

Paper-I Course Code: MCS 401*

In the M.Sc. Computer science Course paper code MCS 401 is reserved for elective subjects, in which students are required to choose one paper from the given list (below).



Elective Papers in Fourth Semester (E-I)

Student shall Opt one subject from given list

1. MCS-401EA- Big Data Analytics,
2. MCS-401EB- Software Project Management,
3. MCS-401EC- Mobile Computing
4. MCS-401ED- Advance Programming

OR

Elective Papers for Fourth Semester (MOOC's/Swayam Subjects)

After completing any one of the following listed or online courses under MOOC's/Swayam (MCS 401) student must submit the self-attested pass/satisfactory certificate to COE office University of Lucknow

MCS-401MA- Web programming with Python and javascript
MCS-401MB-Introduction to Python for Data Science
MCS-401MC- Computer Vision and Image Analysis
MCS-401MD- Ethics and law in Data Analytics

Department of Computer Science University of Lucknow, Lucknow M.Sc. (Computer Science) Fourth Semester Syllabus

Course Title: Big Data Analytics

Course Code: MCS -401EA

Paper Number: I Credit : 04

Maximum Marks: 100

Objective: The objective of this course is to teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability, and to enable students to have skills that will help them to solve complex real-world problems in for decision support.

Unit –I

Introduction to big data : Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools, Analysis vs Reporting.

Unit –II

Mining data streams, Introduction To Streams Concepts, Stream Data Model and Architecture, Stream Computing Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window, Real time Analytics Platform(RTAP) Applications, Case Studies - Real Time Sentiment Analysis- Stock Market Predictions.

Unit –III

Hadoop: History of Hadoop, the Hadoop Distributed File System, Components of Hadoop Analysing the Data with Hadoop Scaling Out, Hadoop Streaming, Design of HDFS-Java interfaces to HDFS Basics- Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features Hadoop environment.

Unit –IV

Business Intelligence, Decision Support Systems, Data Warehousing; Definition of Big Data, Big data characteristics & considerations, Introduction to Hadoop, Big data analytics, Drivers of Big data analytics, Big Data Stack, Typical analytical architecture, Virtualization & Big Data, Virtualization Approaches, Business Intelligence Vs Data science, Applications of Big data analytics.

Unit –V

Need of Data analytic lifecycle, Key roles for successful analytic projects, various phases of Data analytic lifecycle: Discovery, Data Preparation, Model Planning, Model Building, Communicating Results, Operationalization.

Outcome of Course:

At the end of this Course, the students will be able to:

- Understand the key issues in big data management and its associated applications.
- Achieve adequate perspectives of big data analytics in various applications.

Recommended Books

- [1] Arshdeep Bahga, Vijay Madisetti, "Big Data Science & Analytics: A Hands-On Approach", first edition, Import publication, 2016.
- [2] Radha Shankarmani, M. Vijayalakshmi, "Big Data Analytics", first edition, Wiley publication, 2ed Paperback, 2016.
- [3] Subhashini Chellappan, Seema Acharya, "Big Data and Analytics", first edition, Wiley , 2019.

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**Department of Computer Science
University of Lucknow, Lucknow
M.Sc. (Computer Science) Fourth Semester Syllabus**

Course Title: Software Project Management		Objective: The objective of this course is to make student understand the concepts of Project Management for planning to execution of projects.
Course Code: MCS -401EB		
Paper Number: I	Credit : 04	
Maximum Marks: 100		
Unit –I		
Basics of Project Management: Introduction, Need for Project Management, Project Management Knowledge Areas and Processes, The Project Life Cycle, The Project Manager (PM), Phases of Project Management Life Cycle, Project Management Processes, Impact of Delays in Project Completions, Essentials of Project Management Philosophy, Project Management Principles		
Unit –II		
Project Identification and Selection: Introduction, Project Identification Process, Project Initiation, Pre-Feasibility Study, Feasibility Studies, Project Break-even point.		
Unit –III		
Project Planning: Introduction, Project Planning, Need of Project Planning, Project Life Cycle, Roles, Responsibility and Team Work, Project Planning Process, Work Breakdown Structure (WBS).		
Unit –IV		
Organisational Structure and Organisational Issues: Introduction, Concept of Organisational Structure, Roles and Responsibilities of Project Leader, Relationship between Project Manager and Line Manager, Leadership Styles for Project Managers, Conflict Resolution, Team Management and Diversity Management, Change management.		
Unit –V		
Project Risk Management: Introduction, Risk, Risk Management, Role of Risk Management in Overall Project Management, Steps in Risk Management, Risk Identification, Risk Analysis, Reducing Risks.		
Outcome of Course:		
At the end of this Course, the students will be able to:		
<ul style="list-style-type: none">• Manage the cost, timing, and quality of the project• Understand project characteristics and various stages of a project.• Use the various techniques for Project planning, scheduling and execution.		

