



SIES (Nerul) College of Arts, Science and Commerce (Autonomous)

**Syllabus for Approval
M.SC (COMPUTER SCIENCE)**

Sr. No	Heading	Particulars															
1	Title of the Programme	M.Sc. (Computer Science)															
2	Eligibility for admission	<p>The Bachelor's degree in the Faculty of Science/ Technology of this University or equivalent degree of recognized Universities with Major and Ancillary Subjects at undergraduate level as detailed below: A learner who has either passed Bachelor's Degree Examination of University of Mumbai in Science or equivalent degree of any other university recognized as equivalent thereto with one of the following as major subject</p> <table style="width: 100%; border: none;"> <tr> <td style="text-align: center;">MAJOR</td> <td style="text-align: center;">OR</td> <td style="text-align: center;">ANCILIARY</td> </tr> <tr> <td style="text-align: center;">Mathematics</td> <td style="text-align: center;">OR</td> <td style="text-align: center;">_____</td> </tr> <tr> <td style="text-align: center;">Mathematics</td> <td style="text-align: center;">OR</td> <td style="text-align: center;">Statistics</td> </tr> <tr> <td style="text-align: center;">Mathematics</td> <td style="text-align: center;">OR</td> <td style="text-align: center;">Physics</td> </tr> <tr> <td style="text-align: center;"></td> <td style="text-align: center;">OR</td> <td style="text-align: center;"></td> </tr> </table> <p>The Bachelor of Engineering (B.E.) degree examination OR The B.Sc. (Computer Science)/ BCS / B.Sc. (I.T.) Degree Examination</p>	MAJOR	OR	ANCILIARY	Mathematics	OR	_____	Mathematics	OR	Statistics	Mathematics	OR	Physics		OR	
MAJOR	OR	ANCILIARY															
Mathematics	OR	_____															
Mathematics	OR	Statistics															
Mathematics	OR	Physics															
	OR																
3	Minimum Percentage for admission	45%															
4	Semesters	I & II															
5	Level	PG I															
6	Pattern	02 years & 04 semesters CBGS															
7	To be implemented from	From Academic year 2026-27 in a progressive manner															

Date: 21th February, 2026.

Signature:


Dr. Koel Roychoudhury
AC Chairperson


Dr. Sheeja Ravi
Head of the Department



**SIES (Nerul) College of Arts, Science and Commerce
(Autonomous)**

**(Affiliated to University of Mumbai)
RE-ACCREDITED GRADE "A" BY NAAC (3rd CYCLE)**

**BOARD OF STUDIES
SYLLABUS FOR
M.Sc. (Computer Science) Part 1**

(WITH EFFECT FROM THE ACADEMIC YEAR 2026-2027)

OBJECTIVES OF THE PROGRAMME

1. To be fundamentally strong at core subject of Computer Science.
2. To apply programming and computational skills for industrial solutions.
3. Broad understanding of latest technological trends.
4. To identify opportunities for establishing an enterprise for immediate Employment.
5. Able to understand and apply fundamental research concepts.

PROGRAMME OUTCOMES:

1. An ability to apply the skills acquired in post-graduation to get better career prospects.
2. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computational systems.
3. An ability to apply the knowledge for higher research in a specialized area of Computer Science.
4. Ability to understand and apply the core concepts of Computer Science.
5. Ability to provide socially acceptable technical solutions in various domains of specializations.



Image Processing

COURSE CODE: M26CS1MJ01

COURSE CREDIT: 03

1 credit - 15 lectures

1 lecture - 60 minutes

Course Objectives:

- To introduce students to the principles of Digital Image Processing, including its applications, image formation, visual perception, sampling, quantization, pixel relationships, and the basic mathematical tools used in image processing.
- To familiarize students with image enhancement techniques using intensity transformations, spatial filtering, and frequency-domain methods based on Fourier transform concepts.
- To Develop skills to design and implement algorithms for advanced image analysis.

Course Outcomes:

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

- Explain and analyze digital images by applying concepts of image acquisition, sampling, quantization, pixel relationships, and fundamental mathematical tools used in Digital Image Processing.
- Apply intensity transformation, spatial filtering, and frequency-domain filtering techniques to enhance and analyze digital images.
- Knowledge of Perform frequency domain operations on images

