Resolution No: AC/II(22-23).3.RPS6

S. P. Mandali's

Ramnarain Ruia Autonomous College

(Affiliated to University of Mumbai)

Syllabus for M.Sc

Program: M.Sc (Computer Science)

Program Code: Computer Science (RPSCS)

(Choice Based Credit System for the academic year 2023-2024)

GRADUATE ATTRIBUTE

S. P. Mandali's Ramnarain Ruia Autonomous College has adopted the Outcome Based Education model to make its science graduates globally competent and capable of advancing in their careers. The Post graduate Program in Science also encourages students to reflect on the broader purpose of their education.

GA	Description **A student completing Master's Degree in Computer science program will be able to:**
GA1	Demonstrate in depth understanding in the relevant science discipline. Recall, explain, extrapolate and organize conceptual scientific knowledge for execution and application and also to evaluate its relevance.
GA2	Critically evaluate, analyze and comprehend a scientific problem. Think creatively, experiment and generate a solution independently, check and validate it and modify if necessary.
GA3	Access, evaluate, understand and compare digital information from various sources and apply it for scientific knowledge acquisition as well as scientific data analysis and presentation.
GA4	Articulate scientific ideas, put forth a hypothesis, design and execute testing tools and draw relevant inferences. Communicate the research work in appropriate scientific language.
GA5	Demonstrate initiative, competence and tenacity at the workplace. Successfully plan and execute tasks independently as well as with team members. Effectively communicate and present complex information accurately and appropriately to different groups.
GA6	Use an objective, unbiased and non-manipulative approach in collection and interpretation of scientific data and avoid plagiarism and violation of Intellectual Property Rights. Appreciate and be sensitive to environmental and sustainability issues and understand its scientific significance and global relevance

GA7	Translate academic research into innovation and creatively design scientific solutions to problems. Exemplify project plans, use management skills, and lead a team for planning and execution of a task.
GA8	Understand cross disciplinary relevance of scientific developments and relearn and reskill to adapt to technological advancements.

PROGRAM OUTCOMES

PO	Description **A student completing Master's Degree in Science program in the subject of Computer Science will be able to:**
PO 1	Develop a keen interest in the emerging technologies in the industry.
PO 2	Analyse, innovate, and solve real-life case studies using technology.
PO 3	Work in teams with various disciplines,working on an interdisciplinary project.
PO 4	Understand work culture in the industry and attain skills to become a successful entrepreneur.
PO 5	Develop a skill set to analyse, describe, and innovate various methodologies to solve a given problem
PO 6	Understand the philosophy of the subject to apply to various fields of research.
PO 7	Work in an industrial environment under expert supervision and develop expertise in various technologies
PO 8	Effective utilisation of available resources to overcome challenging tasks.

M.Sc (COMPUTER SCIENCE)							
SEMESTER – III (THEORY)					**SEMESTER – III (PRACTICALS)**		
Year	**Sem**	**Course code**	**Course title**	**Credits**	**Course code**	**Course title**	**Credits**
Part II	III	RPSCS301 **Core Course**	Deep Learning	4	RPSCSP301	Practicals of Deep Learning	2
Part II	III	RPSCS302 **Core Course**	Simulation and Modelling	4	RPSCSP302	Practicals of Simulation and Modelling	2
Part II	III	RPSCS303 **SEC**	Bigdata Analytics (SEC)	4	RPSCSP303 (SEC)	Practicals of Big Data Analytics	2
Part II	III	–	–	-	RPSCP304	Project	6

M.Sc (COMPUTER SCIENCE)							
SEMESTER – IV (THEORY)					**SEMESTER – IV (PRACTICALS)**		
Year	**Sem**	**Course code**	**Course title**	**Credits**	**Course code**	**Course title**	**Credits**
Part II	IV	RPSCS401A **DSE**	Advanced Data Modelling	4	RPSCSP401A	Practicals of Advanced	2

						Data Modelling	
Part II	IV	RPSCS401B **DSE**	*Social Network Analysis*	4	RPSCSP401B	Practicals of Social Network Analysis	2
Part II	IV	--	--	--	RPSCSP402	Internship	18

