



Estd. 2004

## Lakshmi Narain College of Technology, Indore

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### **Branch: Computer Science & Engineering**

#### **Programme Educational Objectives (PEOs)**

**PEO 1. Core Knowledge** - Computer engineering graduates will have the knowledge of basic science and Engineering skills, Humanities, social science, management and conceptual and practical understanding of core computer engineering area with project development.

**PEO 2. Employment/ Continuing Education** - Computer engineering graduates will have the knowledge of Industry-based technical skills to succeed in entry level engineering position at various industries as well as in academics.

**PEO 3. Professional Competency** - Computer engineering graduates will have the ability to communicate effectively in English, to accumulate and disseminate the knowledge and to work effectively in a team with a sense of social awareness.

#### **Programme Outcomes (POs)**

Engineering Graduates will be able to:

**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **Programme Specific Outcomes (PSOs)**

Computer Engineering Graduates will be able to::

**Software Systems Development:** Apply the theoretical concepts of computer engineering and practical knowledge in analysis, design and development of software systems.

**Open Source Software:** Demonstrate familiarity and practical competence with a broad range of programming languages and open source platforms

**Computer Proficiency:** Exhibit proficiency through latest technologies in demonstrating the ability for work efficacy to the industry & society.

<b>Course Outcomes (Cos)</b>	
NAME OF SUBJECT: Energy & Environmental Engineering	
SUBJECT CODE: ES301	
Students will be able to	
CO1:	Identify forms of energy & its transformation for sustainable environment.
CO2:	Apply principle of ecology to develop ecosystem for various topographical land.
CO3:	To apply principle of biodiversity at global and local level of conservation of insitu and exsitu of biodiversity.
CO4:	To identify the particulates in solid, liquid and gas waste management and its effect on environment.
CO5:	Student will solve environmental related problem.

NAME OF SUBJECT: Discrete Structure	
SUBJECT CODE: CS302	
Students will be able to	
CO1:	To understand the notion of mathematical thinking, and algorithmic thinking and be able to apply them in problem solving such as formal specification, Verification and basic concepts of set theory.
CO2:	Students understand the basic principle of Boolean algebra, logic and set theory.
CO3:	Be able to construct simple mathematical proof and possess the ability to verify them.
CO4:	To enable students to perform set operation and solve logical reasoning and verify the Correctness of logical statement.
CO5:	To apply the properties of relations and find partially ordered set and lattices.

NAME OF SUBJECT: Data Structure	
SUBJECT CODE: CS303	
Students will be able to	
CO1:	For a given search problem (linear search and binary search) student will be able to Implement it.
CO2:	For a given problem of stacks, queues and link lists, students will be able to implement it and analyze the same to determine the time and computation complexity
CO3:	Write an algorithm for selection sort, insertion sort, quick sort, merge sort, heap sort, bubble sort and compare their performance
CO4:	Implement tree, graph search and traversal algorithms.
CO5:	Implement algorithms for solving various problems using data structures.

NAME OF SUBJECT: Digital Systems	
SUBJECT CODE: CS304	
Students will be able to	
CO1:	Perform number base conversions, use Boolean logic to create digital Circuits.
CO2:	Understand use of encoders, decoders, multiplexers and demultiplexers in communication systems.
CO3:	By learning design of combinational and sequential circuits student can understand its use in

	digital systems such as computers, communication systems and other modern technologies.
CO4:	Study of ADC and DAC along with display devices will enable students to understand signal conversion and its display and their applications in digital devices.
CO5:	Implement various logic families.

NAME OF SUBJECT: Object Oriented Programming & Methodology	
SUBJECT CODE: CS305	
Students will be able to	
CO1:	Recognize attributes and methods for given objects.
CO2:	Define data types and also deal with operations applied for data structures.
CO3:	Implement algorithms and complex problems.
CO4:	Develop understanding of pointers and memory management.
CO5:	Develop understanding of file input/output and templates.