Unit	Syllabus	No. of lectures
1.	Introduction: What is Digital Image Processing?, The Origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System Digital Image Fundamentals: Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships Between Pixels, Introduction to the Basic Mathematical Tools Used in Digital Image Processing	15
2.	Intensity Transformations and Spatial Filtering: Background, Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing (Lowpass) Spatial Filters, Sharpening (Highpass) Spatial Filters, Highpass, Bandreject, and Bandpass Filters from Lowpass Filters, Combining Spatial Enhancement Methods Filtering in the Frequency Domain: Background, Preliminary Concepts, Sampling and the Fourier Transform of Sampled Functions, The Discrete Fourier Transform of One Variable	15
3.	Image Restoration and Reconstruction: A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only - Spatial Filtering, Periodic Noise Reduction Using Frequency Domain Filtering Color Image Processing: Color Fundamentals, Color Models	15



Image Processing - Practical

COURSE CODE : M26CS1MJP01

COURSE CREDIT: 01

1 credit - 30 lectures

1 lecture is 60 minutes

Sr. No.	List of Practical
1	Write program to demonstrate the Upsampling and downsampling on Image.
2	Write program to demonstrate the Fast Fourier Transform to compute DFT
3	Write program to demonstrate the following aspects on image 1. Convolution operation 2. Template Matching
4	Write program to implement point/pixel intensity transformations such as 1. Log and Power-law transformations 2. Contrast adjustments
5	Write program to implement point/pixel intensity transformations such as 1. Histogram equalization 2. Thresholding, and halftoning operations
6	Write a program to apply various enhancements on images using image derivatives by implementing Gradient and Laplacian operations.
7	Write a program to implement linear and nonlinear noise smoothing on suitable image or sound signal.
8	Write a program to apply various image enhancement using image derivatives by implementing smoothing, sharpening, and unsharp masking filters for generating suitable images for specific application requirements.
9	Write a program to Apply edge detection techniques such as Sobel and Canny to extract meaningful information from the given image samples
10	Write the program to implement various morphological image processing techniques.

MAJOR- Practical Algorithm for Optimization

COURSE CODE: M26CS1MJP02

COURSE CREDIT: 01

1 credit - 30 lectures

1 lecture is 60 minutes

Note:

- All the Practical's should be implemented using Julia Link: Julia:<https://julialang.org/>

Sr. No	List of practical
1	Implement Contour Plots.
2	Implement Fibonacci search
3	Implement Golden section search
4	Implement Quadratic Fit Search.
5	Implement Gradient descent.
6	Implement quasi-Newton methods to find the local maxima.
7	Implement the Adagrad method with application
8	Implement the RMSprop and Adadelta
9	Implement Conjugant Gradient
10	Implement radial basis functions using surrogate modeling.
11	Apply Random Forest in surrogate Model.
12	Implement Gaussian Process and its application.
13	Path finding using Ant Colony Optimization with an application.



	Roll-up, Drill-down, Slice, Dice and Pivot; Simple Case Study on Sales Data Warehouse.	
	Database Security, Backup and Recovery – Introduction to Database Security and its importance; Need for Database Security in modern database systems; Types of Database Threats including unauthorized access and data leakage; Authentication and Authorization mechanisms; Users, Roles and Privileges management; SQL Injection – Concept, causes and prevention techniques; Database Backup concepts and importance; Types of Backup including Full, Incremental and Differential backups; Database Recovery concepts and failure types; Log-based Recovery and Checkpoint Mechanism; Case Study on Database Failure and Recovery.	
03		15

Textbook(s):

1. Database Management Systems by Raghu Ramakrishnan and Johannes Gehrke, McGraw Hill, 3rd Edition, 2014
2. Database System concepts by Korth
3. Professional NoSQL By Shashank Tiwari, Wrox-John Wiley & Sons, Inc, 2011
4. Getting Started with NoSQL, Gaurav Vaish, Packt Publishing Ltd, 2013

Reference(s):

1. Advanced Database Management System by Rini Chakrabarti and Shilbhadra Dasgupta, Dreamtech Press, 2017
2. SQL & NoSQL Databases, Andreas Meier · Michael Kaufmann, Springer Vieweg, 2019
3. Parallel and Distributed Systems by Arun Kulkarni, Nupur Prasad Giri, Wiley, Second edition, 2017
4. Practical Hadoop Migration: How to Integrate Your RDBMS with the Hadoop Ecosystem and Re-Architect Relational Applications to NoSQL By Bhushan Lakhe, Apress; 1st edition, 2016.



Mini Project in Emerging Technologies

COURSE CODE: M26CS1MJ04

COURSE CREDIT: 02

1 credit - 15 lectures

1 lecture - 60 minutes

Course Objectives:

- Apply concepts from Image Processing, Optimization Algorithms, and Advanced Database Techniques to build a small real-world prototype or analytical solution.
- Demonstrate skills in problem identification, data handling, algorithm development, testing, documentation, and presentation.

