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. describe the importance of various data structures from application perspective
2. apply the knowledge of data structures for real time applications
3. solve the algorithmic problems optimally.

Nirma University
Institute of Technology
B.Tech. in Computer Science and Engineering
Semester- VII

Course Code:	**2CS701**
Course Title:	**Compiler Construction**

L	**T**	**P**	C
3	0	2	4

Course Learning Outcomes:

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

1. summarize the functionalities of various phases of compiler
2. apply language theory concepts to various phases of compiler design
3. identify appropriate optimization technique for compilation process
4. develop a miniature compiler using appropriate compiler design tool

Course Code:	**2CS702**
Course Title:	**Big Data Analytics**

L	**T**	**P**	C
2	0	2	3

Course Learning Outcomes (CLO):

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

1. outline the significance and challenges of big data
2. model big data using different tools and frameworks
3. apply big data techniques for useful business analytic applications
4. design algorithms for mining the data from large volumes

Department Elective-IV

Course Code:	**2CSDE76**
Course Title:	**Mobile Operating Systems**

L	**T**	**P**	C
3	0	2	4

Course Learning Outcomes:

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

1. compare the similarities, differences and benefits of the current mobile operating systems
2. explain the functionalities of remote operations and security essential of mobile devices
3. analyze the latest trends in building Mobile OS
4. demonstrate the native applications required to build using mobile OS

Course Code:	2CSDE77
Course Title:	Microservice Architecture and Programming

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

1. recognize the key advantages and complexities present in microservice architectures
2. apply appropriate architectural approach for the design of microservices
3. implement microservice applications effectively with the suitable techniques and technologies
4. test the deployment of microservice applications on cloud platforms

Course Code:	2CSDE78
Course Title:	Digital Image Processing and Analysis

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

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

Course Code:	2CSDE79
Course Title:	Cloud Security and Frameworks

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

1. classify cloud architectural aspects
2. recognize the trusted platform for cloud computing.
3. identify the security risks associated with the cloud platforms
4. inspect the cloud computing security design patterns

Course Code:	2CSDE80
Course Title:	Software Testing and Quality Assurance

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

1. interpret different types of testing techniques in depth
2. apply modern software testing strategies in relation to software development
3. design project test plans, test cases, test data to conduct test operations
4. develop practical skills related to software quality assurance

Course Code:	2CSDE81
Course Title:	Complex Networks

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

1. illustrate various types of complex networks
2. analyze real world networks empirically
3. apply the fundamentals of graph theory and statistical methods to large scale networks
4. design networks for real world applications

Course Code:	2CSDE82
Course Title:	Real Time Operating Systems

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

1. summarize the characteristics of a real-time system
2. apply scheduling concepts to real time applications
3. examine the causes of fault occurrence in real time operating systems
4. evaluate intricacies of real time databases

Course Code:	2CSDE83
Course Title:	Modern Networks

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

1. interpret the modern networking concepts and trends
2. demonstrate basic skills for cellular networks design
3. apply the modern networking fundamentals on real-time network analysis
4. design various types of networks using appropriate tools

Course Code:	2CSDE84
Course Title:	Probabilistic Algorithms

L	T	P	C
3	0	2	4

Course Learning Outcomes (CLO):

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

1. illustrate the importance of probabilistic algorithms with computational models and related complexity classes
2. select appropriate data structures to increase efficiency and effectiveness of a randomized algorithm
3. evaluate complexity of a probabilistic algorithm formally
4. apply various tools and techniques to design probabilistic algorithms for given applications

Course Code:	2CSDE85
Course Title:	Artificial Intelligence

L	T	P	C
3	0	2	4

Course Learning Outcomes:

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

1. explain the significance of Artificial Intelligence and knowledge representation,
2. demonstrate the design concepts of control and search strategies in AI Applications,
3. compare different search strategies for a given scenario
4. design applications using Artificial Intelligence.