NAME OF SUBJECT: Mathematics-III	
SUBJECT CODE: BT401	
Students will be able to	
CO1:	Acquire the basic knowledge of solution of polynomial and transcendental equations.
CO2:	Analyze numerical differentiation & integration to solve engineering problems.
CO3:	Determine ordinary differential equations for solving technical problems.
CO4:	Apply transform calculus to solve engineering problems.
CO5:	Describe concept of probability to solve the problems.

NAME OF SUBJECT: Analysis and Design of Algorithm	
SUBJECT CODE: CS402	
Students will be able to	
CO1:	Implement sorting and searching algorithm
CO2:	Experiment with techniques for obtaining maximum output with minimum efforts
CO3:	Make use of dynamic programming for finding
CO4:	Solve 8 queen's problem and others of the kind for application in real world scenarios .
CO5:	Distinguish between NP hard and NP complete problems and develop their solutions

NAME OF SUBJECT: Software Engineering	
SUBJECT CODE: CS403	
Students will be able to	
CO1:	Define various software application domains and remember different process model used in software development.
CO2:	Understand various measures of software and Generate project schedule.
CO3:	Describe functional and non-functional requirements of software and develop design models of software.
CO4:	Investigate the reason for bugs and apply the software testing techniques in commercial environment.
CO5:	Understand various activities to be performed for improving software quality and software

	maintenance.
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NAME OF SUBJECT: Computer Organization & Architecture	
SUBJECT CODE: CS404	
Students will be able to	
CO1:	Understand basic structure of computer system, arithmetic operations.
CO2:	Understand the arithmetic operations, Study of hardwired and micro-programmed control units.
CO3:	Develop the concepts of memory management, interleaving and mapping.
CO4:	Analyze the arithmetic and instructional pipelines.
CO5:	To study the different ways of communicating with I/O devices and standard I/O interfaces, hierarchical memory system including cache memories and virtual memory.

NAME OF SUBJECT: Operating System	
SUBJECT CODE: CS405	
Students will be able to	
CO1:	Gain knowledge of history of operating systems
CO2:	Understand design issues associated with operating systems
CO3:	Gain knowledge of various process management concepts including scheduling, synchronization, and deadlocks.
CO4:	Understand concepts of memory management including virtual memory.
CO5:	Understand issues related to file system interface and implementation, disk management.
CO6:	Be familiar with protection and security mechanisms.
CO7:	Be familiar with various types of operating systems including Unix.

NAME OF SUBJECT: Java Programming Lab	
SUBJECT CODE: CS406 (A)	
Students will be able to	
CO1:	The concepts of Java programming
CO2:	The basic terminology used in computer programming and write, compile and debug programs in JAVA language.
CO3:	The different data types, decision structures, loops, functions to design Java programs.
CO4:	Develop program using the java collection API as well as the java standard class library.
CO5:	Develop Java applets.

NAME OF SUBJECT: Programming in Python	
SUBJECT CODE: CS406 (C)	
Students will be able to	
CO1:	Install Python and have knowledge of syntax of Python.
CO2:	Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
CO3:	Express different Decision Making statements and Functions.
CO4:	Develop code in Python using functions, loops etc.
CO5:	Design GUI Applications in Python and evaluate different database operations.

NAME OF SUBJECT: Introduction to MATLAB	
SUBJECT CODE: CS406 (D)	
Students will be able to	
CO1:	To familiarize students with open source academic software like licensed software like Matlab.
CO2:	To carryout experiments in various fields in due course like computer graphics and multimedia, soft-computing, image processing, data mining etc.
CO3:	Experimental works in web design.
CO4:	To design web pages and develop web based projects.
CO5:	Implement any type of project using MATLAB.

NAME OF SUBJECT: Theory of Computation	
SUBJECT CODE: CS501	
Students will be able to	
CO1:	Convert between finite automata, regular grammars, and regular expression representations of regular languages.
CO2:	Apply the pumping lemma for regular languages to determine if a language is regular.
CO3:	Convert between grammars and push-down automata for context-free languages.
CO4:	Determine if a language is regular or context-free.
CO5:	Demonstrate that a grammar is ambiguous.
CO6:	Translate a context-free grammar from one form to another.
CO7:	Produce simple programs for a Turing Machine.
CO8:	Explain the concept of undecidability.
CO9:	List examples of undecidable problems.

