Multidisciplinary Minor [MDM]Track in Electrical Engineering: Programming for AI and Applications

Sr. No.	Sem	CourseCode	NameofCourse	Hours perweek		Credits	MaximumMarks			ESE Duration Hrs
				L	P		ContinuousEvaluation	End Sem Exam	Total	
1	III	24CS01TH0305-2	Object Oriented Programming	3	0	3	50	50	100	3
2	IV	24CS01TH0405-2	Programming for Machine Learning	3	0	3	50	50	100	3
3	V	24CS01TH0505-2	Database Management System	3	0	3	50	50	100	3
4	VI	24CS01TH0605-2	Internet of Things	3	0	3	50	50	100	3
			TOTAL	**12**	**0**	**12**	**200**	**200**	**400**	

Semester III	
Course Code:	**Course:**Object Oriented Programming
L: 3Hrs, **P**:0Hrs per Week	**Total Credits:** 03
Compulsory/Elective: Compulsory	**Course Type:** MDM

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

CO1	Classify the different features of object-oriented programming.
CO2	Implement the features of Develop basic programs for given problems.
CO3	Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes
CO4	Discuss Generics, Collections and multithreading and develop programs using these concepts.

Syllabus

ModuleI: (08 Hours)
Features of Object-Oriented Programming languages like data encapsulation, inheritance, polymorphism and late binding. Introduction to class and Methods, Access control of members of a class, instantiating a class, Constructors, Garbage Collection, finalize() Method.

Module II: (08 Hours)
Concept of inheritance, methods of derivation, use of super keyword and final keyword in inheritance, run time polymorphism. Abstract classes and methods, interface, implementation of interface, creating packages, importing packages, static and non-static members.

Module III: (09 Hours)
Exceptions, types of exception, use of try catch block, handling multiple exceptions, using finally, throw and throws clause, user defined exceptions, Generics, generic class with two type parameter, bounded generics, Collection classes: Arrays, Vectors, Array list, Linked list, Hash set, Queues, Trees.

Module IV: (09 Hours)
Introduction to streams, byte streams, character streams, file handling in Java, Serialization
Multithreading: Java Thread models, creating thread using runnable interface and extending Thread, thread priorities, Thread Synchronization, Inter-thread communications.

Text Books:	
1	JAVA The Complete Reference: Herbert Schildt; Seventh Edition, Tata McGraw- Hill Publishing Company Limited 2007.

2	A programmer's Guide to Java SCJP Certification: A Comprehensive Primer: Khalid A. Mughal and Rolf W.Rasmussen, Third Edition.
3	Java Fundamentals: A Comprehensive Introduction:HerbertSchildt and Dale Skrien; TataMcGraw- Hill Education Private Ltd., 2013.

Reference Books:	
1	Core JAVA Volume-II Advanced Features: Cay S. Horstmann and Gary Cornell; Eighth Edition; Prentice Hall, Sun Microsystems Press, 2008.
2	Java Programming: A Practical Approach: C Xavier; Tata McGraw- Hill Education Private Ltd.,2011.

Ramdeobaba University, Nagpur
School of Electrical and Electronics Engineering
Department of Electrical Engineering
B.Tech in Electrical Engineering
Specialization AI and Applications

Semester IV	
Course Code:	**Course:**Programming for Machine Learning
L: 3Hrs, **P**:0Hrs Per Week	**Total Credits:** 03
Compulsory/Elective: Compulsory	**Course Type:** MDM

Course Outcomes:	
After completion of the course, students will be able to	
CO1	Develop and execute simple Python programsusing conditionals and looping for solving problems.
CO2	Develop python program to manipulate lists, tuples, dictionaries and sets for given purpose.
CO3	Use python built-in functions and develop relevant user defined function for the given purpose. Also, able to read and write data from/to files in Python programs.
CO4	Use matplotlib and seaborn to create data visualization in python.
CO5	Utilize libraries such as NumPy, Pandas etc. for data processing and visualization.