Department Elective-V

Course Code:	2CSDE86
Course Title:	Application Development Frameworks

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. interpret basic concepts of application development frameworks
2. explain message framework in Django
3. develop programs to solve real world problems based on concepts of Django
4. design applications using cross platform development concepts

Course Code:	2CSDE87
Course Title:	Ethical Hacking and Vulnerability Assessment

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. summarize the core concepts related to malware, hardware and software vulnerabilities and their causes
2. choose state-of-the-art tools to exploit the vulnerabilities related to computer system and networks
3. experiment with various tools to exploit web applications
4. solve the security issues in web applications

Course Code:	2CSDE88
Course Title:	Simulation and Mathematical Modeling

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. illustrate the need of simulation and mathematical modeling in Computer Science
2. demonstrate system activities through simulation
3. apply mathematical modelling to different real life applications
4. analyze behaviour of the system under various circumstances

Course Code:	2CSDE89
Course Title:	Robotics

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. interpret mathematical concepts to model robot manipulators and mobile robots
2. infer trade-off between different sensors, actuators and their processing algorithms
3. relate the computational challenges inherent in fundamental mobile robotic tasks
4. design appropriate algorithms for specific robotic applications

Course Code:	2CSDE90
Course Title:	Formal Methods in Software Engineering

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. explain the significance of formal methods in Software Engineering
2. infer formal specification languages based on propositional logic, predicate logic, relational calculus, and finite state machines
3. apply analysis techniques for formal specification languages with help of supporting tools
4. design formal specifications for software systems

Course Code:	2CSDE91
Course Title:	Contemporary Programming

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. interpret basic concepts of rust programming language
2. explain the concepts of programming with reference to error handling, message passing and concurrency control
3. develop dynamic programs to solve real-time problems
4. design communication module to create robust programs

Course Code:	2CSDE92
Course Title:	Human Machine Interface

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. explain requirements and components of Human Machine Interface (HMI) systems
2. evaluate user interfaces to detect usability problems in HMI applications
3. apply an appropriate interaction style for a given need
4. design a user interface using analytical methods such as cognitive walkthrough and to build multimodal GUI

Course Code:	2CSDE93
Course Title:	Blockchain Technology

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. summarize the concept of Blockchain technology
2. develop the structure of a Blockchain network
3. evaluate security issues relating to Blockchain and cryptocurrency
4. design the applications based on Blockchain technology

Course Code:	2CSDE94
Course Title:	Approximation Algorithms

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. explain importance of approximation algorithms with various approximation schemes
2. choose appropriate approximation scheme for combinatorial algorithms
3. develop Linear Programming based approximation algorithms for various graph problems
4. estimate hardness of approximation algorithms for classical NP-hard problems

Course Code:	2CSDE95
Course Title:	Computer Graphics

L	T	P	C
2	0	2	3

Course Learning Outcomes (CLO):

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

1. explain various aspects of computer graphics and computer visualization
2. infer the working of basic drawing and rendering algorithms in 2D and 3D
3. explain various 2D and 3D transformations
4. design components in 2D and 3D

Course Code:	2CSDE96
Course Title:	Interfacing with Microprocessors

L	T	P	C
2	0	2	3

Course Learning Outcomes (CLO):

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

1. illustrate basic architecture of microprocessors
2. utilize microcontrollers for interfacing of industrial applications
3. develop logic for programs in assembly language
4. design microprocessor-based systems for interfacing peripherals

Course Code:	2CS703
Course Title:	Minor Project

L	T	P	C
0	0	4	2

Course Learning Outcomes:

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

1. make use of acquired knowledge for the problem identification and definition,
2. analyze the technical aspects of the project with a comprehensive and systematic approach,
3. propose and select the appropriate solution,
4. appraise the importance of an individual / team for effective execution,
5. compile and conclude the project with effective communication amongst peers, mentors and society.

Course Code:	2CS704
Course Title:	Summer Internship

L	T	P	C
0	0	0	1

Course Learning Outcomes:

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

1. perceive a better understanding of the engineering workplace,
2. adapt competencies necessary for professional career,
3. value interpersonal and human relationship skills,
4. build the foundation for industrial internship / major project.