NAME OF SUBJECT: Data Base Management System	
SUBJECT CODE: CS502	
Students will be able to	
CO1:	Compare file system and DBMS and explain how DBMS is better than traditional File Processing Systems.
CO2:	Analyze the physical and logical database designs, database modeling, relational, hierarchical, and network models
CO3:	Analyze and renovate an information model into a relational database schema and to use a DDL, DML and DCL utilities to implement the schema using a DBMS.
CO4:	Formulate data retrieval queries in SQL and Relational Algebra.
CO5:	Demonstrate an understanding of functional dependencies, normalization theory and apply such knowledge to the design of a database.
CO6:	Demonstrate and explain terms like Transaction Processing, Concurrency Control, distributed database and big data.

NAME OF SUBJECT: Data Analytics	
SUBJECT CODE: CS503 (A)	

Students will be able to	
CO1:	Demonstrate proficiency with statistical analysis of data.
CO2:	Build and assess data-based models.
CO3:	Execute statistical analyses with professional statistical software.
CO4:	Demonstrate skill in data management.
CO5:	Apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively.

NAME OF SUBJECT: Cyber Security	
SUBJECT CODE: CS503 (C)	
Students will be able to	
CO1:	Become aware of various cyber crimes and cyber laws
CO2:	Underline the need of digital forensic and role of digital evidences
CO3:	Understand different types of digital evidences that can be presented to support investigations
CO4:	List the tools and methods to generate legal evidence and supporting investigation reports
CO5:	Use various digital cyber forensic tools

NAME OF SUBJECT: Internet and Web Technology	
SUBJECT CODE: CS504	
Students will be able to	
CO1:	Describe the concepts of WWW including browser and HTTP protocol.
CO2:	List the various HTML tags and use them to develop the user friendly web pages.
CO3:	Define the CSS with its types and use them to provide the styles to the webpages at various levels.
CO4:	Develop the modern web pages using the HTML and CSS features with different layouts as per need of applications.
CO5:	Use the JavaScript to develop the dynamic web pages.
CO6:	Use server side scripting with PHP to generate the web pages dynamically using the database connectivity.
CO7:	Develop the modern Web applications using the client and server sidetechnologies and the web design fundamentals.

NAME OF SUBJECT: Open Source Software Lab (Linux)	
SUBJECT CODE: CS505	
Students will be able to	
CO1:	Understand the basic commands used in Linux operating system
CO2:	Learn the important Linux/UNIX library functions and system calls
CO3:	Write, compile and debug shell script in Linux environment
CO4:	Mapping the relationship between UNIX Kernel support for files
CO5:	Understand Kernel support for process creation and termination and memory allocation

NAME OF SUBJECT: Python Lab	
SUBJECT CODE: CS506	
Students will be able to	
CO1:	Install Python and have knowledge of syntax of Python.
CO2:	Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
CO3:	Express different Decision Making statements and Functions.
CO4:	Develop code in Python using functions, loops etc.
CO5:	Design GUI Applications in Python and evaluate different database operations.

NAME OF SUBJECT: Machine Learning	
SUBJECT CODE: CS601	
Students will be able to	
CO1:	Recognize the characteristics of machine learning strategies.
CO2:	Apply various supervised learning methods to appropriate problems.
CO3:	Identify and integrate more than one technique to enhance the performance of learning.
CO4:	Create probabilistic and unsupervised learning models for handling unknown pattern.
CO5:	Analyze the co-occurrence of data to find interesting frequent patterns and Preprocess the data before applying to any real-world problem and can evaluate its performance

NAME OF SUBJECT: Computer Networks	
SUBJECT CODE: CS602	
Students will be able to	
CO1:	Have a good understanding of the OSI Reference Model and its Layers
CO2:	Identify core networking and infrastructure components and the roles they serve; and given requirements and constraints, design and IT infrastructure including devices, topologies, protocols, systems software, management and security.
CO3:	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.
CO4:	Specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols.
CO5:	To experience the designing and managing of communication protocols while getting a good exposure to the TCP/IP protocol suite.

