MAHARISHI MARKANDESHWAR (DEEMED TO BE UNIVERSITY)

MULLANA-AMBALA, HARYANA (INDIA), 133-207

(Established under Section 3 of UGC Act, 1956)

(Accredited by NAAC with Grade A++)

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*** Since all supporting documents for this metric exceeds the upload limit of 5Mb, we are providing samples as shown below. If required, we will provide all/any supporting documents.**

M. M. Institute of Computer Technology & Business Management, Maharishi Markandeshwar (Deemed to be University), Mullana

(Established under Section 3 of the UGC Act, 1956)
(Accredited by NAAC with Grade 'A++')

Minutes of the meeting of Board of Studies in Computer Applications held on **16.07.2024** (Tuesday) at 11:30 am in the Board Room of M.M. Institute of Computer Technology & Business Management, MM (DU), Mullana.

The following members attended the meeting:

1. Dr. Sumit Mittal, Professor & Principal, MMICTBM	Chairman, BOS
2. Dr. Rattan Pal Singh Rana, Professor, MMICTBM	Member
3. Dr. Vivek Shrivastava, Professor, MMICTBM	Member
4. Dr. Tejinder Pal Singh Brar, Professor, MMICTBM	Member
5. Dr. Dalip, Assoc. Professor, MMICTBM	Member
6. Dr. Deepa Nehra, Assoc. Professor, MMICTBM	Member
7. Dr. Pooja Rani, Assoc. Professor, MMICTBM	Member
8. Ms. Manju Bagga, Asstt. Professor, MMICTBM	Member

Chairman, BOS welcomed all the members for attending the meeting.

The following items were discussed in the meeting:

1. Approved the minutes of last meeting of Board of Studies held on 02.02.2024 and its action taken report.

2. Considered and approved the new syllabi of the following courses as per NEP-2020 from the batch 2022-26 onwards w.e.f the academic session 2024-25:
   (i) BCA-3rd year (5th Sem. & 6th Sem.) **Annexure-I**
   (ii) BCA-3rd year (5th Sem. & 6th Sem.) with specialization in Artificial Intelligence and Machine Learning **Annexure-II**
   (iii) BCA-3rd year (5th Sem. & 6th Sem.) with specialization in Data Science **Annexure-III**

3. Considered and approved the minor changes in the scheme of the following courses from the batch 2023-27 onwards w.e.f the academic session 2024-25:
   (i) BCA-2nd year (3rd Sem. & 4th Sem.) **Annexure-IV**
   (ii) BCA-2nd year (3rd Sem. & 4th Sem.) with specialization in Artificial Intelligence and Machine Learning **Annexure-V**
   (iii) BCA-2nd year (3rd Sem. & 4th Sem.) with specialization in Data Science **Annexure-VI**

   The syllabi of 2nd year would remain the same for BCA, BCA with specialization in Artificial Intelligence & Machine Learning and BCA with specialization in Data Science **as per Annexure-VIA.**

4. Considered and approved the changes of course objectives and course outcome in the syllabi of the following from academic session 2024-25:
   (i) MCA-1st year (1st Sem. & 2nd Sem.) **Annexure-VII**
   (ii) MCA-2nd year (3rd Sem. & 4th Sem.) **Annexure-VIII**

5. Considered and approved the scheme & syllabi of B.Sc. (Programming & Data Science) -1st year (1st Sem. & 2nd Sem.) under Choice Based Credit Scheme (CBCS) as per NEP-2020 from the batch 2024-28 onwards w.e.f the academic session 2024-25. **Annexure-IX**

6. Considered and approved the scheme & syllabi of B.Sc. (Artificial Intelligence & Machine Learning)-1st year (1st Sem. & 2nd Sem.) under Choice Based Credit Scheme (CBCS) as per NEP-2020 from the batch 2024-28 onwards w.e.f the academic session 2024-25. **Annexure-X**

7. Considered and approved the list of MOOC subjects for BCA & MCA students for the session 2024-25 (Odd Sem.) under the category of SWAYAM courses. **Annexure-XI**

8. Considered and approved the Paper Setters for the examinations to be held in Nov/Dec, 2024 for the following courses:
   (i) BCA - 1st Sem., 3rd Sem. & 5th Sem.
   (ii) BCA (OL) - 1st Sem., 2nd Sem., 3rd Sem., 4th Sem. & 5th Sem.
   (iii) MCA - 1st Sem. & 3rd Sem.
   (iv) MCA (OL) - 1st Sem., 2nd Sem. & 3rd Sem.
   (v) Ph.D Course Work examinations
   (vi) B.Sc (Programming & Data Science) - 1st Sem.
   (vii) B.Sc (Artificial Intelligence & Machine Learning) - 1st Sem.

9. Based on the benchmarking and feedback collected from various stakeholders on Curriculum for the session 2023-24, the following changes has been incorporated in the syllabi of BCA-3rd year to be implemented from AY 2024-25:

S.No.	Course Code	Nomenclature	Percentage Change in Syllabus
1	BCA-501	Open-Source Programming	25%
2	BCA 508	Artificial Intelligence	30%
3	BCA 510	Big Data Analytics	100%
4	BCA 512	Data Science	100%
5	BCA 514	Internet of Things	25%
6	BCA 515	E-Commerce	43%
7	BCA 516	Software Quality Assurance & testing	20%
8	BCA 517	Theory of Computation	100%
9	BCA-518	Neural Network and fuzzy Logic	100%
10	BCA 519	Data Warehousing & Data Mining	100%
11	BCA 520	Soft Computing	100%
12	BCA 521	Natural Language Processing	100%
13	BCA 522	NO SQL Database	100%
14	BHUM-003	Entrepreneurship Development & Management	100%
15	BCA 606	Machine Learning	100%
16	BCA 608	Data Visualization	100%
17	BCA 610	Cyber Security	25%
18	BCA 611	Computer Graphics	20%
19	BCA 612	Software Project Management	100%
20	BCT- I	Cognitive Skills Training – I	100%
21	BCT- II	Cognitive Skills Training - II	100%

10. Discussed and approved the attainment levels for POs, PSOs and Cos for MCA program:
   (i) CO Attainment Level:
   Average Percentage >65%: Level 3
   Average Percentage (>=55 & <65): Level 2
   Average Percentage (>=50 & <55): Level 1
   Average Percentage (<50): Level 0
   (ii) PO Attainment Target Level:
   55%: For PO1, PO2, PO3, PO4, PO5, PO8, PO9, PO11

50% For PO6, PO7, PO10, PO12

(iii) PSO Attainment Target Level:

55%: For PSO1, PSO2, PSO3, PSO4

11. Considered and approved the syllabi of the following value added course:

Sr. No.	Course Code	Nomenclature	Duration (In Hours)	Proof
1.	VA-MCA-06	ChatGPT and Generative AI	16	Annexure-XII
2.	VA-MCA-07	Cisco Packet Tracer for Computer Networks	16	Annexure-XIII

12. Considered and approved the Synopsis and Name of the Supervisor of the following Ph.D research scholars:

Sr. No.	Name of Scholar	Name of Supervisor	Title of Synopsis	Date of Approval by RAC
1.	Deepak Kumar (22-Ph.D-122)	Dr. Ravi Kumar Sharma, Assoc. Professor	An Enhanced Framework To Detect Kidney Stone Using Machine Learning	03.02.2024
2.	Ruby (22-Ph.D-124)	Dr. Swati Rawat, Asstt. Professor	Design an Enhanced Framework for Prognosis of Heart Disease using Deep Learning Techniques	03.02.20224
3.	Narinder Pal Singh (22-Ph.D-125)	Dr. Rattan Pal Singh Rana, Professor	Design a Sustainable and Cost-Effective AI-based Prediction Model for the Classification of Maize using Data-Centric Approach for Starch Industry	16.03.2024
4.	Anjul Bhardwaj (18-MCM-123)	Dr. Vivek Bhatnagar, Assoc. Professor	Deep Learning Model for Diabetic Hypertensive Retinopathy Detection in Fundus Images through Transfer Learning	29-06-2024

The meeting ended with a vote of thanks.