Course Outcomes:

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

- Design and implement a functional mini-project using one or more techniques from image processing, optimization, or NoSQL/advanced databases.
- Prepare concise professional documentation and present their solution using appropriate tools, demonstrating clear technical and ethical understanding.

Suggested Topics (Choose Any One Domain or a Combination)

A. Image Processing Track

- Image enhancement prototype (contrast stretching, histogram equalization, sharpening)
- Edge detection demo using Sobel/Canny filters
- Frequency-domain filtering visualization
- Noise removal and restoration system
- Simple object detection using template matching

B. Optimization Track

- Gradient descent visualization tool
- Optimization of resource allocation or scheduling
- Hyperparameter tuning demo using optimization algorithms
- Pathfinding using Ant Colony Optimization
- Surrogate modeling for simple prediction tasks

C. Advanced Database Techniques Track

- Mini NoSQL application using MongoDB/Redis
- Spatial or temporal data analysis mini-system
- Small data mart/OLAP cube with roll-up and drill-down
- Distributed database demo with simple fragmentation or replication
- Database backup, restore, and security configuration mini-project



TEXTBOOK

1. Kevin L. Jackson, Scott Goessling, Architecting Cloud Computing Solutions, Packt Publishing 2018
2. Shailendra Singh, Cloud Computing: Focuses on the Latest Developments in Cloud Computing, Oxford University Press; First edition, June 2018

REFERENCES

1. Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi, Tata McGraw-Hill Education Private Limited, 2013.



Elective - Software Defined Networking

COURSE CODE: M26CS1E02

COURSE CREDIT: 03

1 credit - 15 lectures

1 lecture - 60 minutes

Course Outcome:

- Understand computer networking concepts, OSI/TCP-IP models, and routing protocols.
- Gain knowledge and skills in Software Defined Networking (SDN) architecture, OpenFlow, and application development.
- Comprehend Network Functions Virtualization (NFV), cloud computing, and IoT integration in modern network architectures.
- Design and implement switching techniques, routing protocols, multicast, MPLS, traffic filtering, and routing redistribution.
- Develop network design and deployment skills for efficient and secure routing, traffic management, and integration of network components.

Course Objectives:

- To make the students capable of understanding computer network basics.
- To Obtain the knowledge of Software defined networks with understanding of data plane, control plane and application plane.
- To apply network virtualization for industry standard solutions. To improve skills in implementing network virtualization and Software Defined Network (SDN).

Unit No.	Syllabus	No. of lectures
01	Module -1- Introduction to Software Defined Networking Understanding the layered architecture of OSI/RM and TCP-IP Model, Study of various network Routing protocols, Introduction to Transport layer and Application layer protocols. Elements of Modern Networking, SDN: Background and Motivation, SDN Data Plane and OpenFlow, SDN Control Plane, SDN Application Plane	15
02	Module-2 -Network Functions Virtualization Concepts and Architecture, NFV Functionality, Network Virtualization Quality of Service, Modern Network Architecture: Cloud and Fog, Cloud Computing, The Internet of Things: Components	15
03	Module-3 -Design and implementation of Network Understand and implement Layer 2/3 switching techniques (VLAN/TRUNKING/Managing Spanning Tree), Implementation of OSPF V2 and V3, Implementation BGP, Implementation Multicast Routing, Implementation of MPLS, Implementation of Traffic Filtering by using Standard and Extended Access Control List, Implementation of Routing redistribution, Implementation of Policy Based Routing/Load Balancing /QOS/Natting /VRF	15



Software Defined Networking Practical

COURSE CODE: M26CS1EP02

COURSE CREDIT: 01

1 credit - 30 lectures

1 lecture is 60 minute

2 lecture per week

Note:

All the Practical's should be implemented using GNS3/EVENG/CISCO VIRL

Link: GNS3 :<https://www.gns3.com/software/download>

EVE-NG: <https://www.eve-ng.net/index.php/download/CISCO>

VIRL:<https://learningnetwork.cisco.com/s/question/0D53i00000Kswpr/virl-15-download>

Sr. No	Syllabus
1	1. Implement SPAN Technologies (Switch Port Analyzer) 2. Implement SNMP and Syslog 3. Implement Flexible NetFlow
2	1. Implement a GRE Tunnel 2. Implement VTP 3. Implement NAT
3	Implement Inter-VLAN Routing
4	Observe STP Topology Changes and Implement RSTP 1. Implement Advanced STP Modifications and Mechanisms 2. Implement MST
5	1. Implement EtherChannel 2. Tune and Optimize EtherChannel Operations
6	OSPF Implementation 1. Implement Single-Area OSPFv2 2. Implement Multi-Area OSPFv2 3. OSPFv2 Route Summarization and Filtering 4. Implement Multiarea OSPFv3
7	Implement BGP Communities 1. Implement MP-BGP 2. Implement eBGP for IPv4
8	Implement IPsec Site-to-Site VPNs 1. Implement GRE over IPsec Site-to-Site VPNs 2. Implement VRF Lite
9	Simulating SDN with 1. OpenDaylight SDN Controller with the Mininet Network Emulator 2. OFNet SDN network emulator
10	Simulating OpenFlow Using MININET