NAME OF SUBJECT: Advanced Computer Architecture (ACA)	
SUBJECT CODE: CS603 (A)	
Students will be able to	
CO1:	Discuss the classes of computers.
CO2:	Study advanced performance enhancement techniques such as pipelines branch predictions
CO3:	Compare and contrast the modern computer architectures such as RISC, Scalar, and multi CPU systems.
CO4:	Critically evaluate the performance of different CPU architecture
CO5:	Improve the performance of applications running on different CPU architectures.
CO6:	Develop applications for high performance computing systems.



NAME OF SUBJECT: Computer Graphics & Multimedia	
SUBJECT CODE: CS603 (B)	
Students will be able to	
CO1:	Understand the core concepts of computer graphics.
CO2:	Implement various shapes drawing algorithms.
CO3:	Apply geometric transformations on graphic objects and also implement clipping, shading and color models.
CO4:	Understand multimedia systems architecture, multimedia components and use various Multimedia tools.
CO5:	Perform activities involved in design, development and testing of modeling, rendering, Shading and animation.

NAME OF SUBJECT: Compiler Design	
SUBJECT CODE: CS603 (C)	
Students will be able to	
CO1:	Demonstrate an understanding of the compilation phases.
CO2:	Specify and analyze the lexical, syntactic and semantic structures of advanced language features.
CO3:	Write a scanner, parser, and semantic analyzer without the aid of automatic generators.
CO4:	Describe techniques for intermediate code and machine code optimization.
CO5:	Design the structures and support required for compiling advanced language features.

NAME OF SUBJECT: Knowledge Management	
SUBJECT CODE: CS604 (A)	
Students will be able to	
CO1:	Learn the Evolution of Knowledge management.
CO2:	Be familiar with tools.
CO3:	Be exposed to Applications.
CO4:	Be familiar with some case studies.

NAME OF SUBJECT: Project Management	
SUBJECT CODE: CS604 (B)	
Students will be able to	
CO1:	Understanding the evolution and improvement of software economics according to the basic parameters and transition to the modern software management.
CO2:	Learning the objectives, activities and evaluation criteria of the various phases of the life cycle of software management process.
CO3:	Gaining knowledge about the various artifacts, workflows and checkpoints of the software management process and exploring the design concept using model based architecture from technical and management perspective.
CO4:	Develop an understanding of project planning, organization, responsibilities, automation and control of the processes to achieve the desirable results.

NAME OF SUBJECT: Data Analytics Lab	
SUBJECT CODE: CS605	
Students will be able to	
CO1:	Understand the basic of data analytics using concepts of statistics and probability.
CO2:	Understand the needs of data processing techniques.
CO3:	Implement the data analytics techniques using R, MATLAB and Python.
CO4:	Apply the data analytics techniques in real life applications.

NAME OF SUBJECT: Skill Development Lab	
SUBJECT CODE: CS606	
Students will be able to	
CO1:	Understand the basics of software as a product.
CO2:	Understand the current requirements of industries.
CO3:	Implement the software as a product using different design patterns.
CO4:	Apply the software development techniques in real life applications.

NAME OF SUBJECT: Software Architectures	
SUBJECT CODE: CS701	
Students will be able to	
CO1:	Describe the Fundamentals of software architecture
CO2:	Understand the fundamental principles and guidelines for software architecture design architectural styles
CO3:	Use implementation techniques of Software architecture for effective software development.
CO4:	Apply core values and principles of software architectures for enterprise application development.

NAME OF SUBJECT: Computational Intelligence	
SUBJECT CODE: CS702 (A)	
Students will be able to	
CO1:	Describe in-depth about theories, methods, and algorithms in computation Intelligence.
CO2:	Compare and contrast traditional algorithms with nature inspired algorithms.
CO3:	Examine the nature of a problem at hand and determine whether a computation intelligent technique/algorithm can solve it efficiently enough.
CO4:	Design and implement Computation Intelligence algorithms and approaches for solving real-life problems.