-Sd-
Chairman
Board of Studies

Endst. No. MMICTBM/BOS/2024/356 Dated: 17.07.2024

A copy of the above is forwarded to the following for information and necessary action:

1. Controller of Examinations, MM(DU), Mullana
2. Dean, Academic (Technical), MM(DU), Mullana
3. Concerned Members, MMICTBM
4. Deputy Registrar (Academic), MM(DU), Mullana
5. Administrative Officer (Accounts), MM(DU), Mullana
6. Dr. Sonal Chawla, Professor,
   Department of Computer Science & Applications,
   Panjab University, Chandigarh
7. Mr. Mukesh Gupta, Sr. Manager,
   Mahindra & Mahindra Ltd., Mohali

Chairman
Board of Studies 17.07.24

M. M. Institute of Computer Technology & Business Management,
Maharishi Markandeshwar (Deemed to be University), Mullana
Established under Section 3 of the UGC Act, 1956
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A meeting of the Board of Studies in Computer Science & Applications held on **24.03.2025 (Monday)** at **02:30 pm** in the Board Room of M.M. Institute of Computer Technology & Business Management, MM (DU), Mullana.

The following members attended the meeting:

1. Dr. Sumit Mittal, Professor & Principal, MMICTBM	Chairman
2. Dr. Pardeep Mittal, Professor, DCSA, KUK	External Expert
3. Dr. Rattan Pal Singh Rana, Professor, MMICTBM	Member
4. Dr. Tejinder Pal Singh Brar, Professor, MMICTBM	Member
5. Dr. Sanjeev Puri, Professor, MMICTBM	Member
6. Dr. Vivek Bhatnagar, Professor, MMICTBM	Member
7. Dr. Ravi Kumar Sharma, Assoc. Professor, MMICTBM	Member
8. Dr. Bharti Sharma, Assoc. Professor, MMICTBM	Member
9. Ms. Ritu Pandey, Asstt. Professor, MMICTBM	Member
10. Dr. Rubika Walia, Asstt. Professor, MMICTBM	Member

Mr. Rohit Krishna, External Expert & Dr. Vivek Shrivastava, Internal Member couldn't attend the meeting due to the official assignments.

Chairman, BOS welcomed all the members for attending the meeting.

The following items were discussed in the meeting:

1. Approved the minutes of last meeting of Board of Studies held on 16.07.2024 and its action taken report.

2. Considered and approved the minor changes in the scheme of 3rd year for the following courses as per NEP-2020 under Choice Based Credit Scheme (CBCS) for the batches 2023-27 & 2024-28:
   (i) BCA **Annexure-I**
   (ii) BCA with specialization in Artificial Intelligence and Machine Learning **Annexure-II**
   (iii) BCA with specialization in Data Science **Annexure-III**

3. Considered and approved the new syllabi of the following courses as per NEP-2020 for the batches 2022-26, 2023-27 & 2024-28 w.e.f the academic session 2025-26: **Annexure-IV**
   (i) BCA (Hons. / Hons. with Research) - 4th year (7th Sem. & 8th Sem.)
   (ii) BCA (Hons. / Hons. with Research) - 4th year (7th Sem. & 8th Sem.) with specialization in Artificial Intelligence and Machine Learning
   (iii) BCA (Hons. / Hons. with Research) - 4th year (7th Sem. & 8th Sem.) with specialization in Data Science

4. Considered and approved the scheme & syllabi of B.Sc. (Artificial Intelligence & Machine Learning)-2nd year (3rd Sem. & 4th Sem.) under Choice Based Credit Scheme (CBCS) as per NEP-2020 for the batches 2024-28 w.e.f the academic session 2025-26. **Annexure-V**

5. Considered and approved the scheme & syllabi of B.Sc. (Programming & Data Science) -2nd year (3rd Sem. & 4th Sem.) under Choice Based Credit Scheme (CBCS) as per NEP-2020 for the batches 2024-28 w.e.f the academic session 2025-26. **Annexure-VI**

6. Considered and approved the scheme & syllabi of M.Sc. (Artificial Intelligence & Machine Learning)-1st year (1st Sem. & 2nd Sem.) under Choice Based Credit Scheme (CBCS) as per NEP-2020 from the batches 2025-27 onwards w.e.f the academic session 2025-26. **Annexure-VII**

7. Considered and approved the syllabi of the following value-added courses: **Annexure-VIII**

Sr. No.	Course Code	Nomenclature	Duration (In Hours)
1.	VA-MCA-07	Network Design & Simulation using Cisco Packet Tracer	16
2.	VA-MCA-08	Data Visualization Using Power BI	16

8. Considered and approved the list of MOOC subjects for BCA, B.Sc, MCA & M.Sc students for the session 2025-26 (Odd Semester) under the category of SWAYAM Courses. **Annexure-IX**

9. Considered and approved the Panel of Paper Setters for the examinations to be held in May/June/July, 2025 for the following courses:
   (i) BCA/BCA (OL) - 2nd Sem., 4th Sem. & 6th Sem. examinations
   (ii) BCA (OL) - 1st Sem., 3rd Sem. & 5th Sem. examinations
   (iii) MCA/MCA (OL) - 2nd Sem. & 4th Sem. examinations
   (iv) MCA (OL) - 1st Sem. & 3rd Sem. examinations
   (v) B. Sc. (Artificial Intelligence & Machine Learning) - 2nd Sem. examinations
   (vi) B. Sc. (Programming & Data Science) - 2nd Sem. examinations
   (vii) Ph.D Course Work examinations

10. Considered and approved the Panel of Paper Setters for the examinations to be held in Nov/Dec, 2025 for the following courses:
   (i) BCA/BCA (OL) - 1st Sem., 3rd Sem. & 5th Sem. examinations
   (ii) BCA (OL) - 2nd Sem., 4th Sem. & 6th Sem. examinations
   (iii) MCA/MCA (OL) - 1st Sem. & 3rd Sem. examinations
   (iv) MCA (OL) - 2nd Sem. & 4th Sem. examinations
   (v) B. Sc. (Artificial Intelligence & Machine Learning) - 1st Sem. & 3rd Sem. examinations
   (vi) B. Sc. (Programming & Data Science) - 1st Sem. & 3rd Sem. examinations
   (vii) M. Sc. (Artificial Intelligence & Machine Learning) - 1st Sem. examinations
   (viii) Ph.D Course Work examinations

11. Considered and approved the Synopsis and the Name of the Supervisor of the following Ph.D research scholars:

Sr. No.	Name of Scholar	Name of Supervisor	Title of Synopsis	Date of Approval (RAC)
1.	Sunita Rani (22-Ph.D-120)	Dr. Tejinder Kaur	Fraud Detection in Healthcare Insurance Using Machine Learning	08.07.2024
2.	Preeti Kathuria (22-Ph.D-123)	Dr. Deepa Nehra	Design A Machine Learning Model for Skin Cancer Detection	26.07.2024
3.	Vandana Rani (23-Ph.D-165)	Dr. Rattan Pal Singh Rana	Design an AI-Based Model for Prediction of Malnutrition using Machine Learning Approach	26.07.2024
4.	Muskan Aggarwal (23-Ph.D-175)	Dr. Shikha Verma	An Ensemble Based Machine Learning Model for Stock Price Prediction Using Sentiment Analysis	07.09.2024
5.	Preety Sharma (23-Ph.D-170)	Dr. Ravi Kumar Sharma	An Enhanced Model for the Prediction of Maintainability of Object-Oriented Software System Using Soft Computing Techniques	10.10.2024
6.	Amandeep Kaur (23-Ph.D-169)	Dr. Archana Sandhu	Development of a Hybrid Model for Overlapped Plant Leaf Disease Detection Using Deep Learning	19.10.2024
7.	Ruchi Sharma (23-Ph.D-172)	Dr. Archana Sandhu	Design of a Multimodal for Skin Cancer Detection Using Machine Learning	19.10.2024
8.	Gulshan Kumar (23-Ph.D-171)	Dr. Chandani Sharma	Develop a Model to detect the Multi-Class Weed Species in Mixed Crop using Hybrid Deep Learning Techniques	04.01.2025
9.	Tejinder Sharma (23-Ph.D-176)	Dr. Bharti Sharma	A Federated Learning Framework for DDoS Attacks Detection in Internet of Medical Things (IoMT)	04.01.2025
10.	Chetna Sharma (23-Ph.D-168)	Dr. Chandani Sharma	An Enhanced Model for Alzheimer's disease Classification and Detection using Hybrid Deep Learning Techniques	29.01.2025

12. Considered and approved the Panel of examiners for the evaluation of Ph.D thesis of the following research scholars:
    (i) Mr. Peerzada Hamid Ahmad, Regn. No. 13-MCM-212 under the supervision of Dr. Munishwar Rai.
    (ii) Ms. Bhavna Vohra, Regn. No. 20-Ph.D-074 under the supervision of Dr. Sumit Mittal.
    (iii) Ms. Priya Vij, Regn. No. 20-Ph.D-075 under the supervision of Dr. Dalip.
    (iv) Mr. Lakhvinder Singh, Regn. No. 20-Ph.D-076 under the supervision of Dr. Dalip.
    (v) Mr. Rajan Saluja, Regn. No. 21-Ph.D-104 under the supervision of Dr. Munishwar Rai.
    (vi) Mr. Deepak Pandey, Regn. No. 21-Ph.D-105 under the supervision of Dr. Rajeev Gupta.