SEMESTER - III

Course Code: **RPSCS301**
Course Title: **Deep Learning**

Academic Year: 2023-24

Course Outcomes	**After Completing this course student will be able to :**
CO 1	Understand fundamental concepts in deep learning.
CO 2	Compare popular deep learning frameworks such as TensorFlow, PyTorch, or Keras to develop and train deep learning models.
CO 3	Apply deep learning techniques to various real-world applications.
CO 4	Solve real-world problems and work on deep learning projects, including problem formulation, data collection, model development

COURSE CODE RPSCS301	**COURSE NAME Deep Learning**	**CREDITS 4 LECTURES**

I	Deep Learning: Deep forward Networks: Gradient-Based Learning, Hidden Unit, Back-Propagation and Other Differentiation Algorithms. Regularization of Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations	15 L
II	Convolution Networks: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, The Neuroscientific Basis for Convolutional Networks.	15 L
III	Sequence Modelling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Echo State Networks. Applications: Large Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing	15 L
IV	Deep Learning Research- Linear Factor Models: Probabilistic PCA and Factor Analysis, Independent Component Analysis (ICA), Slow Feature Analysis, Sparse Coding, Manifold Interpretation of PCA. Structured Probabilistic Models for Deep Learning: The Challenge of Unstructured Modeling, Using Graphs to Describe Model Structure, Sampling from Graphical Models, Advantages of Structured Modeling, Learning about Dependencies, Inference and Approximate Inference, The Deep Learning Approach to Structured Probabilistic Models	15 L

RPSCSP301 PRACTICAL OF RPSIT301 (Deep Learning)

Course Outcomes	**After Completing this course student will be able to :**
CO 1	Use popular deep learning frameworks such as TensorFlow, PyTorch

CO 2	Develop trained deep learning models into production environments.
CO 3	Evaluate the performance of deep learning models using appropriate evaluation metrics and techniques.

COURSE CODE **RPSCSP301**	**COURSE NAME** **PRACTICAL OF RPSIT301 (Deep Learning)**	**CREDITS** **2**
	1. Demonstrate the deep feedforward networks. 2. Demonstrate Convolution networks using a deep learning model. 3. Demonstrate Stochastic gradient descent (SGD) with Nesterov momentum 4. Demonstrate recursive neural networks 5. Demonstrate deep learning application for NLP 6. Demonstrate Echo state networks 7. Demonstrate Independent component analysis 8. Demonstrate sampling from graph models.	

Text book:

- Deep Learning Ian Goodfellow, Yoshua Bengio, Aaron Courville (Adaptive Computation and Machine Learning series) MIT Press

Course Code: RPSCS302
Course Title: **Simulation & Modeling**
Academic Year: 2023-24

Course Outcomes	**After Completing this course student will be able to :**
CO 1	Understand various simulation models
CO 2	Apply simulation models to perform projections

CO 3	Develop skills for encoding a given problem and understanding which statistical technique will help stimulate the same

COURSE CODE RPSCS302	COURSE NAME Simulation & Modeling	CREDITS 4
I	Introduction to Simulation: System and System environment, Components of system, Type of systems, Type of models, Steps in the simulation study, Advantages and Disadvantages of simulation. Simulation Examples: Simulation of Queueing systems, Other examples of simulation. Concepts of discrete event simulation, List processing, History of simulation software, Desirable software features, General-purpose simulation packages, Object-oriented simulation, Trends in simulation software Simulation Modeling : The need for Simulation, Time to simulate, Inside simulation software: Modeling the progress of Time, Modeling Variability	15 L
II	Statistical Models in Simulation: Useful statistical model, Discrete distribution, Continuous distribution, Poisson process, Empirical distribution. Queueing Models: Characteristics of Queueing systems, Queueing notations, Long run measures of performance of Queueing systems, Steady-state behaviour of infinite population Markovian models, Steady-state behaviour finite population model, Network of Queues. Random Number Generation: Properties of random numbers, Generation of pseudo-random numbers, Techniques for generating random numbers, Tests for random numbers. Inverse transform technique, Convolution method, Acceptance rejection techniques	15 L
III	Conceptual Modelling: Introduction to Conceptual modelling, Defining conceptual model, Requirements of the conceptual model, Communicating the conceptual model, Developing the Conceptual, A framework for conceptual modelling, methods of model simplification. Types of models, Analytical vs Simulation modelling, Application of simulation modelling, Agent-Based Modelling, Designing state-based behaviour	15 L