NAME OF SUBJECT: Computational Intelligence	
SUBJECT CODE: CS702 (B)	
Students will be able to	
CO1:	Describe in-depth about theories, models and algorithms in machine learning.
CO2:	Compare and contrast different learning algorithms with parameters.
CO3:	Examine the nature of a problem at hand and find the appropriate learning algorithms and it's

	parameters that can solve it efficiently enough.
CO4:	Design and implement of deep and reinforcement learning approaches for solving real-life problems.

NAME OF SUBJECT: Wireless and Mobile Computing	
SUBJECT CODE: CS702 (C)	
Students will be able to	
CO1:	Explain the basic concepts of wireless network and wireless generations.
CO2:	Demonstrate the different wireless technologies such as CDMA, GSM, GPRS etc
CO3:	Explain the design considerations for deploying the wireless network infrastructure.
CO4:	Appraise the importance of Adhoc networks such as MANET and Wireless Sensor networks
CO5:	Differentiate and support the security measures, standards. Services and layer wise security considerations.

NAME OF SUBJECT: Big Data	
SUBJECT CODE: CS702 (D)	
Students will be able to	
CO1:	Understand the concept and challenges of Big data.
CO2:	Demonstrate knowledge of big data analytics.
CO3:	Develop Big Data Solutions using Hadoop Eco System
CO4:	Gain hands-on experience on large-scale analytics tools.
CO5:	Analyze the social network graphs.

NAME OF SUBJECT: Cryptography & Information Security	
SUBJECT CODE: CS703 (A)	
Students will be able to	
CO1:	Understanding of the basics of Cryptography and Network Security and working knowledge of Mathematics used in Cryptology.
CO2:	Understanding of previous attacks on cryptosystems to prevent future attacks from securing a message over an insecure channel by various means.
CO3:	Knowledge about how to maintain the Confidentiality, Integrity and Availability of a data.
CO4:	Understanding of various protocols for network security to protect against the network threats.
CO5:	Getting hands-on experience of various Information Security Tools.

NAME OF SUBJECT: Data Mining and Warehousing	
SUBJECT CODE: CS703 (B)	
Students will be able to	
CO1:	Demonstrate an understanding of the importance of data warehousing and OLAP Technology.
CO2:	Organize and Prepare the data needed for data mining using pre preprocessing techniques
CO3:	Implement the appropriate data mining methods like classification, clustering or Frequent Pattern mining on various data sets.

CO4:	Define and apply metrics to measure the performance of various data mining algorithms.
CO5:	Demonstrate an understanding of data mining on various types of data like web data and spatial data.

NAME OF SUBJECT: Agile Software Development	
SUBJECT CODE: CS703 (C)	
Students will be able to	
CO1:	Describe the fundamental principles and practices associated with each of the agile development methods.
CO2:	Compare agile software development model with traditional development models and identify the benefits and pitfalls.
CO3:	Use techniques and skills to establish and mentor Agile Teams for effective software development.
CO4:	Apply core values and principles of Agile Methods in software development.

NAME OF SUBJECT: Disaster Management	
SUBJECT CODE: CS703 (D)	
Students will be able to	
CO1:	An exposure to disasters, their significance and types.
CO2:	Understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
CO3:	Understanding of approaches of Disaster Risk Reduction (DRR).
CO4:	To enhance awareness of institutional processes in the country
CO5:	To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity.

NAME OF SUBJECT: Major Project- I	
SUBJECT CODE: CS706	
Students will be able to	
CO1:	Solve real life problems by applying knowledge.
CO2:	Analyze alternative approaches, apply and use most appropriate one for feasible solution
CO3:	Write precise reports and technical documents in a nutshell.
CO4:	Participate effectively in multi-disciplinary and heterogeneous teams exhibiting team work, Inter-personal relationships, conflict management and leadership quality.