(vii) Mr. Sunil Kumar, Regn. No. 22-Ph.D-117 under the supervision of Dr. Pooja Rani.

13. Considered and approved the new scheme and syllabi of BCA/BCA (Hons.)/BCA (Hons. with Research) from 1st year to 4th year under Choice Based Credit Scheme (CBCS) as per NEP-2020 from the batch 2025-29 onwards w.e.f the academic session 2025-26. The syllabi of 1st year & 2nd year would remain the same for BCA, BCA with specialization in Artificial Intelligence & Machine Learning and BCA with specialization in Data Science.

Annexure-X

14. Considered and approved the new scheme & syllabi of B.Sc. (Artificial Intelligence & Machine Learning)-1st year (1st Sem. & 2nd Sem.) under Choice Based Credit Scheme (CBCS) as per NEP-2020 from the batches 2025-29 onwards w.e.f the academic session 2025-26. **Annexure-XI**

15. Considered and approved the scheme & syllabi of B.Sc. (Programming & Data Science))-1st year (1st Sem. & 2nd Sem.) under Choice Based Credit Scheme (CBCS) as per NEP-2020 from the batches 2025-29 onwards w.e.f the academic session 2025-26. **Annexure-XII**

16. Considered and approved the new scheme and syllabi of MCA program from 1st year to 2nd year under Choice Based Credit Scheme (CBCS) from the batches 2025-27 onwards w.e.f the academic session 2025-26. **Annexure-XIII**

17. Considered and approved the minor changes in the scheme of MCA-2nd year for the under Choice Based Credit Scheme (CBCS) for the batch 2024-26. **Annexure-XIV**

18. Based on the feedback collected from various stakeholders on Curriculum for the session 2024-25, the following changes has been incorporated in the syllabi of BCA (1st yr. to 4th yr.) & MCA (1st yr. to 2nd yr.) to be implemented from the Academic Year 2025-26:

Sr. No.	Course Code	Nomenclature	Percentage Change in Syllabus
1	BCA - 101	Problem Solving using C	25%
2	BCA - 102	Computer Fundamentals & MS Office	20%
3	BCA - 201	Object Oriented Programming Using C++	25%
4	BCA - 510	Data Science	20%
5	BCA - 608	Data Visualization	60%
6	BCA - 610	Cyber Security	20%
7	MCA - 209	Web Technologies	60%
8	MCA - 301	Programming with Python	25%
9	MCA - 407	Big Data Analytics	100%

The meeting ended with a vote of thanks.

-Sd-
Chairman
Board of Studies

Endst. No. MMICTBM/BOS/2025/70 Dated: 10.04.2025

A copy of the above is forwarded to the following for information and necessary action:

1. Controller of Examinations
2. Dean, Faculty of Engineering & Technology
3. Dean, Academic (Technical)
4. Concerned Members, MMICTBM
5. Deputy Registrar (Academic)
6. Administrative Officer (Accounts)
7. Dr. Pardeep Mittal, Professor,
   Dept. of Computer Science & Applications,
   Kurukshetra University, Kurukshetra
8. Mr. Rohit Krishna, QA Manager,
   Edifees Technologies, Mohali

Chairman
Board of Studies 10.04.25

O/C

M.M. INSTITUTE OF COMPUTER TECHNOLOGY & BUSINESS MANAGEMENT,
MAHARISHI MARKANDESHWAR (DEEMED TO BE UNIVERSITY), MULLANA–AMBALA

DETAILS OF SYLLABUS REVISION IN BCA-3RD YEAR FROM SESSION 2024-25

Detailed Syllabus (Prior to revision)	Detailed Syllabus (Post revision)	% age revision
BCA-501	**Open-Source Programming**	
Unit-I Open Source: Introduction, Need, Commercial Software vs Open Source Software, Free Software vs Freeware. Open source development models, Advantages, Disadvantages and Application of Open Sources. Web Servers: Local Servers and Remote Servers, Installing Web servers: Internet Information Server (IIS), Apache Web Server, XAMPP Server and Personal Web Server (PWS). **Unit-II** PHP: Introduction to PHP, Start and End Tags, Data types, Variables, Constants, Operators and Expressions, Printing data on PHP page, Control statements: if, switch case, for, while, do while. Iterations and Functions, Working with Forms: Get and Post Methods, Query strings, HTML form controls and PHP. Working with Files: Opening and Closing Files, Reading and Writing files to the Web Server. **Unit-III** Database applications with MySQL: Introduction to MySQL & its applications, Regular Expressions, Object Oriented Programming with PHP and MySQL, Open Source MySQL, Querying a MySQL database using PHP, Process User Input, Writing to Web Databases, Database Insert Update and Delete, Issues in Writing Data to Databases and generate reports. Static website vs Dynamic website development. **Unit-IV** PHP Frameworks: Introduction to PHP frameworks, Features PHP frameworks, Concepts, Local environment setup, Text editor, Installation on UNIX/Linux/Windows OS. Introduction to WordPress, Setting WordPress: Dashboard settings, General setting, Writing setting, Reading setting, WordPress categories, Posts, Media, Pages, Plugins, Themes.	**Unit-I** Open Source: Introduction, Need, Commercial Software vs Open Source Software, Free Software vs Freeware. Open source development models, Advantages, Disadvantages and Application of Open Sources. Web Servers: Local Servers and Remote Servers, Installing Web servers: Internet Information Server (IIS), Apache Web Server, XAMPP Server and Personal Web Server (PWS). **Unit-II** **PHP:** Introduction to PHP, History, why choose PHP. **Installation:** Installation overview, configuration, advantage of PHP over other scripting language, Start and End Tags, creating a PHP script. **Data Types and Control Structures:** Data types, Variables, Constants, Operators and Expressions, Printing data on PHP page, handle error in PHP script, Control statements: if, switch case, for, while, do while, Mixing Decisions and looping with Html, Iterations and Functions, Working with Forms: Get and Post Methods, Query strings, HTML form controls and PHP. Working with Files: Opening and Closing Files, Reading and Writing files to the Web Server. **Unit-III** **Database applications with MySQL:** Introduction to MySQL & its applications, Object Oriented Programming with PHP and MySQL, Open Source MySQL, Connection with MySQL database, Querying a MySQL database using PHP, Process User Input, Performing basic database operations (Insert, Delete, Update, Select), Data Dealing with Multi-value filed, and Generating File uploaded form, redirecting a form after submission. **Unit-IV** **PHP Frameworks:** Introduction to PHP frameworks, Features PHP frameworks, Concepts, Introduction to Session Control, Session Functionality, Installation on UNIX/Linux/Windows OS. Introduction to WordPress, Setting WordPress: Dashboard settings, General setting, Writing setting, Reading setting, WordPress categories, Posts, Media, Pages, Plugins, Themes.	**25%**
BCA 508	**Artificial Intelligence**	
Unit-I **Introduction**: Background and history, AI applications areas. The Turing Test, Knowledge, Knowledge Pyramid. **Problem Representation:** State space representation of problems, problem reduction representation, truth maintenance system. **Game Playing:** Introduction, main component of game playing, game playing strategies (minimax, minimax with alpha beta cutoff), problems in game playing. **Unit-II** **Search Strategies**: Strategies for state space search-data driven and goal	**Unit-I** **Introduction**: Background and History, Present state of AI, Applications areas, Nature of AI problems, examples of AI problems, Turing test, Learning agents **Problem Representation:** Problem solving techniques, state space search, control strategies, heuristic search, problem characteristics, Problem reduction representation **Unit-II** **Search Strategies**: Uninformed Search: Depth First Search (DFS), Breadth First Search (BFS). Informed Search: Best First Search, A*. Local Search: Hill Climbing. Problem Reduction Search: AO*. Population Based Search: Ant Colony Optimization, Genetic Algorithm. Game Playing: Main component of game playing, Min Max Algorithm,	