	Publishing the Paper: Rights and Permissions, How to Submit the Manuscript, How and When to Use Abbreviations, How to Write a thesis, Outcome of Research, Ethical issues in research	
	Statistical analysis and fitting of data : Introduction to Statistics -- Probability Theories - Conditional Probability, Poisson Distribution,	
04	Binomial Distribution and Properties of Normal Distributions, Estimates of Means and Proportions; Chi-Square Test, Association of Attributes - t-Test -Anova- Standard deviation - Co-efficient of variations. Co- relation and Regression Analysis.	15

Textbook(s):

1. Business Research Methods William G.Zikmund, B.J Babin, J.C. Carr, Atanu Adhikari, M.Griffin Cengage 8e 2016.
2. Business Analytics Albright Winston Cengage 5e 2015.
3. Research Methods for Business Students Fifth Edition Mark Saunders 2011.
4. Multivariate Data Analysis Hair Pearson 7e 2014.
5. Thesis & Assignment Writing-J Anderson, B.H. Dursten & M.Poole, Wiley Eastern, 1977
6. A Hand Book of Methodology of Research – P. Rajammal and P. Devadoss, R. M. M. Vidya Press, 1976.



Major - Applied Machine Learning

COURSE CODE : M26CS2MJ01

COURSE CREDIT: 03

1 credit - 15 lectures

1 lecture - 60 minutes

Course Objectives:

- To understand the importance and concepts of Machine Learning.
- Knowledge on various learning techniques, performance measure, and Artificial Neural Network (ANN).
- Applying algorithms available for the machine learning.
- Designing and developing practical Machine Learning and Machine Learning based applications.

Course Outcomes:

- The ability to describe the basic pragmatics of machine learning.
- Discover various projects in machine learning for industrial applications.
- Assess and Evaluate semantics of ML based systems.
- Analyse Machine Learning with visualization techniques and develop real-time applications.

Unit	Syllabus	No. of lectures
1.	The Fundamentals of Machine Learning What is Machine Learning? Why use Machine Learning? Types of Machine Learning, Supervised Learning, Unsupervised Learning & Reinforcement Learning. Challenges of Machine Learning, Testing and Validation, A First Application: Classification, MNIST Dataset, Performance Measures, Confusion Matrix, Precision and Recall, Precision/Recall Tradeoff, The ROC Curve, Multiclass Classification, Error Analysis. Case Study	15
2.	Regression Analysis Linear Regression, Gradient Descent, Batch Gradient Descent, Stochastic Gradient Descent, Mini-batch Gradient Descent, Polynomial Regression, Learning Curves, The Bias/Variance Tradeoff, Ridge Regression, Lasso Regression, Early Stopping, Logistic Regression, Decision Boundaries, Softmax Regression, Cross Entropy. Case Study	15
3.	Supervised Learning Linear SVM Classification, Soft Margin Classification, Nonlinear SVM Classification, Polynomial Kernel, Gaussian RBF Kernel, SVM Regression, Decision Trees, Training and Visualizing a Decision Tree, Making Predictions, The CART Training Algorithm, Gini Impurity vs Entropy, Regularization Hyperparameters. Case Study	15



Major- Applied Machine Learning Practical

COURSE CODE : M26CS2MJP01

COURSE CREDIT: 01

1 credit - 30 lectures

1 lecture - 60 minutes

Sr. No.	List of Practical
1	Write a program to implement Linear Regression (Diabetes Dataset)
2	Write a program to Implement Logistic Regression (Iris Dataset)
3	Write a program to Implement Multinomial Logistic Regression (Iris Dataset)
4	Write a program to Implement SVM classifier (Iris Dataset)
5	Write a program to Train and fine-tune a Decision Tree for the Moons Dataset
6	Write a program to Train an SVM regressor on the California Housing Dataset
7	Write a program to Implement Batch Gradient Descent with early stopping for Softmax Regression
8	Write a program to Implement MLP for classification of handwritten digits (MNIST Dataset)
9	Write a program to implement SVM classification on the Iris dataset.
10	Mini Project



2. Barret, Couch, Compiler Construction Theory and Practice, , Asian Student Edition.
 3. Dhamdhere D.M, "Compiler Construction Principle and Practice", McMillan India;
 4. David Galles, Modern Compiler Design, Pearson Education, 2009
-



MAJOR- Software Architecture and Design Pattern

COURSE CODE: M26CS2MJ03

COURSE CREDIT: 03

1 credit – 15 lectures

1 lecture - 60 minutes

Course Objectives:

- To provide students with a structured understanding of software engineering principles, process models, and architectural concepts used in modern software development.
- To develop competence in software testing techniques, quality assurance practices, and testing strategies applicable to real-world software systems.
- To introduce architectural frameworks and MVC-based application development using industry-relevant frameworks such as Django and Struts.