NAME OF SUBJECT: Internet of Things	
SUBJECT CODE: CS801	
Students will be able to	
CO1:	Understand Internet of Things and its hardware and software components
CO2:	Interface I/O devices, sensors & communication modules
CO3:	Analyze data from various sources in real-time and take necessary actions in an intelligent fashion
CO4:	Remotely monitor data and control devices

CO5:	Develop real life IoT based projects
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NAME OF SUBJECT: Blockchain Technology	
SUBJECT CODE: CS802 (A)	
Students will be able to	
CO1:	Understand block chain technology
CO2:	Acquire knowledge of cryptocurrencies
CO3:	Develop block chain based solutions and write smart contract using Hyperledger Fabric and Ethereum frameworks
CO4:	Build and deploy block chain application for on premise and cloud based architecture
CO5:	Integrate ideas from various domains and implement them using block chain technology in different perspectives

NAME OF SUBJECT: Cloud Computing	
SUBJECT CODE: CS802 (B)	
Students will be able to	
CO1:	Explain the core concepts of the cloud computing paradigm.
CO2:	Demonstrate knowledge of virtualization.
CO3:	Explain the core issues of cloud computing such as security, privacy, and interoperability.
CO4:	Choose the appropriate technologies, algorithms, and approaches for the related issues.
CO5:	Identify problems, and explain, analyze, and evaluate various cloud computing solutions.

NAME OF SUBJECT: High Performance computing	
SUBJECT CODE: CS802 (C)	
Students will be able to	
CO1:	To develop an understanding of various basic concepts associated with parallel computing environments
CO2:	Understand, appreciate and apply parallel and distributed algorithms in problem solving
CO3:	Acquire skills to measure the performance of parallel and distributed programs
CO4:	Design parallel programs to enhance machine performance in parallel hardware environment
CO5:	Design and implement parallel programs in modern environments such as CUDA, OpenMP, etc

NAME OF SUBJECT: Object Oriented Software Engineering	
SUBJECT CODE: CS802 (D)	
Students will be able to	
CO1:	Explain OOSE concepts.
CO2:	Perform object oriented SE analysis and develop static model of system after identifying classes and their relationships.
CO3:	Develop dynamic model of system by identifying states and events & test models.
CO4:	Develop interaction model of system by drawing use case, sequence and activity diagrams.
CO5:	Select an appropriate design approach and effectively construct object-oriented programs.

NAME OF SUBJECT: Image Processing and Computer Vision	
SUBJECT CODE: CS803 (A)	
Students will be able to	
CO1:	Explain basic concepts of image processing.
CO2:	Have knowledge of techniques employed for the enhancement of images
CO3:	Categorize image compression techniques
CO4:	Interpret image segmentation and representation techniques.
CO5:	Develop any image processing application

NAME OF SUBJECT: Internet of Things	
SUBJECT CODE: CS803 (B)	
Students will be able to	
CO1:	Understand Internet of Things and its hardware and software components
CO2:	Interface I/O devices, sensors & communication modules
CO3:	Analyze data from various sources in real-time and take necessary actions in an intelligent fashion
CO4:	Remotely monitor data and control devices
CO5:	Develop real life IoT based projects

NAME OF SUBJECT: Managing Innovation and Entrepreneurship	
SUBJECT CODE: CS803 (D)	
Students will be able to	
CO1:	To innovate in business.
CO2:	Understand the basic terminology, typology of innovations and historical context for better comprehension.
CO3:	Familiar with the impact of innovation, innovative processes and aspects.
CO4:	Implement applicable methods and innovation management techniques.

NAME OF SUBJECT: Major Project- II	
SUBJECT CODE: CS805	
Students will be able to	
CO1:	Show evidence of independent investigation
CO2:	Critically analyze the results and their interpretation.
CO3:	Report and present the original results in an orderly way and placing the open questions in the right perspective.
CO4:	Link techniques and results from literature as well as actual research and future research lines with the research.
CO5:	Appreciate practical implications and constraints of the specialist subject



Estd. 2004

## Lakshmi Narain College of Technology, Indore

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### **Branch: M. Tech (Computer Science & Engineering)**

#### **Programme Educational Objectives (PEOs)**

1. Practice with an expertise in academics, entrepreneurship, design and development in computing technology, or research in a specialized area of computer science and Engineering to pursue higher studies.
2. Exhibit analytical, decision –making and problem solving skills by applying research principles for handling real life problems with realistic constraints.
3. Ability to communicate the findings or express innovative ideas in an effective manner with an awareness of professional, social and ethical responsibilities.