driven search: Search algorithms-Brute Force Search (depth first, breadth first) and Heuristic search (Hill climbing, best first, A*, AO* algorithm, beam search, constraint satisfaction, mean end analysis), Time and Space complexity. **Unit-III** **Logic Programming and Knowledge Representation**: The predicate calculus, Syntax and semantic for propositional logic and FOPL, Clausal form, inference rules, resolution and unification. **Network Representation**-Associative network & conceptual graphs, conceptual dependencies, structured representation- Frames & Scripts. **Production system**: Introduction, Types of production system, Control of search in production system. **Unit-IV** **Expert System:** Components of Expert System: Knowledge Base, Inference Engine, User Interface, Features of Expert System, Expert System Life Cycle, Categories of Expert System,Application Areas of Expert System. **Rule based expert systems:** Architecture, development, managing uncertainty in expert systems (Bayesian probability theory, Stanford certainty factor algebra, Fuzzy logic).	Alpha-Beta Pruning. **Unit-III** **Logic Programming and Knowledge Representation**: The predicate calculus, Syntax and semantic for propositional logic and FOPL, Clausal form, inference rules, resolution and unification. **Network Representation**-Associative network & conceptual graphs, conceptual dependencies, structured representation- Frames & Scripts. **Production system**:Introduction, Types of production system, Control of search in production system. **Unit-IV** **Expert System:** Components of Expert System: Knowledge Base, Inference Engine, User Interface, Features of Expert System, Expert System Life Cycle, Categories of Expert System,Application Areas of Expert System. **Rule based expert systems:** Architecture, development, managing uncertainty in expert systems (Bayesian probability theory, Stanford certainty factor algebra, Fuzzy logic).	30%
BCA 510 Big Data Analytics		
	Unit-I Introduction to Big Data: Types of Digital Data-Characteristics of Data, Evolution of Big Data, Definition of Big Data, Challenges with Big Data, 3Vs of Big Data, Business Intelligence vs. Big Data, Data warehouse and Hadoop environment – Coexistence. **Unit-II** Classification of BIG data analytics: Terminologies in Big Data, CAP Theorem, BASE Concept. Types of Databases – comparison of New SQL - SQL vs. NOSQL vs New SQL, Overview of Hadoop: Features, Hadoop vs. SQL, RDBMS vs. Hadoop. Introduction to Machine learning: Linear Regression – Clustering - Collaborative filtering - Association rule mining - Decision tree. **Unit-III** BI and Decision Making: Introduction to Business Intelligence with data, Information and knowledge, Decision Support System, Operational data vs. informational data, Determining BI Cycle, BI Environment and Architecture, Role of Business Intelligence in an Organization Decision Making Concepts :Concepts of Decision Making, Techniques of Decision Support System (DSS), Development of Decision Support System (DSS), Applications of DSS, Data-Warehouse: Data warehouse Modelling, data warehouse design, Distributed data warehouse, and materialized view **Unit-IV** BI with Hadoop Eco systems: HADOOP for Analytics of unstructured data- Hadoop Components: Architecture, HDFS, Map Reduce: Mapper – Reducer – Combiner, Partitioner – Searching – Sorting - Compression. Hadoop (YARN): Architecture, The Hadoop Ecosystem- overview of Pig, HIVE, HBase, Mahout, NoSQL. Interacting with Hadoop Eco systems. Use cases, Map Reduce, Apache Hadoop.	100%
BCA 512 Data Science		
	Unit-I **Introduction to Data Science:** – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues, Data Science Lifecycle, Roles in Data Science (Data Scientist, Data	

	Analyst, Data Engineer, etc.) **Unit-II** **Digital Data Pre-Processing:** Data Manipulation with Pandas, Series and DataFrame objects, Basic operations on DataFrames, Handling missing data, Data Visualization, Importance of data visualization, Introduction to Matplotlib and Seaborn, Creating basic plots (line plots, bar charts, histograms), Customizing plots (titles, labels, legends) **Data Collection Strategies**: Primary Data Collection, Secondary Data Collection, Data Pre-Processing Overview: Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization. **Unit-III** **Regression Models**: Simple and Multiple Regression, Model Evaluation using Visualization – Residual Plot, Distribution Plot, Polynomial Regression and Pipelines, **Exploratory Data Analytics:** Measures for In-sample Evaluation –Prediction and Decision Making. Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis – Box Plots – Pivot Table – Heat Map – Correlation Statistics – ANOVA. **Unit-IV** **Model Evaluation:** Generalization Error, Out-of-Sample Evaluation Metrics, Cross Validation, Overfitting – Under Fitting and Model Selection – Prediction by using Ridge Regression – Testing Multiple Parameters by using Grid Search.	**100%**
BCA 514 Internet of Things		
Unit-I **Introduction to Internet of Things:** Definition and characteristics of IoT, Physical design of IoT, Logical design of IoT, IoT enabling techniques, An Architectural Overview of IoT, IoT Levels Domain Specific IoTs, IoT and M2M,M2M and IoT Analytics- IoT System Management with NETCONF-YANG-IoT Platforms Design Methodology. **IoT Applications:** Smart Cities, Smart Homes, Smart Grid, Smart Health, Smart Farming, Smart Learning, etc. **Unit-II** **IoT Architecture:** Introduction, Architecture, M2M high-level ETSI Architecture, IETF Architecture for IoT, OGC Architecture - IoT Reference Model, Domain Model, Information Model, Functional model, Communication Model, IoT reference architecture. **Design Constraints:** Introduction, Technical Design constraints. **Unit-III** **IoT Protocols:** Protocol Standardization for IoT, Efforts, M2M and WSN Protocols, SCADA and RFID Protocols, Unified Data Standards, Protocols, IEEE 802.15.4,BACNet Protocol, Modbus, Zigbee Architecture, Network layer, 6LowPAN,CoAP, Security. **Bluetooth/BLE:** Low power vs. high power, Speed of detection, Class of BLE. **Unit-IV** **IoT Platforms:** Introduction to Mobile app platform, Protocol stack of Mobile app, Building IoT with Raspberry Pi & Arduino- Building IOT with Raspberry Pi, IoT Systems, Logical Design using Python, IoT Physical Devices & Endpoints IoT Device, Building blocks. Raspberry Pi: Board, Linux on Raspberry Pi, Raspberry Pi Interfaces.	**Unit-I** **Introduction to Internet of Things:** Definition and characteristics of IoT, Physical design of IoT, Logical design of IoT, IoT enabling techniques, Functional blocks of IoT,IoT Levels Domain Specific IoTs, Embedded Systems, Machine to Machine, Difference between IoT and M2M, Cloud Computing, Big Data Analytics **IoTApplications:** Smart Cities, Smart Homes, Smart Grid, Smart Health, Smart Farming, Smart Learning, etc. **Unit-II** **IoT Architecture:** Introduction, Architecture, M2M high-level ETSI Architecture, IETF Architecture for IoT, OGC Architecture - IoT Reference Model, Domain Model, Information Model, Functional model, Communication Model, IoT reference architecture. **Design Constraints:** Introduction, Technical Design constraints. **Unit-III** **IoT Protocols:** Protocol Standardization for IoT, M2M and WSN Protocols, SCADA and RFID Protocols, Unified Data Standards, Protocols, IEEE 802.15.4,BACNet Protocol, Modbus, Zigbee Architecture, Network layer, 6LowPAN,CoAP, Security. NETCONF, YANG, IoT System Management with NETCOZF-YANG, IoT Design Methodology **Bluetooth/BLE:** Low power vs. high power, Speed of detection, Class of BLE. **Unit-IV** **IoT Platforms:** Introduction to Mobile app platform, Protocol stack of Mobile app, Rapsberry Pi, Rapsberry Pi interfaces, Building IoT with Raspberry Pi & Arduino-Building IOT with Raspberry Pi, Logical Design using Python, IoT Physical Devices & Endpoints IoT Device, Building blocks. Raspberry Pi: Board, Linux on Raspberry Pi.	**25%**
BCA 515 E-Commerce		
Unit-I	**Unit-I**	