Syllabus

MODULE I: INTRODUCTION TO PYTHON (06 Hours)
Python Basics: Python as scripting Language,Python's building blocks- Identifiers, Keywords, Variables, Constants, Indentation, Comments in python,Data Types,Input and Output statements in python Operators in Python, Operator precedence and Associativity.
Types of Control Statements :Decision Making Statements: - if, if…. else, else-if ladder,nested if and switch statement; Looping statement: - while loop, for loop, nested loop Manipulating Loops- use of break, continue and pass statements.

MODULE II: LISTS, TUPLES, DICTIONARIES, SETS (07 Hours)
Lists: create, access, slicing, negative indices, list comprehension
Tuples: create, indexing and slicing, operation on tuple
Dictionaries: create, add and replace values ;Sets: Create and operations

MODULE III: STRINGS, FUNCTIONS, FILES (07 Hours)
Strings: Comparison, formatting, slicing, splitting, stripping, string matching, search and replace
Functions: Parameters and arguments: positional argument, keyword argument, parameters with default values-local and global scope of variable, recursive function, lamda function
Files and exception: create, open, read, write, append and close, errors and exceptionshandling

MODULE IV: MODULES, PACKAGES and DATA VISUALIZATION (06 Hours)
Modules - Defining Modules and importing modules;
Packages - Defining packages, importing packages; Standard Packages - Using standard packages/libraries
Matplotlib &Seaborn**:**Introduction to Data Visualization, Histograms, Line Plots, scatter

	plots, Heatmaps.
	MODULE V: ESSENTIAL PYTHON LIBRARIES FOR MACHINE LEARNING:NUMPY (06 Hours) Introduction to NumPy-Arrays, Indexing, Advanced array manipulation, Broadcasting, Mathematical Operations.
	MODULE VI: ESSENTIAL PYTHON LIBRARIES FOR MACHINE LEARNING:PANDAS(06 Hours) Introduction to Pandas: Data Frames, Data loading, Data cleaning preparation, Data wrangling, Exploratory data analysis.

Text Books:	
1	Martin C. Brown, "Python: The Complete Reference"-Graw Hill, 4th Edition, 2018
2	Mark Lutz , "Learning Python", O'Reilly, 5th Edition, 2013
3	Magnus Lie Hetland, "Beginning Python: From Novice to Professional ", Apress, Edition: 4th Edition, 2024.
4	Reema Thareja, "Python Programming: Using Problem Solving Approach", Oxford University Press, 2nd Edition.

Reference Books:	
1	Hands-On Exploratory Data Analysis with Python, Suresh Kumar Mukhiya, Packt Publishing.
2	Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly Media, 2nd Edition.
3	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", O'Reilly Media, 2nd Edition.

Course Code : 24CS01TH0507   **Course:BackendTechnologies**

L: 3Hrs, T: 0 Hr, P: 0Hrs, Per Week   **Total Credits: 03**

Course Objectives

1. Understandthebasicsofhowwebapplicationsworkbehindthescenes.
2. Learntobuildanddeploysimplebackend systems.
3. LearnhowtointegratedatabasesandAPIs.
4. Understandtheimportanceofsecurityanddatamanagementinbackendsystems.
5. UnderstandDeploymentofbackendapplications.

SYLLABUS

UNIT I: Introduction to Backend Development: Overview of Backend Technologies Client-Server Architecture, Frontend vs. Backend vs. Full Stack, HTTP/HTTPS Protocols, HTTP Methods (GET, POST, PUT, DELETE), Web Servers & Deployment

UNIT II: Server-Side Programming: Server-Side Languages: Introduction to Node.js (JavaScript/TypeScript), Python (Django/Flask), Java (Spring Boot), PHP (Laravel)

UNIT III: Database Integration: Databases: Introduction to Databases, SQL vs NoSQL, MySQL/PostgreSQL (Relational), MongoDB (NoSQL), Connecting databases with Node.js/Express or Python, CRUD operations with database

UNIT IV: Authentication and Security: Authentication vs Authorization Session and Token-based Authentication (JWT), User login/register system, Data validation and sanitization,Securitybestpractices:Hashing(bcrypt),HTTPS,CORS,Helmet.jsPreventing SQL Injection, XSS, CSRF

UNIT V: Deployment: Deploying backend applications, Cloud platforms, Overview of microservices and serverless architecture

Course Outcomes:
Onsuccessfulcompletionofthecourse,studentswillbeableto:

1. Understandworkingofwebapplications.
2. Tobuildanddeploysimple backendsystems.
3. TointegratedatabasesandAPIs.
4. ToUnderstandtheimportanceofsecurityinbackendsystems.
5. ToDeployofbackendapplications.