Semester- VIII

Course Code:	2CS801
Course Title:	Major Project / Internship

L	T	P	C
0	0	0	11

Major Project

Course Learning Outcomes:

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

1. make use of acquired knowledge for the problem identification and definition related to industry / research / societal need,
2. analyse the technical aspects of the project with a comprehensive and systematic approach,
3. select the appropriate modern tool(s) and technique(s) for problem solving,
4. propose and select the appropriate and cost effective solution,
5. appraise the importance of an individual / team for effective execution,
6. value the health, environment, safety and ethical practices during the project,
7. perceive the possibility of scalability and scope of intellectual property rights,
8. compile and conclude the project with effective communication amongst peers, mentors and society,
9. develop life-long learning skills for productive career.

Internship

Course Learning Outcomes:

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

1. support the theoretical learning with practice and integrate knowledge for engineering applications,
2. adapt to real time industry exposure and experience,
3. develop work habits, interpersonal skills and attitudes necessary for professional success,
4. evaluate the interests and abilities in the field of study,
5. appraise the importance of an individual and multidisciplinary team for effective execution,
6. build the career alternatives prior to graduation,
7. value the health, environment, safety and ethical practices during the internship,
8. compile and conclude the learning during internship with effective communication amongst peers, mentors and society,
9. develop lifelong learning skills for productive career / entrepreneurship.

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

Course Code	2CSOE51
Course Title	Machine Learning

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. comprehend statistical methods as basis of machine learning domain
2. learn variety of learning algorithms for appropriate applications
3. identify various machine learning techniques to solve problems in applicable domains

Course Code	2CSOE52
Course Title	Data Structures

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. illustrate various data structures for efficient data storage and retrieval
2. correlate various data structure in algorithm design
3. analyse various searching, sorting, and indexing algorithms.

Course Code	2CSOE53
Course Title	Operating Systems

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. describe the various components of Operating Systems
2. analyze the different services provided by UNIX Operating System
3. design and implement concurrent processes requiring synchronization.

Course Code	2CSOE54
Course Title	Database Management Systems

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. relate various aspects of relational databases like models, functional dependencies, and normalization
2. evaluate various storage and retrieval methods to correlate with relational model through appropriate indexing
3. design database queries using SWL, PL/SQL, and NoSQL

Course Code	2CSOE01
Course Title	IoT Analytics

L	T	P	C
3	0	0	3

Course Learning Outcomes:

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

1. comprehend the architectural components and platforms of IoT ecosystem
2. apply appropriate access technology and protocols as per the application requirement
3. appreciate the role of big data, cloud computing and data analytics in a typical IoT system
4. design applications with suitable lightweight data processing and communication methodologies.

Course Code	2CSOE02
Course Title	Cloud Computing

L	T	P	C
3	0	0	3

Course Learning Outcomes:

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

1. understand the hardware, software concepts and architecture of cloud computing
2. contrast the key technical and commercial issues concerning cloud computing versus traditional software models
3. realize the importance of virtualization technology in support of cloud computing
4. explore the issues related to cloud computing.

Course Code	2CSOE03
Course Title	Data Analytics

L	T	P	C
3	0	0	3

Course Learning Outcomes:

At the end of this course, student will be able to-

1. interpret the statistical parameters and its tendencies
2. compare different data distributions, descriptions and their applications
3. use statistical parameters for inferences and support it with valid arguments and values
4. apply statistical inferences for various real life problems.

Course Code	2CSOE76
Course Title	Object Oriented Programming

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

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

Course Code	2CSOE77
Course Title	Web Technology

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. understand the architecture of the internet and web technology
2. design an efficient web application
3. use programming language to develop a web application.

Course Code	2CSOE78
Course Title	Scientific Programming

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

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

Course Code	2CSOE79
Course Title	Mobile Application Development

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. explain the basic principles and constructs of object-oriented programming
2. design, develop, execute, debug and validate programs in object oriented programming environment
3. apply various tools and technologies to conceptualize and develop variety of mobile applications

Course Code	2CSOE80
Course Title	Cyber Security

L	T	P	C
2	0	2	3

Course Learning Outcomes:

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

1. illustrate core concepts related to hardware and software vulnerabilities
2. demonstrate various attacks using appropriate tools
3. evaluate vulnerabilities in the network and computer system