An overview of E-Commerce: Operating System Services, Developer Services, Data Services, Application Services, Store Services, Client Services, Types of E-Commerce Solutions: Direct Marketing and Selling, Supply Chain Integration, Corporate Procurement, Types of e-commerce Business models. **Electronic Data Interchange:** Evolution, Uses, Benefits, Working of EDI, EDI Standards (includes variable length EDI standards), Cost Benefit Analysis of EDI, Electronic Trading Networks, EDI Components, File Types, EDI Services. **Unit-II** **Applications of E-Commerce**: Applications, Obstacles in adopting E-Commerce, Future of E Commerce. **E-Commerce Marketing Concepts**: Basic marketing concepts for Internet marketing, E-commerce marketing and branding strategies, strengthening the customer relationship. **Unit-III** **Electronic Payment Systems:** Overview of Electronic Payment Systems, Cyber cash (Customer to Merchant Payments, Peer to Peer Payments, Security). Smart Card (Card Types, Closed or Open Security, Privacy, Card Costs, Non-Card Costs), Electronic Banking, Electronic Fund Transfers. IT Act 2000 and Cyber Crimes: Definitions, Digital Signature, Electronic governance, Attribution, acknowledgement and dispatch of electronic records, Regulation of certifying authorities, Digital signatures certificates, Duties of subscribers, Penalties and adjudication, Offences and Cyber-crimes. **Unit-IV** **Security issues**: Introduction, Network and Web security, Risks Analysis, E-business risk management issues, types of threats, Encryption overview, Elements of an encryption system, Secret key encryption, Public-key encryption, Cryptography export restrictions, Secure Sockets Layer (SSL), Secure Electronic Transactions (SET).	**Introduction to E-Commerce:** Defining ECommerce, Traditional Commerce and ECommerce, Main Activities of E-Commerce, Benefits of E-Commerce, Broad Goals of E-Commerce, Components of E-Commerce, Functions of E-Commerce, Process of ECommerce, Types of e-commerce Business models, ,Role of Internet and Web in E-Commerce, Prerequisites of E-Commerce, Scope of ECommerce. Recent trends in e-commerce, Risks in e- commerce and preventive measures **Unit-II** **Electronic Data Interchange (EDI):** Introduction and definition of EDI, EDI layered Architecture, EDI technology and standards, EDI communications and transactions, Benefits and applications of EDI. **Applications of E-Commerce:** Applications, Obstacles in adopting E-Commerce, Future of E Commerce. **E-Commerce Marketing Concepts:** Basic marketing concepts for Internet marketing, E-commerce marketing and branding strategies, strengthening the customer relationship. **Unit-III** **Electronic Payment Systems:** Overview of Electronic Payment Systems, Cyber cash (Customer to Merchant Payments, Peer to Peer Payments, Security). Smart Card Types, Electronic Banking, Electronic Fund Transfers. Overview on Online Payment Portals and apps in India, CC Avenue, Paytm, BHIM, UPI, PhonePe etc. Concept of Payment Gateway and Payment Processor, IT Act 2000 and **Cyber Crimes:** Definitions, Digital Signature, Electronic governance, Attribution, acknowledgement and dispatch of electronic records, Regulation of certifying authorities, Digital signatures certificates, Duties of subscribers, Penalties and adjudication, Offences and Cyber-crimes. **Unit-IV** **Security issues:** Introduction, Network and Web security, Risks Analysis, E-business risk management issues, types of threats, Encryption overview, Elements of an encryption system, Secret key encryption, Public-key encryption, Cryptography export restrictions, Secure Sockets Layer (SSL), Secure Electronic Transactions (SET).	**43%**
BCA 516	**Software Quality Assurance & testing**	
Unit-I **Software Quality Assurance and Standards:** The Software Quality challenge, What is Software Quality, Software Quality factors, The components of Software Quality Assurance system, Software Quality Metrics, Costs of Software Quality, Quality Management Standards, Management and its role in Software Quality Assurance. **Unit-II** **Software Testing Strategy and Environment:** Minimizing Risks, Writing a Policy for Software Testing, Economics of Testing, Testing an organizational issue, Management Support for Software Testing, Building a Structured Approach to Software Testing, Developing a Test Strategy Building Software Testing Process, Software Testing Guidelines. **Unit-III** **Software Testing Tools:** Selecting and Installing Software Testing tools, Automation Load Runner, Win runner and Rational Testing Tools, Silk test, Java Testing Tools, JMetra, JUNIT and Cactus. **Unit-IV**	**Unit-I** **Software Quality Assurance and Standards:** The Software Quality challenge, What is Software Quality, Software Quality factors, The components of Software Quality Assurance system, Software Quality Metrics, Costs of Software Quality, Quality Management Standards, Management and its role in Software Quality Assurance. Formal technical review of quality, Review Meeting **Unit-II** **Software Testing Strategy and Environment:** Minimizing Risks, Writing a Policy for Software Testing, Economics of Testing, Testing an organizational issue, Management Support for Software Testing, Building a Structured Approach to Software Testing, Psychology of testing, Developing a Test Strategy Building Software Testing Process, Software Testing Guidelines. **Unit-III** **Software Testing Tools:** Selecting and Installing Software Testing tools, Automation Load Runner, Win runner and Rational Testing Tools, Silk test, Java Testing Tools, static and dynamic testing tools **Unit-IV**	**20%**

Testing Process: Seven Step Testing Process, Overview of the Software Testing Process, Organizing of Testing, Developing the Test Plan, Verification Testing, Validation Testing, Analyzing and Reporting Test results, Acceptance and Operational Testing, Post-Implementation Analysis Specialized Testing.	**Testing Process:** Seven Step Testing Process, Overview of the Software Testing Process, Organizing of Testing, Developing the Test Plan, Verification Testing, Validation Testing, Black box and white box testing, Acceptance and Operational Testing, Post-Implementation Analysis Specialized Testing.	
BCA 517	**Theory of Computation**	
	Unit - I **Introduction to Languages:** Alphabets, string, language, Basic Operations on language, Concatenation, Kleene Star **Introduction to Finite Automata:** The central concepts of Automata theory; Deterministic finite automata; Non deterministic finite automata. **Unit – II** **Finite Automata and Regular Expressions:** Applications of finite automata, Finite automata with Epsilon transitions, Regular Expressions & its applications, Regular languages, Pumping Lemma for Regular Languages, Closure properties of regular languages, Equivalence and minimization of automata. **Unit – III** **Context–free grammars:** Parse trees, Ambiguity in grammars and languages, Pushdown Automata, the languages of a PDA, Equivalence of PDA's and CFG's, Properties of Context free languages, Normal Forms. **Unit – IV** **The Turing machine:** Turing Machine Definition and design of Turing machine, Turing machine as a model of Computation, Variants of Turing Machines, Universal Turing Machine, Language Acceptability and Decidability with Turing machine.	**100%**
BCA-518	**Neural Network and fuzzy Logic**	
	Unit - I **Introduction of Neural Network:** Basic concepts of neural network, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Characteristics of ANN, Artificial Neuron models, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory, Applications of ANN. **Unit - II** **Back propogation networks:** Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propogation learning methods, effect of learning rule co-efficient; back propagation algorithm, factors affecting back propagation training, applications. **Unit - III** **Introduction of Fuzzy Logic:** Introduction:-Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion. **Unit - IV** **Fuzzy Logic Rules & Applications:** (Fuzzy Membership, Rules):- Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, development of rule base and decision making system, Fuzzy Controller, Industrial applications.	**100%**
BCA 519	**Data Warehousing & Data Mining**	
	Unit - I **Data Warehouse:** Overview, A Brief History, Characteristics, Architecture for a Data	