Course Outcomes:

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

- Apply software engineering concepts, process models, and design principles to analyze and design software systems.
- Design and execute appropriate software testing strategies, prepare test artifacts, and evaluate software quality.
- Develop and test web applications using MVC architecture and framework-based approaches such as Django and Struts.

Unit No.	Syllabus	No. of Lectures
I	Software Engineering: Software engineering concepts, software development life cycle, software process models: waterfall model, incremental model, spiral model, agile process models, requirement engineering, feasibility study, software project planning, software cost estimation techniques: LOC, Function Point Analysis, software design principles, modular design, cohesion and coupling, software architecture concepts, software configuration management, version control, change management.	15
II	Software Testing and Quality Assurance: Software testing fundamentals, levels of testing: unit testing, integration testing, system testing, acceptance testing, testing techniques: black-box testing, white-box testing, gray-box testing, test case design techniques, test plan preparation, defect life cycle, debugging techniques, software quality concepts, software reliability, verification and validation, regression testing, introduction to automation testing, testing of web-based applications.	15
III	Software Architecture and Application Frameworks: Software architecture for web applications, Model-View-Controller (MVC) architecture, MVC components and flow, web application request-response lifecycle, Django framework: architecture, models, views, templates, URL routing, ORM, Struts framework: architecture, components, MVC implementation in Struts, comparative study of MVC frameworks, deployment and security basics.	15

Textbooks:

1. Software Engineering: A Practitioner's Approach – Roger S. Pressman
2. Software Testing – Naresh Chauhan



Software Architecture and Design Pattern Practical

COURSE CODE: M26CS2MJP03

COURSE

CREDIT: 01

1 credit - 30 lectures

1 lecture - 60 minutes

Practical No.	List of Practical
1	Study of software development life cycle models used in real-world projects.
2	Preparation of software project estimation using Function Point or LOC methods.
3	Conduct a test suite for two different websites using Selenium IDE. Perform various actions like clicking links, filling forms, and verifying content.
4	Write a program using Selenium WebDriver to automate the login process on a specific web page. Verify successful login with appropriate assertions.
5	Write a program using Selenium WebDriver to update 10 student records in an Excel file. Perform data manipulation and verification.
6	Preparation of test plan and test cases for a given software application.
7	Study and implementation of MVC architecture using a simple application.
8	Development of a basic web application using Django framework.
9	Implementation of MVC-based application using Struts framework.
10	Testing and validation of the developed web application.



References:

1. Yatindra Singh, *Cyber Laws*, Universal Law Publishing, New Delhi.
2. Pavan Duggal, *Cyber Law: The Indian Perspective*, Saakshar Law Publications.
3. Rodney D. Ryder, *Guide to Cyber Laws*, Wadhwa & Company.
4. Tavani, Herman T., *Ethics and Technology: Controversies, Questions, and Strategies for Ethical Computing*, Wiley.
5. Information Technology Act, 2000 and Information Technology (Amendment) Act, 2008.



	Identifying differentially expressed genes Data Visualization and Reporting: Visualizing bioinformatics data, Creating interactive visualizations of biological data Case Study	
03	Analytics and Business: Introduction to machine learning algorithms and techniques, Feature selection and dimensionality reduction in biological data, Predictive modeling for biological data (classification, regression) Ethical, Legal, and Social Implications: Ethical considerations in bioinformatics research, Privacy and data security in genomic data, social and policy issues in bioinformatics and personalized medicine Case Study	15

References:

1. Bioinformatics: Sequence and Genome Analysis by David W. Mount Publisher: Cold Spring Harbor Laboratory Press Publication (4th edition), 2021,
2. Python for Bioinformatics by Tiago Antao, Packt Publishing Publication, 2015
3. Python for Biologists: A complete programming course for beginners" by Martin Jones CreateSpace Independent Publishing Platform, 2013,
4. Bioinformatics for Beginners: Genes, Genomes, Molecular Evolution, Databases, and Analytical Tools by SupratimChoudhuri, Academic Press Publication, 2014
5. Bioinformatics Programming Using Python: Practical Programming for Biological Data by Mitchell L. Model, O'Reilly Media, 2009



Embedded and IoT Technology

COURSE CODE: M26CS2E02

COURSE CREDIT: 03

1 credit - 15 lectures

1 lecture is 60 minutes

Pre requisite: Basic electronics knowledge (components, microcontrollers), understanding of wireless sensor networks, familiarity with IoT concepts and architectures.