TextBooksandReference Books

1. Web Development with Node and Express, Author: Ethan Brown, O'Reilly MediaEdition: 2nd Edition (2019)
2. FlaskWebDevelopment:DevelopingWebApplicationswithPython,Miguel Grinberg, Publisher: O'Reilly Media, 2nd Edition (2018)
3. LearningPHP,MySQL&JavaScript:WithjQuery,CSS&HTML5,RobinNixonPublisher: O'Reilly Media Edition: 6th Edition (2021)

(Multidisciplinary Minor in Computer Science & Engineering)

CourseCode :24CS01TH0605   **Course:Cloud Technologies**

L:3Hrs,T:0Hr,P:0Hrs,PerWeek   **TotalCredits:03**

Course Objectives

1. Understandthecoreconceptsandarchitectureofcloudcomputing.
2. ExplorevariousservicemodelssuchasIaaS,PaaS,andSaaS.
3. Learnaboutdifferentclouddeploymentmodelsandplatforms.
4. Gainknowledgeofvirtualizationandcontainerizationtechnologies.
5. Implement applicationsusing publiccloud services like AWS, Azure,orGCP.
6. Identifychallengesandsolutionsrelatedtocloudsecurityandmanagement.

SYLLABUS

UNITI:IntroductiontoCloudComputing: Definition and Characteristics of Cloud Computing, Cloud Service Models: IaaS, PaaS, SaaS, Cloud Deployment Models: Public, Private, Hybrid, Community, Advantages and Challenges of Cloud Computing, Cloud Computing vs. Traditional Computing

UNITII:VirtualizationandContainerization: IntroductiontoVirtualization,Typesof Virtualization: Hardware, OS, Storage, Network, Hypervisors: Type 1 and Type 2, Introduction to Containers and Docker, Comparing VMs and Containers

UNITIII:CloudInfrastructureandPlatforms: CloudInfrastructureComponents:Compute, Storage, Network, Overview of AWS, Microsoft Azure, Google Cloud Platform, Storage Services:S3, Blob, Google Cloud Storage, Compute Services: EC2, Azure VM, GCP Compute Engine, Deployment and Configuration Management Tools

UNITIV:CloudSecurityandCompliance: SecurityChallengesintheCloud,CloudSecurity Principles and Controls, Identity and Access Management (IAM), Compliance Standards: ISO, GDPR, HIPAA, Security Tools and Best Practices

UNITV:CloudApplicationDevelopmentandManagement: DevelopingApplicationsforthe Cloud, Cloud Native vs. Cloud Enabled Applications, DevOps in the Cloud: CI/CD Pipelines, Monitoring and Performance Management, Cost Management and Auto-scaling

Course Outcomes:
Onsuccessfulcompletionofthecourse,studentswillbeableto:

CO1:Definethebasicconceptsandmodelsofcloudcomputing.
CO2: Compare and contrast various cloud service and deployment models.
CO3:Applyvirtualizationandcontainertechnologiesforcloudenvironments. CO4:
Utilize major cloud platforms for deploying applications.
CO5:Analyzecloudsecurityissuesandimplementbestpracticesforcloudmanagement.

Text Books

1. CloudComputing:Concepts,Technology&Architecture–ThomasErl.
2. CloudComputingBible–BarrieSosinsky.

Reference Books

1. Cloud Computing: Principles and Paradigms – Rajkumar Buyya, James Broberg, Andrzej Goscinski.
2. ArchitectingtheCloud–MichaelJ.Kavis.
3. AmazonWebServices inAction–MichaelWittig,AndreasWittig.
4. OfficialdocumentationfromAWS,Azure,andGCP.