	Warehouse. Data Mining: Introduction, Motivation, Importance, Knowledge Discovery Process, Data Mining Functionalities, Interesting Patterns, Classification of Data Mining Systems, Major issues, Data Preprocessing: Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization, Outliers. **Unit – II** **Data Mining Techniques:** Clustering- Requirement for Cluster Analysis, Clustering Methods- Partitioning Methods, Hierarchical Methods, Decision Tree- Decision Tree Induction, Attribute Selection Measures, Tree Pruning. Association Rule Mining- Market Basket Analysis, Frequent Itemset Mining using Apriori Algorithm, Improving the Efficiency of Apriori. Concept of Nearest Neighborhood and Neural Networks. **Unit - III** **Data Integration:** Architecture of Data Integration, Describing Data Sources: Overview and Desiderate, Schema Mapping Language, Access Pattern Limitations, String Matching: Similarity Measures, Scaling Up String Matching, Schema Matching and Mapping: Problem Definition, Challenges, Matching and Mapping Systems, Data Matching: Rule- Based Matching, Learning- Based Matching, Matching by Clustering. **Unit - IV** **Graph Mining, Social Network Analysis:** Introduction to Graph Mining, Social Network Analysis Mining Object, Spatial, Multimedia, Text, and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World. **Applications and Trends in Data Mining:** Data Mining Applications, Data Mining System Products and Research Prototypes, Additional Themes on Data Mining, Social Impacts of Data Mining, Trends in Data Mining	100%
BCA 520	**Soft Computing**	
	Unit - I **Introduction:** Overview of soft computing and historical development, difference between soft and hard computing, brief descriptions of different components of soft computing including artificial intelligence systems, soft computing tools, application of soft computing techniques in different areas. **Unit - II** **Neural Networks and Back Propagation networks:** Introduction to Neural Networks, Model of Artificial Neuron, Neural Network Architectures, Characteristics of neural networks, Learning Methods, Early neural network architectures, Application domains. Back propagation network (BPN), Back propagation Learning, Applications of BPN, Parameter selection, Variations of Back Propagation Algorithms. **Unit - III** **Fuzzy Logic:** Crisp set and Fuzzy set, Basic concepts of fuzzy sets and operations, Fuzzy Arithmetic. Fuzzy measures-belief and plausibility measure. Probability measure-Measure of fuzziness, Fuzzy integrals. **Membership functions**: Features of membership function, Fuzzification. **Unit - IV** **Genetic Algorithms:** Introduction to Genetic Algorithms (GA) and their terminology; Traditional optimization and search techniques, Genetic algorithms. Operators: Encoding, Selection, Crossover, Mutation. Classification: Adaptive genetic algorithms, Hybrid genetic algorithms, Parallel genetic algorithms, Real coded genetic algorithm.	100%
BCA 521	**Natural Language Processing**	
	Unit - I **Natural Language Understanding and Generation:** The Study of Language,	

	Applications of Natural Language Understanding, Evaluating Language Understanding Systems, The Different Levels of Language Analysis, The Organization of Natural Language Understanding Systems. Basic concepts: tokens, and language models, Challenges in NLP **Unit - II** **Text Preprocessing:** Text Preprocessing, Tokenization (word and sentence tokenization), Removing stop words, Text normalization (lowercasing, stemming, lemmatization), Regular expressions for text processing. **Unit - III** **Text Analysis and Understanding:** Text Analysis and Understanding, Supervised ML & Sentiment Analysis, Vocabulary & Feature Extraction, Negative and Positive Frequencies, Feature Extraction with Frequencies, Data Preprocessing. **Unit - IV** **NLP Applications:** NLP Applications, Question Answering and Chabot's, Brief introduction of state of art applications, Text Summarization, Machine Translation, Dialog system	100%
BCA 522	**NO SQL Database**	
	Unit - I **Data base revolutions:** First generation, second generation, third generation, Managing Transactions and Data Integrity, ACID and BASE for reliable database transactions, speeding performance by strategic Use of RAM, SSD, and disk, achieving horizontal scalability with database shading, Brewers CAP Theorem **Unit-II** **No SQL Data model:** Aggregate Models- Document Data Model- Key-Value Data Model Columnar Data Model, Graph Based Data Model Graph Data Model, No SQL system ways to handle big data problems, Moving Queries to data, not data to the query, hash rings to distribute the data on clusters, replication to scale reads, Database distributed queries to data nodes. **Unit-III** **Mongo DB :** No SQL Key/Value databases using Mongo DB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure. Architecture and implementation Terms, Designing Structured Values, Limitations of Key Value Databases, Design Patterns for Key-Value Databases, Case Study: Key-Value Databases for Mobile Application Configuration **Unit-IV** **Apache Hbase:-Column-** oriented No SQL databases using Apache HBASE, Column-oriented No SQL databases using Apache Cassandra, Architecture of HBASE, Advanced techniques: Vector zed Processing, Compression, Write penalty, Operating Directly on Compressed Data Late Materialization Joins , Group-by, Aggregation and Arithmetic Operations, Case Studies Key-Value Store, Key-Value Store Features, Consistency, Transactions	100%
BHUM-003	**Entrepreneurship Development & Management**	
	Unit - I Definition and objectives of Project Management, Characteristics of projects, Taxonomy of projects, Project identification & project preparation, Zero based project formulation, Types of Project, Project appraisal-Technical, Commercial, Economic, Financial,	

	Management; Project risk analysis- Break even analysis, Sensitivity analysis, Decision tree analysis, Monte-carlo technique, Game theory **Unit - II** Present value and future value, Types of cost, Cost of project, components of capital cost of project, sources of finance, role of Financial Institutions, Project scheduling, Project cost Vs Project completion time, Normal time & crash time, Direct & Indirect cost, Total cost, Rehabilitation of sick units, causes & prediction of sickness, Board of Industrial & Financial Reconstruction (BIFR) **Unit - III** Entrepreneurship, Role of Entrepreneur in Indian economy, Characteristics of an entrepreneur, Types of entrepreneurs, some myths and realities about entrepreneurship, Role and scope of small scale industries, concept of small scale and ancillary industrial undertakings, How to start a small scale industry, Steps in launching own venture, procedure for registration of small scale industries, Financial concept for small-scale industries, financial requirements, Financial support programmer of banks, government financial agencies. **Unit - IV** Various developmental agencies-their functions and role in industrial and entrepreneurship development, Infrastructure facilities available for entrepreneurship development in India, Hire-purchase facilities, alternate sources of finance, The modern concept of marketing, Definitions, functions and principle of marketing, Marketing research, Advertising, Market survey, Pre-feasibility and feasibility of project. Identification and evaluation of business opportunity, risk involved and preparation of business plan, Tools for evaluation of techno economic feasibility project report, SWOT analysis.	**100%**
BCA 606	**Machine Learning**	
	Unit - I **Introduction to Machine Learning (ML):** History and features of ML, working of ML, Classification of ML. **Data Pre-Processing:** Data Frame Basics, CSV File, Libraries for Pre-processing, Handling Missing data, Encoding Categorical data, Feature Scaling, Handling Time Series data. **Feature Extraction:** Overview of Feature Selection and Feature Extraction Techniques; Data Transformation, Data Normalization. **Unit - II** **Data Visualization:** Different types of plots, Plotting fundamentals using Matplotlib, Plotting fundamentals using Seaborn. Supervised Learning Techniques: Regression: Linear Regression, Multiple Linear Regression, Polynomial Regression, Logistic Regression; **Regularization:** Ridge Regression, Lasso Regression. Classification: Binary Classification and Multi-Class Classification, Support Vector Machine, K-Nearest Neighbours, Naive Bayes classifier, Decision Trees, Random Forest. **Unit - III** **Unsupervised Learning Techniques:** Clustering: Centroid-Based Clustering: K- Means Clustering; Density-Based Clustering: DBSCAN Clustering Algorithm; Distribution-Based Clustering and Hierarchical Clustering. **Association Rule Learning:** Overview of the Association based Clustering and its Algorithms, Applications and Advantages of Association Rule Learning. **Unit - IV**	**100%**