Course Objectives:

- Understand embedded systems design and basics of IoT components.
- Learn about electronics and microcontrollers in embedded systems.
- Gain knowledge of IoT building blocks, sensors, and wireless sensor networks.
- Explore advanced IoT technologies, including gateway architecture and cloud computing.
 - Understand IoT security, communication, and design connected IoT systems using Packet Tracer.

Sr. No	Syllabus	No. of lectures
01	Module I Embedded System Basics Introduction to Embedded Systems- Design of Embedded Systems, Memory Architecture, Input/Output. Basic electronics: Semiconductors, Transistors, BJT, Flip Flops, Resistors, Capacitors. Microcontrollers, UART Communications, SPI-peripherals interface, I2C communication, Wireless Sensor Network (WSN) Case Study	15
02	Module II Basics of IOT- Introduction IoT, IoT Building Blocks -Hardware and Software: The basic IoT building blocks, smart thing components and capabilities, basics of Packet Tracer with reference to IoT, basics of IoT gateway, Cloud, and analytics IoT Gateway: IoT architecture domains, IoT gateway architecture, IoT gateway functionalities, IoT gateway selection criteria, IoT gateway and edge computing, edge computing-based solution for specific IoT applications IoT Protocol Stack, IoT Cloud and Fog Computing: Components of IoT Cloud architecture, usage of application domains of IoT Cloud platforms, layered architecture of Fog computing, distinguish Fog computing from other related terms. Case Study	15



Embedded and IoT Technology Practical

COURSE CODE: M26CS2EP02

COURSE CREDIT: 01

1 credit - 2 lectures

1 lecture is 60 minutes

Note: - The following set of practicals should be implemented in CodeVisionAVR, Proteus8, Cisco Packet Tracer, Keli V5, Python

Link: -Python:<https://www.python.org/downloads/>

CodeVisionAVR :<https://www.codevision.be/>

Proteus8:<https://www.labcenter.com/downloads/>

Cisco Packet Tracer:<https://www.netacad.com/courses/packet-tracer>

Keli V5: <https://www.keil.com/download>

Sr. No.	List of Practicals
1	Design and implement basics embedded circuits 1. Automatic Alarm system- Alarm should get trigger by sensor 2. Timer based buzzer 3. Sensor based Counting device
2	Demonstrate communication between two embedded devices using UART port
3	Built an IoT system to send ticket before entering the bus.
4	Demonstrate an IoT based game which can be played between two player who are physically at a considerable distance.
5	Develop a IoT application which will record the movement and orientation of your phone and give the data back to the PC
6	Develop an IoT application that will raise an alarm whenever with going to rain outside based on the weather prediction data.
7	Deploy an IoT application which will alert you by beeping or vibrating your phone whenever you get someone call your name.
8	Develop an IoT application for monitoring water levels in tanks and automatically start the motor to fill the tank if the level goes below the critical level.
9	Develop an IoT module to which measure the intensity of light and send the same to your PC/ Phone
10	Develop an IoT application for Motion detection.



Following are the objectives of the Internships envisaged for the students enrolled in State HEIs:

- Exposing students to industrial environments that cannot be replicated in a classroom.
- Providing opportunities to acquire and refine analytical and managerial skills crucial for a professional career.
- Offering hands-on experience in teamwork, thereby enhancing professional skills like communication, work ethics, conflict resolution, etc., with a lasting impact on lifelong learning and professional development.
- Establishing links between students and potential future job or research opportunities.

1.3 Types of Internships

Internships are an integral part of the academic curricula. Satisfactory completion of an internship is a mandatory requirement for the degree to be awarded by the HEI. Furthermore, considering the curriculum structure approved by the HEI, multiple modes of internships are possible and are assigned academic credits within the curricula. The general idea is to enable students to undertake immersive assignments within the organizations for a limited period.

The following is a brief overview of credit requirements in line with GoM GRs, UGC, and AICTE⁴:

- 4 credits of Internship activities may be accounted for B.A., B.Sc., B.Com. and all Non-AICTE professional UG degree courses.
- 4 credits of Internship activities may be accounted for M.A., M.Sc., M.Com. and all professional PG degree courses

It must be noted that 1 credit is equivalent to minimum 30 hours of work. An intern is expected to spend 120 hours on Internship. Furthermore, Internships may be done through offline / online mode/ hybrid.