IV	Model Verification and Validation Data Collection and Analysis: Introduction, Data requirements, Obtaining data, Representing unpredictable variability, Selecting statistical distributions. Obtaining Accurate Results: Introduction, The nature of simulation models and simulation output, Issues in obtaining accurate simulation results, example model, dealing with initialization bias: warm-up and initial conditions, Selecting the number of replications and run-length. Searching the Solution Space: Introduction, The nature of simulation experimentation, Analysis of results from a single scenario, Comparing alternatives, Search experimentation, and Sensitive analysis. Verification, Validation and Confidence: Introduction, Defining Verification and Validation, The difficulties of verification and validation, Methods of verification and validation, Independent verification and validation.	15 L

PRACTICAL OF RPSCS302 (Simulation & Modeling)

Course Outcomes	**After Completing this course student will be able to :**
CO 1	Demonstrate various simulation models under anylogic software
CO 2	Illustrate the application of models for various options
CO 3	Choose the proper pathways for developing the 3D model

COURSE CODE	**COURSE NAME**	**CREDITS**
RPSCSP302	**PRACTICAL OF RPSCS302 (Simulation & Modeling)**	**2**

	1. Design and develop an agent-based model 2. Design and develop the System Dynamic model 3. Design and develop a discrete-event model that will simulate the process. 4. Design and develop a time-slice simulation for a scenario like an airport model to design how passengers move within a small airport that hosts two airlines, each with its own gate. Passengers arrive at the airport, check in, pass the security checkpoint and then go to the waiting area. After boarding starts, each airline's representatives check their passengers' tickets before they allow them to board. 5. Verify and validate a model developed like a bank model or manufacturing model & Create a defence model to simulate aircraft behaviour. 6. Demonstrate Statistical models 7. Demonstrate queuing models 8. Demonstrate random number generation 9. Case studies	

References:

1.Jerry Banks, John Carson, Barry Nelson, David Nicol, Discrete Event System
2. Simulation.Introduction to Social Network Methods: Robert A. Hanneman, Mark Riddle, University of California, 2005 [Published in digital form and available athttp://faculty.ucr.edu/~hanneman/nettext/index.html].
3. Simulation: The Practice of Model Development and Use by Stewart Robinson, John Wiley and Sons, Ltd, 2004.
4.The Big Book of Simulation Modeling: Multimethod Modeling by AndreiBorshchev, 2013

Course Code: RPSCS303
Course Title:Big Data Analytics

Academic Year: 2023-24

Course Outcomes:

Course Outcomes	**After Completing this course student will be able to :**
CO 1	Understand various Big Data Technologies

CO 2	Design the prototype and give solutions for the real world problems.
CO 3	Develop smart applications with the help of smart devices.
CO 4	Demonstrate the implementation of IoT based applications in the Cloud.
CO 5	Propose and apply automation in industry.

COURSE CODE RPSCS303	**COURSE NAME Big Data Analytics**	**CREDITS 4 LECTURES**
UNIT I	Introduction to Hadoop, Hadoop Distributed File System, MapReduce framework, YARN, Other changes, Installing Hadoop 3. Overview of Big Data Analytics: Introduction to data analytics, Introduction to big data, Distributed computing using Apache Hadoop	15 L
UNIT II	The MapReduce framework, Hive, Apache Spark, Visualisation using Tableau. Big Data Processing with MapReduce, The MapReduce framework, MapReduce job types, MapReduce patterns. Scientific Computing and Big Data Analysis with Python and Hadoop, Scientific Computing and Big Data Analysis with Python and Hadoop, Data analysis. Statistical Big Data Computing with R and Hadoop: Introduction, Methods of integrating R and Hadoop, Data analytics.	15 L
UNIT III	Batch Analytics with Apache Spark: SparkSQL and DataFrames, DataFrame APIs and the SQL API, Schema – the structure of data, Loading datasets, Saving datasets, Aggregations, Joins. Real-Time Analytics with Apache Spark Streaming, Spark Streaming, file Stream, Transformations Checkpointing, Driver failure recovery. Visualizing Big Data: Introduction, Tableau, Chart types, Using Python to visualise data, Using R to visualise data, Big data visualisation tools	15 L
UNIT IV	Importing and Exporting Data from Various DBs: Learning about data files as the database, Understanding MySQL, Understanding Excel, Understanding MongoDB, Understanding SQLite, Understanding PostgreSQL, Understanding Hive, Understanding HBase	15 L