	Reinforcement Learning: Types of Reinforcement learning, Key Features of Reinforcement Learning, Elements of Reinforcement Learning, Applications of Reinforcement Learning. **Performance Metrics:** Performance Metrics for Regression: Mean Absolute Error, Mean Squared Error, Root Mean Squared Error, R-Squared; Performance Metrics for Classification: Confusion Matrix, Accuracy, Precision, Recall, F1 score.	
BCA 608 Data Visualization		
	Unit-1 **Introduction:** Context of data visualization – Definition, Methodology, Visualization design objectives. Key Factors – Purpose, visualization function and tone, visualization design options – Data representation, Data Presentation, Seven stages of data visualization, widgets, data-visualization tools. Mapping-Time Series-Connections and Correlations Scatter plot Maps-Trees, Hierarchies, and Recursion –Networks and Graphs **Unit-II** **Visualization techniques for time-series:** Mapping-Timeseries-Connectionsandcorrelations–Indicator-Areachart-Pivottable- Scatter charts, Scatter maps **Trees & Graphs** :Tree maps, Space filling and non-space filling methods- Hierarchies and Recursion-Networks and Graphs-Displaying Arbitrary Graphs-node link graph-Matrix representation for graphs-Info graphics **Unit-III** **Time- Series data visualization** – Text data visualization – Multivariate data visualization and case studies. Best practices of Data Streaming, processing streaming data for visualization, presenting streaming data, streaming visualization techniques, streaming analysis **Unit-IV** **Security in Data Visualization:** Ports can visualization –Vulnerability assessment and exploitation-Firewall log visualization-Intrusion detection log visualization-Attacking and defending visualization Systems–Creating secured visualization system.	100%
BCA 610 Cyber security		
Unit-1 **Security Fundamentals:** Principles of Security, Basic security components. **Security Threats:** Attacks, Phishing, Password Cracking, Key-loggers and Spywares, Virus, Worms, DoS and DDoS, SQL injection, Buffer Overflow, Spyware, Adware and Ransomware. Pornography, IPR violations: Software Piracy, Copyright infringement, Patent & Trademarks violations, Cyber Squatting, Cyber smearing, Cyber stacking, Credit card related crimes. **Unit- II** **Cryptography:** Classical encryption techniques, Block and Chain ciphers, Data Encryption Standard, Advanced Encryption Standard, RC5. **Advanced Cryptography:** Chinese Remainder Theorem and its implication in Cryptography, Diffie-Hellman key exchange algorithm, RSA algorithm, Message Digest and Cryptographic Hash Functions, MD5 and SHA-1, Digital Signatures and Authentication. **Unit-III** **Key Management and Secure Communication:** Public Key Infrastructure (PKI), X.509 Certificate, Needham Schroeder algorithm and Kerberos. IP Security: IPv6 and IPSec, Web Security: HTTPS, Mail Security: PGP, S/MIME.	**Unit-1** **Security Fundamentals:** Principles of Security, Basic security components.Fundamentalsof Cyber Crime, Types of Cyber Crime: crime against individual, Crime against property, Cyber extortion, Drug trafficking, cyber terrorism. Cybercrime issues. **Security Threats:** Attacks, Phishing, Password Cracking, Key-loggers and Spywares, Virus, Worms, DoS and DDoS, SQL injection, Buffer Overflow, Spyware, Adware and Ransom ware. Pomography. **IPR Violations:** Software Piracy, Copyright infringement, Patent & Trademarks violations, Cyber Squatting, Cyber smearing, Cyber stacking, Credit card related crimes. **Unit-II** **Cryptography:** Classical encryption techniques, Block and Chain ciphers, Data Encryption Standard, Advanced Encryption Standard, RC5. **Advanced Cryptography:** Chinese Remainder Theorem and its implication in Cryptography, Diffie-Hellman key exchange algorithm, RSA algorithm, Message Digest and Cryptographic Hash Functions, MD5 and SHA-1, **Digital Signatures:** Digital Signatures, authentication Protocol: Kerberos, LDAP, OAuth2, SAML(Security Assertion Markup Language), RADIUS - digital signature standards (DSS) .	

Firewall: Introduction, Types of Firewall, Design Principle of Firewall, SSL. **Unit-IV** **Issues in Security Management and Cyber Laws:** Overview, Risk identification, Risk Assessment, Risk Control Strategies, Quantitative vs. Qualitative Risk Control Practices. Risk Management. **Laws and Ethics in Information Security:** Codes of Ethics, Protecting programs and data Cybercrime and Information security, Classification of Cybercrimes.	**Unit-III** **Key Management and Secure Communication:** Public Key Infrastructure (PKI), X.509 Certificate, Needham Schroeder algorithm. IP Security: IPv6 and IPSec, Web Security: HTTPS, Mail Security: PGP, S/MIME. **Firewall:** Introduction, Types of Firewall, Design Principle of Firewall, SSL. **Unit-IV** **Digital Forensics:** Introduction to Digital Forensics, historical background of digital forensics, Forensic Software and Hardware, need for computer forensics science, special tools and techniques digital forensic life cycle, challenges in digital forensic. **Issues in Security Management and Cyber Laws:** Risk identification, Risk Assessment, Risk Control Strategies, Quantitative vs. Qualitative Risk Control Practices. Risk Management. **Laws and Ethics in Information Security:** Codes of Ethics, Protecting programs and data.	**25%**
BCA 611 Computer Graphics		
Unit-I **Overview of Computer Graphics:** Introduction to Computer Graphics and its applications, Interactive and passive graphics. **Graphics Devices:** Storage tube graphics display, Raster scan and random Scan display, Resolution, Aspect Ratio, Interlacing, Beam Penetration, Shadow Mask Monitors, Plasma Panel, LED and LCD monitors. **Unit-II** **Drawing Geometry:** Coordinate System, Scan Conversions: Points & lines, Line drawing algorithms, DDA algorithm, Bresenham's line algorithm, Circle generation algorithm, Ellipse generating algorithm. **Filling:** Fill algorithm, Boundary Fill algorithm, Flood fill algorithm, Scan-line Polygon fill algorithm. **2D Transformations:** Basic transformations: Translation, Rotation, Scaling, Matrix representations &Homogeneous Coordinates, Reflection, Shearing, Zooming. **Unit-III** **Viewing:** Windowing, Viewing, Window to viewport coordinate transformation. **Clipping:** Point and Line clipping, Cohen-Sutherland and Mid-point sub-division line clipping, Polygon Clipping, Sutherland-Hodgeman Polygon clipping, Circle & Curve clipping algorithm. **Unit-IV** **3D Transformations:** Translation, Rotation, Scaling, Rotation about an arbitrary axis in space, Reflection through an arbitrary plane, Parallel Projection, Hidden surface Detection: Z-buffer algorithm, Backface, Scan-line. **Color & Shading models:** Light &Colour model, Interpolative shading model, Flat shading, Phong shading, Gouraud shading, Lambert lighting model, Phong lighting model, Blinn-Phong lighting model, Texture.	**Unit-I** **Overview of Computer Graphics:** Introduction to Computer Graphics and its applications, Interactive and passive graphics. **Graphics Devices:** Storage tube graphics display, Raster scan and random Scan display, Resolution, Aspect Ratio, Interlacing, Beam Penetration, Shadow Mask Monitors, Plasma Panel, LED and LCD monitors. **Unit-II** **Drawing Geometry:** Coordinate System, Scan Conversions: Points & lines, Line drawing algorithms, DDA algorithm, Bresenham's line algorithm, Circle generation algorithm, Ellipse generating algorithm. **Filling:** Fill algorithm, Boundary Fill algorithm, Flood fill algorithm, Scan-line Polygon fill algorithm. **Unit-III** **2D Transformations:** Basic transformations: Translation, Rotation, Scaling, Matrix representations &Homogeneous Coordinates, Reflection, Shearing, Zooming. **Viewing:** Windowing, Viewing, Window to viewport coordinate transformation **Unit-IV** **Clipping:** Point and Line clipping, Cohen-Sutherland and Mid-point sub-division line clipping, Polygon Clipping, Sutherland-Hodgeman Polygon clipping, Circle & Curve clipping algorithm. **3D Transformations:** Translation, Rotation, Scaling, Rotation about an arbitrary axis in space, Reflection through an arbitrary plane, Parallel Projection, Hidden surface Detection: Z-buffer algorithm, Backface, Scan-line.	**20%**
BCA 612 Software Project Management		
	Unit-1 **Project Evaluation and Project Planning:** Introduction to Project, why is Software Project Management, Importance of Software Project Management, Principles of Project management, Evaluation of Individual Projects, Setting objectives, Management	