For B.A., B.Sc., B.Com. and all Non-AICTE professional UG degree courses, the indicative requirement regarding Internship duration and credits is as follows:

Internship	Schedule	Duration	Activities	Credits
Summer	After 4 th Semester	4-8 Weeks		4
Winter	After 5 th Semester	4-8 Weeks		4

For M.A., M.Sc., M.Com. and all professional PG degree courses, the indicative requirement regarding Internship duration and credits is as follows:

Internship	Schedule	Duration	Activities	Credits
Summer	After 2 nd Semester	4-8 Weeks		4



2.2 Duties and Responsibilities

2.2.1 Role of Training and Placement Officer (TPO) / Internship Officer

- A. Facilitate communication between students, faculty, and organizations regarding Internships/OJT.
- B. Help coordinate internship/OJT opportunities in line with academic credit requirements.
- C. Support students by providing information and guidance on internships/OJT.
- D. Assist in monitoring internship/OJT progress and gathering necessary documentation.
- E. Maintain relationships with industry partners and alumni to promote internship/OJT options.

2.2.2 Role of Head of Department (HOD)

The Head of Department (HOD) is responsible for overseeing the On-the-Job Training (OJT) program with the following key duties:

- a) **Orientation and Guidance:** Conducts an orientation session at the end of the semester before OJT begins, familiarizing students with the program's purpose, process, and code of conduct. Provides guidance regarding OJT expectations and requirements.
- b) **Assignment of Faculty Members:** Assigns faculty advisors to guide students through preparation and execution of their OJT.
- c) **Supervision and Support:** Ensures faculty advisors are equipped with necessary resources, training, and support to effectively mentor students.
- d) **Communication and Coordination:** Acts as a liaison among the department, students, faculty advisors, industry mentors, and other stakeholders to ensure smooth program implementation.
- e) **Monitoring and Evaluation:** Monitors student progress and overall program functioning through periodic reviews and performance assessments. Arrangement of External evaluator for Viva-Voce.
- f) **Alignment with Academic Objectives:** Ensures the OJT program aligns with departmental and institutional academic goals, integrating OJT with the curriculum to promote relevant skills development.

2.2.3 Role of Faculty Advisor / Mentors

Faculty advisors play a critical role in guiding students through the OJT process:

- A. **Assisting in Identifying OJT Opportunities:** Help students find suitable internships aligned with their specialization and career goals.
- B. **Monitoring Student Progress:** Regularly track and evaluate student progress during OJT, offering guidance to overcome challenges.
- C. **Providing Guidance and Supervision:** Serve as primary contacts for students, offering mentorship and practical advice.
- D. **Reviewing and Approving OJT Plans:** Ensure student plans align with learning objectives and program goals, providing constructive feedback.



5. Evaluation

Evaluation pattern of the Internship work

100 Marks Internship Based Project Work (04 Credits)	
Internal (As Per Annexure-A)	50 Marks
External (As Per Annexure-B)	50 Marks
Total	100 Marks
Passing Standard 40 Percentage	



ANNEXURE :B
Internal Assessment Sheet
Learning Outcome Assessment of Students by Mentor

Section-I (Basic Details): To be filled in by the Student			
Name of Organization for			
Internship/ OJT / Project Work			
Name of the Student			
Uni. PRN Number			
ABC-ID (As per NEP-2020)		Semester No:	
Name of Programme		Exam Seat No:	
Date of Commencement of Training		College Roll No	
Date of Completion of Training			

Section-II: External Assessment	This Section 50 Marks				
Attributes & Scoring	Un-Satisfactory	Satisfactory	Good	Very Good	Excellent
	"Upto 2" Marks	"Upto 4" Marks	"Upto 6" Marks	"Upto- 8" Marks	"Upto 10" Marks
(1) Dependability and Initiative Is self-reliant, performs in a dependable manner Accepts responsibility, shows initiative / interest in work and learns quickly					
(2) Communicates Effectively: Was able to communicate effectively (speaking and writing skills) with peers during the association.					
(3) Creativity & Quality of Work: Demonstrates creativity, Produces high quality work and accepts criticism. Uses technical knowledge and skills, Analyses problems effectively, shows good logical judgements.					
(4) Professionalism & Time Management and Discipline:: Has a professional attitude and mannerism, cooperates with co-workers and supervisors. Demonstrates organizational skills & Is punctual and Uses time effectively.					
(5) Overall Project Report:					
Total					
Total Marks out of 50					