PRACTICAL OF RPSCS303 (Big Data Analytics)

Course Outcomes	**After Completing this course student will be able to :**
CO 1	Use tools of Big data technologies

CO 2	Demonstrate techniques used in data analytics
CO 3	Apply Data visualisation techniques

COURSE CODE RPSCSP303	**COURSE NAME PRACTICAL OF RPSCS303 (Big Data Analytics)**	**CREDITS 2**
1	Demonstrate usage of HIVE in Hadoop	
2	Demonstrate queries on streams with Apache Spark	
3	Implement Mapreduce for a case study	
4	Demonstrate an application in R to implement predictive methods in data analytics.	
5	Demonstrate the usage of HBase	
6	Extract data from various sources and load it in Hadoop	
7	Demonstrate the data visualisation using R	
8	Demonstrate the data visualisation by creating a dashboard in R	
9	Demonstrate usage of HIVE in Hadoop	

Text book:

1. Big Data, Black Book: Covers Hadoop 2, MapReduce, Hive, YARN, Pig, R and Data Visualization

2. Hadoop: The Definitive Guide by Tom White 5th Edith O'Reilly.

Course Code: RPSCSP304
Course Title: PROJECT
Academic Year: 2023-24

Course Outcomes	**After Completing this course student will be able to :**
CO 1	Formulate research problem of real world
CO 2	Excel critical thinking skills to solve problems.
CO 3	Develop research quotient to bring new ideas
CO 4	Apply technical knowledge to innovate optimise solution

COURSE CODE **RPSCSP304**	**COURSE NAME** **PROJECT**	**CREDITS** **6**
The syllabus proposes project implementation as part of the semester–IV. The student is expected to give a presentation of the project proposed and get verified and sanctioned by the project guide. In addition, experimental setup, analysis of results, comparison with results of related works, conclusion and future prospects will be part of the project implementation. A student is expected to make a project implementation report and appear for a project viva. He or she needs to spend around 200-250 hours on the project implementation for which the student will be awarded 6 credits.		

SEMESTER - IV

Course Code: **RPSCS401A**
Course Title: **Advanced Data Modelling[DSE1]**

Course Outcomes	**After Completing this course student will be able to :**
CO 1	Interpret different Data modelling Techniques for handling a variety of data.
CO 2	Evaluate and Apply appropriate NoSQL database for a specific use case.
CO 3	Analyze spatial data, relationships and metrics.
CO 4	Design and implement applications for semi-structured data.

COURSE CODE RPSCS401 A	**COURSE NAME** **RPSCS401: Advanced Data Modelling**	**CREDITS** 4
UNITS	**COURSE CONTENTS**	**NO. OF LECTURES**
I	Spatial data modelling: spatial data types, Raster, vector representation, topological spatial relationships, indexing, Geographical information systems: Data management, processing, referencing and analysis, visualisation	15 L

II	Semi-structured data modelling: Semi-structured data model, Hierarchical data model, DTD, XML documents and schema, XML documents and databases, XML querying	15 L
III	Nosql: Features,Managing different data types,consistency methods,Distributed scenario, Partitioning,Query model,Storage layout,Enterprise application Evaluating Nosql:Technical ,Business,issues	15 L
IV	NoSQL data stores: features and use cases of key-value, Big Table, document database, hybrid NoSQL, search engines.	15 L

Text book:

1. NoSQL for Dummies by Adam Fowler published by Willey
2. NoSQL and SQL Data modelling By Ted Hills
3. Fundamentals of database systems Navathe
4. Principles of GIS, otto Huisman, Rolf A

RPSCSP401A:PRACTICAL OF Advanced Data M

Course Outcomes	**After Completing this course student will be able to :**
CO 1	Demonstrate techniques of handling semi structured data
CO 2	Use NO-SQL database

CO 3	Apply mechanism with spatial data

COURSE CODE	**COURSE NAME**	**Credits**
RPSCSP401A	PRACTICAL OF Advanced Data Modelling	2
	Real-world Case studies based on the following single category of databases or a combination of multiple databases 1. Semi-structured data 2. Spatial data 3. GIS 4. Nosql: Columnar data store 5. NoSQL: Key-value datastore 6. NoSQL: Graph datastore 7. NoSQL: Document datastore NoSQL: Search engine	

Course Code: **RPSCS401B [DSE2]**
Course Title: **Social Network Analysis**
Academic Year: 2023-24

Course Outcomes	**After Completing this course student will be able to :**
CO 1	Explain the working of Social Networks through real world networks
CO 2	Describe working of social networking based on graphs & algorithm
CO 3	Calculate & interpret Statistical result Social Networking

CO 4	Examine the behaviour of various different Social Networking

COURSE CODE	**COURSE NAME**	**CREDITS**
RPSCS401 B	Social Network Analysis	**2**
UNITS	**COURSE CONTENTS**	**NO. OF LECTURES**
I	Introduction to social network analysis (SNA) Introduction to networks and relations- analyzing relationships to understand people and groups, binary and valued relationships, symmetric and asymmetric relationships, multimode relationships, social networks vs. link analysis, ego-centric and socio-centric density. Visualization and applications of social networks Using graph theory for social networks analysis- adjacency matrices, edge-lists, adjacency lists, graph traversals and distances, depth-first traversal, breadth-first traversal paths and walks, Dijkstra's algorithm, graph distance and graph diameter, Hybrid representation, Applications - networks, community welfare, collaboration networks, Co-citation networks.	15 L
II	Networks, Centrality and centralization in SNA Understanding networks- density, reachability, connectivity, reciprocity, group-external and group-internal ties in networks, ego networks, extracting and visualizing ego networks, structural holes, Centrality degree of centrality, closeness and betweenness centrality, local and global centrality, centralization and graph centres, the notion of importance within the network, Google Page Rank algorithm, Analyzing network structure-bottom-up approaches using cliques,	15 L

	N-cliques, N-clans, K-plexes, K-cores, blocks and cut-points, lambda sets and bridges & factions.	
III	Measures of similarity and structural equivalence in SNA Approaches to network positions and social roles-defining equivalence similarity, structural equivalence, automorphic equivalence, finding equivalence sets, brute force and Tabu search, regular equivalence, the equivalence of distances: Maxim, regular equivalence, Measuring similarity/dissimilarity- valued relations, Pearson correlations covariance and cross-products, Euclidean, Manhattan, and squared distances, binary relations, Jaccard, Hamming distance	15 L
IV	Two-mode networks for SNA Understanding mode networks- Bi-partite data structures, visualizing two-mode data, Singular value decomposition (SVD) analysis, two-mode factor analysis. Predicting Human Behavior and Privacy Issues Understanding and predicting human behaviour for social communities, User data Management, Enabling human experience, Privacy on social networks	15L

References:

1. Introduction to Social Network Methods: Robert A. Hanneman, Mark
2. Riddle, University of California, 2005 [Published in digital form and available athttp://faculty.ucr.edu/~hanneman/nettext/index.html].
3. Social Network Analysis for Startups- Finding connections on the social web: MaksimTsvetovat, Alexander Kouznetsov, O'Reilly Media, 2011.
4. Social Network Analysis- 3rd edition, John Scott, SAGE publications, 2012.
5. Ajith Abraham, Aboul Ella Hassanien, Václav Snášel, —Computational Social Network Analysis: Trends, Tools and Research Advances‖, Springer, 2012
6. Charu C. Aggarwal, —Social Network Data Analytics‖, Springer; 2014