#### **Programme Outcomes (POs)**

- a. Apply knowledge of recent computing technologies, skills and current tools of computer science and engineering.
- b. Ability to design and conduct experiments, as well as to analyze and interpret data.
- c. Knowledge of contemporary research issues in the different areas of computer science & engineering
- d. Ability to explore research gaps, analyze and carry out research in the specialized/emerging areas.
- e. Design software systems, components, or processes to meet identified needs within economic, environmental and social constraints.
- f. Ability to express/present ideas in an impressive and professional manner.
- g. Recognize the need to engage in lifelong learning through continuing education and research.
- h. Ability to work in multi–disciplinary and multi–cultural environment.

i. Ability to become entrepreneur based upon societal needs.

j. An understanding of professional, social and ethical responsibilities.

### Course Outcomes (Cos)

NAME OF SUBJECT: Advanced Computational Mathematics

SUBJECT CODE: MCSE101

Students will be able to

CO1:	Understand fundamental concepts of a special topic in computational mathematics and its role in modern mathematics and applied contexts.
CO2:	Demonstrate accurate and efficient use of specific computational mathematics techniques.
CO3:	Demonstrate capacity for mathematical reasoning through analyzing, proving and explaining concepts from computational mathematics.

NAME OF SUBJECT: Advanced Data Structures and Algorithm

SUBJECT CODE: MCSE102

Students will be able to

CO1:	Understand the algorithm design paradigm, methods of analysis of algorithms and classify algorithms in P and NP domains.
CO2:	Understand applications of algorithms in real life problems, like searching, social network analysis, constraint handling and implementation of algorithms for distributed and parallel systems.
CO3:	Understand the application of algorithms in Internet programming, search engines design and data compression.
CO4:	Understand the applications of Randomized, Geometric and Numerical algorithms for solving real life problems and designing solutions.

NAME OF SUBJECT: Advanced Computer Architecture

SUBJECT CODE: MCSE103

Students will be able to

CO1:	Understand the classification & architecture of modern computer systems.
CO2:	Understanding & Implementation of performance enhancements techniques in advanced processors.
CO3:	Able to compare the performance of different architectures and their applications.

NAME OF SUBJECT: Object Oriented Technology

SUBJECT CODE: MCSE104

Students will be able to

CO1:	Demonstrate the Conceptual model of UML and SDLC.
CO2:	Define classes modeling techniques and instances modeling techniques.
CO3:	Describe interaction diagrams and their modeling techniques
CO4:	Demonstrate activity diagram and their modeling techniques
CO5:	Demonstrate component and deployment diagram.



NAME OF SUBJECT: Advanced Computer Networking	
SUBJECT CODE: MCSE105	
Students will be able to	
CO1:	Understand the main abstract concepts related to the layered communication architecture
CO2:	Analyze and implement some of the most advanced routing and congestion control algorithms.
CO3:	Evaluate the performances of computer networks (through mathematical modeling and simulation).
CO4:	Understand basics and principles of new generation of computer networks (VPN, wireless networks, mobile networks...).

NAME OF SUBJECT: Web Technology and Commerce	
SUBJECT CODE: MCSE201	
Students will be able to	
CO1:	Explain the history of the internet and related internet concepts that are vital in understanding web development.
CO2:	Discuss the insights of internet programming and implement complete application over the web.
CO3:	Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Style sheet.
CO4:	Utilize the concepts of JavaScript and Java
CO5:	Use web application development software tools i.e. Ajax, PHP and XML etc. and identify the environments currently available on the market to design web sites.
CO6:	Develop solution to complex problems using appropriate method, technologies, frameworks, web services and content management
CO7:	Understand the basic concepts and technologies used in the field of management information systems;
CO8:	Understand the processes of developing and implementing information systems;

NAME OF SUBJECT: Information theory, coding and cryptography	
SUBJECT CODE: MCSE202	
Students will be able to	
CO1:	Understand issues in information
CO2:	Learn metadata organization for effective information access.
CO3:	Understand, analyze and implement different language models.
CO4:	Understand the classification of computer security techniques.
CO5:	Identify the security weaknesses in different networking environment
CO6:	Implement appropriate cryptography scheme & security mechanism for different computing environment and information systems.