Sign & Date

Internship Supervisor of Internship/OJT/ Project Work



Appendix I: OJT Undertaking

1. Student Name:			
2. Current Address			
3. Residence Address			
4. Email id			
5. Mobile Nos.			
6. Aadhar No.			
7. PAN			
8. Overall GPA			
9. Mode of OJT			
10. OJT Preferences			
	Location	Core Area	Organization / Institute
Preference-1			
Preference-2			
Preference-3			
<p>I confirm that I agree with the terms, conditions, and requirements of the OJT Policy</p> <p>Student Signature: _____</p> <p>Date _____</p> <p>I confirm that the student has attended the OJT orientation and has met all paperwork and process requirements to participate in the OJT program and has received approval from his/her mentor.</p> <p>Sign of Mentor: _____ Date: _____</p>			



Appendix III: Department letter

To,
The (Manager, HR)

Subject: Request for OJT Dear Sir/Madam,

As the Head of the Department at SIES (Nerul) College of Arts, Science and Commerce (Autonomous), I'm reaching out to discuss arranging an On-the-Job Training (OJT) opportunity for one of our students at your organization.

SIES (Nerul) College of Arts, Science and Commerce (Autonomous), established in 1998, is committed to produce professionals of high caliber values to establish a truly educated cosmopolitan city, in line with NEP 2020. Our curriculum now includes a mandatory 120-hours OJT component, undertaken in the sixth semester of UG and second semester of PG programs. We have a dedicated student/s eager to undertake a 120-hours OJT at your organization. This practical experience aligns with their studies and enhances their employability.

We believe this collaboration will benefit both parties. Your support in facilitating this OJT placement would be greatly appreciated.

In view of the above, I request your good self to allow our following (no. of students) students for practical raining in your esteemed organization. Kindly accord your permission and give at least one-week time for students to join training after confirmation.

S.No.	Name	Roll no.	Year	Department

The resumes of these students are attached with this letter. If vacancies exist, kindly do plan for Interviews for the students in above branches.

A line of confirmation will be highly appreciated.

Yours sincerely,

Head of department





SIES (Nerul) College of Arts, Science and Commerce (Autonomous)

No Objection Certificate (NOC) for OIT/Internship

Date: ___ / ___ / 202

Student Information

Full Name of the Student: _____

Class: _____

Roll Number: _____

Department: _____

Company Information:

Name of the Company: _____

Company Address: _____

HR / Contact Person: _____

Designation: _____

Contact Number: _____

Email ID: _____

Internship Details:

Internship Duration: From ___ / ___ / 2025 to ___ / ___ / 2025

Total Working Hours: _____

Working Days & Timings: _____

Mode of Internship: Online / Offline / Hybrid (circle one)

Type of Work / Department Assigned: _____

Declaration by Student

I hereby declare that all the information provided above is true and accurate to the best of my knowledge. I understand that providing any false or misleading information may lead to cancellation of my internship approval.

I also undertake full responsibility to maintain discipline and professionalism throughout the internship period.

Signature of the Student: _____

With Best Regards,

Name	Designation	Signature
	Head of [Department Name]	
	TPO/IO	
	Principal	



SCHEME OF THEORY and PRACTICALS EXAMINATION

4 CREDIT PAPERS

The scheme of examination shall be divided into two parts:

- Internal assessment 40% i.e. 40 marks
- Semester end examination 60% i.e. 60 marks

A. Internal Assessment 40 marks

Description	Marks
Internal test of 20 marks	
1. Multiple choice Questions / True or False - 20 Marks	20
One Project and Viva voce / Presentation / Case studies / Poster Making / Quiz / Role Play / Subject Specific Activities	15
Attendance and Class behavior	05
Total	40

B. Semester end examination 60 marks

PAPER PATTERN

Duration: 2 hours			
Total Marks: 60			
All Questions are Compulsory			
Question	Based on	Options	Marks
Q. 1	Unit 1	A and B or P and Q	15
Q. 2	Unit 2	A and B or P and Q	15
Q. 3	Unit 3	A and B or P and Q	15
Q. 4	Unit 1,2,3	A and B or P and Q	15
Total			60

Note:

Q.1, 2, 3 and 4 may be divided into sub questions with internal choice if required.

- Passing criteria: Minimum 40% in Internal (16 out of 40) and 40% (24 out of 60) in semester end examination.



B. Semester end examination 30 marks

PAPER PATTERN

Duration: 1 hours			
Total Marks: 30			
All Questions are Compulsory			
Question	Based on	Options	Marks
Q. 1	Unit 1	A and B or P and Q	10
Q. 2	Unit 2	A and B or P and Q	10
Q. 3	Unit 1,2	A and B or P and Q	10
Total			30

Note:

Q.1, 2 and 3 may be divided into sub questions with internal choice if required.

- Passing criteria: 40% (12 out of 30) in semester end examination.