Recommended Books

- [1] Royce, "Software Project Management", First edition, pearson, 2002.
- [2] Bob Hughes, Mike Cotterell and Rajib Mall, "Software Project Management", sixth edition, 2017.
- [3] Rishabh Anand, "Software Project Management", First Edition, S.K. Kataria & Sons, 2013

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Department of Computer Science
University of Lucknow, Lucknow
M.Sc. (Computer Science) Fourth Semester Syllabus

Course Title: Mobile Computing
Course Code: MCS -401EC
Paper Number: I Credit : 04
Maximum Marks: 100

Objective: The objective of this course is to provide an opportunity to students to understand the key components and technologies involved and to gain hands-on experiences in building mobile applications.

Unit –I

Mobile computing vs wireless network, Mobile computing Applications, Characteristics of Mobile computing, Structure of Mobile computing Application. MAC protocols- wireless MAC issues, Fixed Assignment schemes, Random assignment schemes, Reservation based schemes.

Unit –II

Mobile Internet protocol and Transport layer Overview of mobile IP- Features of mobile IP, Key mechanism in mobile IP route optimization, Overview of TCP/IP- Architecture of TCP/IP, Adaptation of TCP window, Improvement in TCP performance.

Unit –III

Mobile Telecommunication system Global system for Mobile communication (GSM), General Packet Radio Service (GPRS), Universal Mobile Telecommunication System (UMTS).

Unit –IV

Mobile Adhoc Network Ad-Hoc basic concepts, Characteristics, Applications, Design issues, routing, Essential of traditional routing protocol, Popular routing protocols, Vehicular AdHoc network VANET, MANET vs VANET, security.

Unit –V

Mobile platforms and applications Mobile device operating system, special constraints and requirements, commercial mobile operating system, software development kit- IOS, Android, BlackBerry, windows phone, Mcommerce, structure, pros & Cons, Mobile payment system, Security issues.

Outcome of Course:

At the end of this Course, the students will be able to:

- Understand fundamentals of wireless communications.
- Analyze security, energy efficiency, mobility, scalability, and their unique characteristics in wireless networks.
- Demonstrate basic skills for cellular networks design.
- Apply knowledge of TCP/IP extensions for mobile and wireless networking.

Recommended Books

- [1] Raj Kamal, Mobile Computing, Third Edition, Oxford University press, 2013.
[2] Ashoke K Talukder, Hasan Ahamed, "Mobile Computing Technology- Application and service creation", Second edition, McGraw Hill Education, 2017.

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Department of Computer Science
University of Lucknow, Lucknow
M.Sc. (Computer Science) Fourth Semester Syllabus

Course Title: Advance Programming	Objective: The objective of this course is to provide the fundamental concepts and techniques necessary to write high-quality programs, including basic concepts of object-oriented programming, modular design, exception handling, and class libraries.
Course Code: MCS - 401ED	
Paper Number: I Credit : 04	
Maximum Marks: 100	

Unit –I

Pointers, Pointers in general, memory organization, Indirection (*) and address-of (&) operators, Pointers in struct, pointers to struct, Pointers of pointers, advanced usage, Static vs. Dynamic Arrays (1D, 2D and more), Creating & destroying arrays, Array of pointers, Pointers of arrays.

Unit –II

Classes and Objects, Composition: Class vs. struct, Primitive types vs. Objects, Functions vs. Methods, Data fields, constructor & destructor, overloading constructors

Unit –III

Instantiating objects: creating on stack / heap, new, delete, new [], delete [] commands, Static keyword, Pointers and objects Referencing (.) vs. Dereferencing (->) operators, .*, ->*

Unit –IV

Class notations, header files, Cloning classes: assigning objects, shallow copy, deep copy, copy constructor, Inheritance, Subclasses in general, Defining and creating subclasses, construction and destruction chain, Construct base class by non-default constructor, Overriding, overloading vs. overriding.

Unit –V

Inheritance, Encapsulation, Visibility modifiers: public, private, protected, Abstraction, get and set methods, Polymorphism Polymorphism in general, Benefits, software design, Class hierarchy, conversion from sub-to-base and base-to-sub classes.

Outcome of Course:

At the end of this Course, the students will be able to:

- Understand advanced concepts for handling runtime errors using stack unwinding, uncaught exception and automatic cleanup.
- Apply logical constructs for branching and loops as well as use iterator objects when appropriate.
- Create and access arrays and array lists, including.
- learn how to handle exceptions and errors.

Recommended Books

- [1] John W. Perry, "Advanced Programming", Pws Pub Co, first edition, 1998.
 [2] W. Richard Stevens, "Advanced Programming in the UNIX Environment", Third edition, Addison-Wesley Professional, 2013.

Project Course Code: MCS 402

Major Project: In this course student shall prepare synopsis, dissertation, make demonstration and contribution in the form of publication.

Literature Review: Students shall collect at least 10 research papers from various journals of repute and prepare the summary report.

Monthly Presentation: Student shall demonstrate their progress of project with Power Point slides before Departmental committee.

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