NAME OF SUBJECT: Advanced Concept in Data Bases	
SUBJECT CODE: MCSE203	
Students will be able to	
CO1:	Identify influencing factors responsible for modern day database evolution and understand new trends in database systems.
CO2:	Understand the basic concepts and techniques of data mining and data warehousing.
CO3:	Perform multidimensional analysis and descriptive mining of complex data objects.
CO4:	Study applications and trends in data mining.
CO5:	Ability to do Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment.

NAME OF SUBJECT: System Programming	
SUBJECT CODE: MCSE204	
Students will be able to	
CO1:	To understand the basics of system programs like editors, compiler, assembler, linker, loader, interpreter and debugger. Analyze and synthesize system software
CO2:	Use tools like LEX & YACC.
CO3:	Implement operating system functions.
CO4:	To understand how linker and loader create an executable program from an object module created by assembler and compiler.
CO5:	To know various editors and debugging techniques.

NAME OF SUBJECT: Soft Computing	
SUBJECT CODE: MCSE205	
Students will be able to	
CO1:	Understand concept of ANN and explain the XOR problem.
CO2:	Use supervised neural networks to classify given inputs.
CO3:	Understand unsupervised neural networks for clustering data.
CO4:	Build Fuzzy inference system using concepts of fuzzy logic.
CO5:	Obtain an optimized solution to a given problem using genetic algorithm.

NAME OF SUBJECT: Data Warehousing & Mining	
SUBJECT CODE: MCSE301	
Students will be able to	
CO1:	Demonstrate an understanding of the importance of data warehousing and OLAP Technology.
CO2:	Organize and Prepare the data needed for data mining using pre preprocessing techniques
CO3:	Implement the appropriate data mining methods like classification, clustering or Frequent Pattern mining on various data sets.
CO4:	Define and apply metrics to measure the performance of various data mining algorithms.
CO5:	Demonstrate an understanding of data mining on various types of data like web data and spatial data.

NAME OF SUBJECT: Network Security	
SUBJECT CODE: MCSE302	
Students will be able to	
CO1:	Describe network security services and mechanisms.
CO2:	Symmetrical and Asymmetrical cryptography.
CO3:	Data integrity, Authentication, Digital Signatures.
CO4:	Various network security applications, IPSec, Firewall, IDS, Web security, Email security, and Malicious software etc.
CO5:	Be able to perform simple vulnerability assessments and password audits Be able to configure simple firewall architectures Understand Virtual Private Networks

NAME OF SUBJECT: Simulation and Modeling	
SUBJECT CODE: MCSE303	
Students will be able to	
CO1:	Define, describe and apply basic concepts related to modeling, identification and simulation
CO2:	Classify various simulation models and give practical examples for each category.
CO3:	Demonstrate the ability to apply knowledge of probability and statistics for <i>simulation &amp; modeling</i> ,
CO4:	Generate and test random numbers and apply them to develop simulation models.
CO5:	Construct a model for a given set of data and motivate its validity.

NAME OF SUBJECT: Dissertation Part- I	
SUBJECT CODE: MCSE304	
Students will be able to	
CO1:	Solve real life problems by applying knowledge.
CO2:	Analyze alternative approaches, apply and use most appropriate one for feasible solution
CO3:	Write precise reports and technical documents in a nutshell.
CO4:	Participate effectively in multi-disciplinary and heterogeneous teams exhibiting team work, Inter-personal relationships, conflict management and leadership quality.

NAME OF SUBJECT: Dissertation Part- II	
SUBJECT CODE: MCSE401	
Students will be able to	
CO1:	Show evidence of independent investigation
CO2:	Critically analyze the results and their interpretation.
CO3:	Report and present the original results in an orderly way and placing the open questions in the right perspective.
CO4:	Link techniques and results from literature as well as actual research and future research lines with the research.
CO5:	Appreciate practical implications and constraints of the specialist subject