RPSCS401B:Practical of Social Network Analysis

Course Outcomes	**After Completing this course student will be able to :**
CO 1	Illustrate the working of Social Networks through real world networks
CO 2	Demonstrate working of social networking based on graphs & algorithm
CO 3	Interpret Statistical result Social Networking

COURSE CODE	**COURSE NAME**	**Credits**
RPSCS401B	Practical of Social Network Analysis	2
	1. Write a program to compute the following for a given a network: 1. number of edges, 2. a number of nodes; 3. degree of the node; 4. node with the lowest degree; 5. the adjacency list; 6. matrix of the graph. 7. Length of the shortest path 8. edge list 2. Perform the following tasks: 1. View data collection forms and/or import one-mode/two-mode datasets; 2. Basic Networks matrices transformations 3. Compute the following node level measures: 1. Density; 2. Degree; 3. Reciprocity; 4. Transitivity; 5. Centralization; 6. Clustering. 7. equivalence 4. Create sociograms for the persons-by-persons network and the committee-by-committee network for a given relevant problem. Create a one-mode network and two-node network for the same.	

	5. Bipartite Graph 6. Hamming distance, Manhattan, Euclidean 7. Perform SVD analysis of a network. 8. Case studies

Course Code: **RPSCSP402**
Course Title: **INTERNSHIP**
Academic Year: 2023-24

Course Outcomes	**After Completing this course student will be able to :**
CO 1	Introduce the students to the real world work environment.
CO 2	Explore new and upcoming trends and technologies in the IT Industry.
CO 3	Develop a professional portfolio enhancing their competitiveness in the market
CO 4	Develop professional skills required in a professional work environment.
CO 5	Excel Team Building capacities, cooperation and coordination among themselves, communications skills and many more.

COURSE CODE RPSCSP402	**COURSE NAME** **INTERNSHIP** (**Approx.** 600-650 **hrs)**	**CREDITS 18**
The syllabus proposes an internship for about 600-650 hours to be done by a student. It is expected that a student chooses an IT or IT-related industry and formally works as a full time intern during the period. The student should give a presentation of the internship subject as the part of internship evaluation with proper documentation of the attendance and the type of work he or she has done in the chosen organisation. Proper certification (as per the guidelines given) by the person, to whom the student was reporting, with the Organization's seal should be attached as part of the documentation. Students will be awarded 14 credits for the entire internship along with the final presentation in front of the examiners.		

MSc Part II (Sem III & IV) EVALUATION SCHEME

THEORY

Internal Exam - 40 Marks

1. **20 Marks -- MCQ Test:**

Test will be taken based on any of the unit/units as informed by the faculty in-charge.

1. **20 Marks –**

Assignments based on syllabus or any other topic in demand based on syllabus.

Note: Students have to acquire at least 40% marks in each paper individually.

External Examination- 60%- 60 Marks

Semester End Theory Examination: (Deviation from the usual modality)

External Examination - 60 Marks Duration 2½ Hrs

- **Pandemic changes**
  - MCQ

Theory Question Paper Pattern:-

All Questions are Compulsory		
Questions	**Based On**	**Marks**
Q1	Unit I	12
Q2	Unit II	12
Q3	Unit III	12
Q4	Unit IV	12
Q5	MIX	12

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- **Each Question will have 3 sub-questions carrying 6 marks each, out of which student has to answer any 2.**

Note: Students have to acquire at least 40% marks in each paper individually.

PRACTICAL

Internal Exam - 20 Marks

1. Innovative Practical -- 10 Marks

1. It can be clubbed with assignments.
2. Research paper review to be done for an application.

2. Regularity -- 10 Marks

1. Timely submission of practical's on the Google classroom.
2. Attendance should be 75%.
3. Submission of e-journal on time.

Note: Students have to acquire at least 40% marks in each paper individually.

External Examination - 30 Marks Practical Question -

- 1 or 2 questions can be asked in the practical exam for each paper.
- External will be called for evaluating the same.

- **Pandemic changes**
  - MCQ, Viva, Written submission.

Note:

1. **Students who have submitted their e-Journal and are certified are only allowed to appear for the exam.**
2. **Students have to acquire at least 40% marks in each paper individually.**

PROJECT EVALUATION - 150 Marks

Internal evaluation - 60 Marks

- Abstract submission & literature Survey / sample data collection - 10 Marks
- Technology Implementation - 10 marks
- Mid-Term Presentation - 20 Marks
- Project Documentation- 20 marks

External evaluation - 90 Marks

- Project Quality - 20 Marks.
- Project Implementation - 40 Marks.
- Presentation - 30 Marks.

A Student should submit project implementation report with following details:

1. **Title:** Title of the project.
2. **Implementation details:** A description of how the project has been implemented. It shall be of 2 to 4 pages.
3. **Experimental set up and results:** A detailed explanation on how experiments were conducted, what software used and the results obtained. Details like screen shots, tables and graphs can come here. It shall be of 6 to 10 pages.
4. **Analysis of the results:** A description on what the results means and how they have been arrived at. Different performing measures or statistical tools used etc may be part of this. It shall be of 4 to 6 pages.
5. **Conclusion:** A conclusion of the project performed in terms of its outcome (May be half a page).
6. **Future enhancement:** A small description on what enhancement can be done when more time and resources are available (May be half a page).
7. **Program code:** The program code may be given as appendix.

Note:

1. **Students have to acquire at least 40% marks in project evaluation.**
2. **Internal evaluation will be done by the Project guide allotted.**
3. **Timely submission on google classroom as per requirement is must, regularity will be determined based on that.**
4. **Attendance should be 75%.**

INTERNSHIP EVALUATION - 450 Marks

Internal evaluation - 180 Marks

Following are the guidelines for evaluation:

1. Job description : 20 Marks
2. Technical knowledge/skills : 40 Marks
3. Innovation & creativity : 40 Marks
4. Adherence to Schedule (weekly activity report) : 20 Marks
5. Soft Skills (Communication, Team work, Resource Management, Leadership qualities) : 40 Marks
6. Discipline & behavior : 20 Marks

External evaluation - 270 Marks (50% by employer & 50% by external examiner)

On the basis of the detailed internship report submitted by the student duly signed by the employer and the internal faculty. A presentation is expected from the student for sharing his / her learning experience and work done at the internship.

Following are the guidelines for evaluation:

1. Internship Report : 30 Marks
2. Innovation and creativity : 50 Marks
3. Experience based learning : 50 Marks
4. Viva : 20 Marks
5. Internship Genuineness : 20 Marks
6. Soft Skills : 30 Marks
7. Suitability & Clarity of material presented : 30 Marks
8. Quality of oral presentation : 40 Marks

Note: - Students need to find Internship by themselves. It's their responsibility.

Following things are expected to be completed by the student for the final evaluation.

1) The syllabus proposes an internship for about 600 hours to be done by a student.
2) It is expected that a student chooses an IT or IT-related industry and formally works as a full time intern during the period.
3) Evaluation will be done based on the feedback given by the employers about the student.
4) The student should subject oneself with an internship evaluation with proper documentation of the attendance and the type of work he or she has done in the chosen organization.

Following are the guidelines laid for the same

1) Internship joining Letter with proper job description.
2) Weekly Report in Excel format to be shown every week to Internal In-charge
   - Start date
   - End date
   - Task Assigned
   - Task completed
   - Outcome / Learning's
3) Internship completion Letter with proper hours & task completed.
4) Employer Feedback Form is prepared to assess based on the following:
   - Skills/ Knowledge
   - Self-Management
   - Dependability
   - Attitude
   - Relationships
5) Internship report :
   - Organization Overview
   - Description (Role, Activities, Technology Used, Live project link or screenshots)
   - SWOT Analysis
   - Introspection (knowledge acquired, Skills learned, challenging task performed)
   - Employers Feedback.
6) Proper certification by the person, to whom the student was reporting, with the Organization's seal should be attached as part of the documentation.

Note: - Students need to find Internship by themselves. It's their responsibility

PASSING CRITERIA 40%: - Students must acquire a minimum of 40% marks in each course individually (Theory, Practical, Project & Internship).