	Principles, Management Control, Pro[illegible] portfolio Management, Cost-benefit evaluation technology. Risk evaluation, Strategic program Management, Stepwise Project Planning. **Unit-II** **Project Life Cycle and Effort Estimation:** Software process and Process Models, Selection of Process models, Rapid Application development, Agile methods, Dynamic System Development Method, Extreme Programming, Managing interactive processes, Basics of Software estimation, Effort and Cost estimation techniques, COSMIC Full function points, COCOMO II – a Parametric Productivity Model. **Unit-III** **Activity Planning and Risk Management:** Objectives of Activity planning, Project schedules, Activities, Sequencing and scheduling, Network Planning models, Formulating Network Model, Forward Pass & Backward Pass techniques, Critical path (CRM) method. Risk identification, Assessment, Risk Planning, Risk Management, PERT technique. **Unit-IV** **Project Management and Control:** Framework for Management and control, Collection of data, Visualizing progress, Cost monitoring, Earned Value Analysis, Prioritizing Monitoring, Project tracking, change control, Software Configuration Management, Managing contracts, Contract Management.	**100%**
BCT- I	**Cognitive Skills Training - I**	
	Unit-I **Quantitative Aptitude & Logical Reasoning:** Simple Interest, Compound Interest, Average, Ratio & Proportion, Ages & Partnership, Time & Work., Counting of Figures, Embedded Images and Pattern Completion, Sitting Arrangement, Syllogism, Statement and Course of action, Cubes and Dices. **Unit-II** **Soft Skills & Verbal Ability:** Introduction to Interview skills (Self Introduction Technique), Resume Writing, Phrasal verb, Spot the error, Email writing, Video Resume, Closet test, GD- Abstract topic based, Presentation skills, Verbal Analogy, LinkedIn Profiling , Blog writing, MOCK PI. **Unit-III** **Technical Ability: Sorting and Searching Algorithms:** Basic sorting algorithms (Bubble, Selection, Insertion), Efficient sorting algorithms (Merge Sort, Quick Sort, Heap Sort), Searching algorithms (Binary Search, Ternary Search) **Linear Data Structures: Linked Lists:** Singly linked list, Doubly linked list, Circular linked list, Operations: insertion, deletion, reversal, finding middle, etc.	**100%**
BCT- II	**Cognitive Skills Training - II**	
	Unit-I **Quantitative Aptitude & Logical Reasoning:** Mixture & alligation, Time Speed Distance, Data Interpretation, Sequence & Series, Permutation & Combination, Probability, Clock, Calender, Paper Cutting and Paper Folding, Analogy, Statement and Argument, Water Image and Mirror Image, Game Based Aptitude **Unit-II** **Soft Skills & Verbal Ability:** Personal Branding and elevator pitch, Dress to success, Paragraph writing, reading comprehension I, Reading comprehension II, Para jumbles, Leadership skills, Team building skills, Debate, Video analysis, Mock GD, Mock PI **Unit-III** **Technical Ability: Stacks:** Implementation (array-based and linked-list-based), Applications (expression evaluation, syntax parsing, etc.), Problems (balanced parentheses, postfix/prefix conversion, etc.)	**100%**

	Queues: Implementation (array-based, linked-list-based, circular queue, deque), Applications (scheduling, buffering, etc.), Problems (sliding window maximum, etc.)	

Benchmark:

Himachal Pradesh Technical University, Hamirpur (Himachal Pradesh), I. K. Gujral Punjab Technical University, Kurukshetra University, Savitribai Phule Pune University, IIT Delhi, IIT Kanpur, NPTEL, National Institute of Technology Calicut, Vellore Institute of Technology, Delhi University, Gujarat University, Ahemadabad, IIT Madras, Jawaharlal Nehru University (JNU), Delhi, Anna University, Chennai, Indian Institute of Information Technology (IIIT), Allahabad.

The above revision/change has been approved by the following academic bodies:

1. Board of Studies vide resolution no. 02 dated 16.07.24
2. Academic Council vide resolution no. 25 dated 20.07.24

PRINCIPAL

MAHARISHI MARKANDESHWAR (DEEMED TO BE UNIVERSITY)
MULLANA-AMBALA, 133207 HARYANA (INDIA)
(Established under Section 3 of the UGC Act. 1956)
(Accredited By NAAC With Grade A++)

DEPARTMENT OF CSE

Curriculum Update w.e.f. July, 2025 based on Stakeholder's feedback, BOS & External Experts

Sr. No.	Programme	Subject Code	Subject Name	%age change	Semester & Batch
1	B.Tech.	BIT-001	Industrial Internship-1	New Subject (100%)	B.Tech.-7th Semester (CSE, CSE with Specialization in Cloud Technology & Information Security, Data Science, FSD) (Batch: 2022-26)
2	B. Tech	BCSE-525	Industrial Training	New Subject (100%)	B.Tech.-7th Semester (CSE, CSE with Specialization in Cloud Technology & Information Security, Data Science, FSD) (Batch: 2022-26)
3	B.Tech.	BCSE-731	Software Architecture Design	New Subject (100%)	B.Tech.-7th Semester (CSE with Specialization in Full Stack Development) (Batch: 2022-26)
4	B.Tech.	BCSE-732	Web Application Deployment	New Subject (100%)	B.Tech.-7th Semester (CSE with Specialization in Full Stack Development) (Batch: 2022-26)
5	B.Tech.	BCSE-733	Software Test Automation	New Subject (100%)	B.Tech.-7th Semester (CSE with Specialization in Full Stack Development) (Batch: 2022-26)
6	B.Tech.	BCSE-741	Version Control System	New Subject (100%)	B.Tech.-7th Semester (CSE with Specialization in Full Stack Development) (Batch: 2022-26)
7	B.Tech.	BCSE-742	Web Performance Optimization	New Subject (100%)	B.Tech.-7th Semester (CSE with Specialization in Full Stack Development) (Batch: 2022-26)

8	B.Tech.	BIT-002	Industrial Internship-II	New Subject (100%)	B.Tech.-8th Semester (CSE, CSE with Specialization in Cloud Technology & Information Security, Data Science, Full Stack Development) (Batch: 2022-26)
9	B.Tech.	BCSE-705	Progressive Web Apps	New Subject (100%)	B.Tech.-7th Semester (CSE with Specialization in Data Science) (Batch: 2022-26)
10	B.Tech.	BCSE-706	AI & ML in Web Apps	New Subject (100%)	B.Tech.-7th Semester (CSE with Specialization in Data Science) (Batch: 2022-26)
11	B.Tech.	BCSE-527	Industrial Training-I	New Subject (100%)	B.Tech.-5th Semester (CSE, CSE with Specialization in Cloud Technology & Information Security, Data Science, Full Stack Development. AI & Machine Learning) (Batch: 2023-27)
12	B.Tech.	BCSE-802	Computer Vision	New Subject (100%)	B.Tech.-5th Semester (CSE with Specialization in AI & Machine Learning) (Batch: 2023-27)
13	B.Tech.	BCSE-802L	Computer Vision Lab	New Subject (100%)	B.Tech.-5th Semester (CSE with Specialization in AI & Machine Learning) (Batch: 2023-27)
14	B.Tech.	BCSE-811	Programming in R	New Subject (100%)	B.Tech.-5th Semester (CSE with Specialization in AI & Machine Learning) (Batch: 2023-27)
15	B.Tech.	BCSE-811L	Programming in R Lab	New Subject (100%)	B.Tech.-5th Semester (CSE with Specialization in AI & Machine Learning) (Batch: 2023-27)
16	B.Tech.	BCSE-812	AI in HealthCare	New Subject (100%)	B.Tech.-5th Semester (CSE with Specialization in AI & Machine Learning) (Batch: 2023-27)

17	B.Tech.	BCSE-812L	AI in HealthCare Lab	New Subject (100%)	B.Tech.-5th Semester (CSE with Specialization in AI & Machine Learning) (Batch: 2023-27)
18	B.Tech.	BCSE-813	PROLOG Programming	New Subject (100%)	B.Tech.-5th Semester (CSE with Specialization in AI & Machine Learning) (Batch: 2023-27)
19	B.Tech.	BCSE-813L	PROLOG Programming Lab	New Subject (100%)	B.Tech.-5th Semester (CSE with Specialization in AI & Machine Learning) (Batch: 2023-27)
20	B.Tech.	BCSE-803L	Reinforcement Learning Lab	New Subject (100%)	B.Tech.- 6th Semester (CSE with Specialization in AI & Machine Learning) (Batch: 2023-27)
21	B.Tech.	BCSE-821L	Artificial Neural Network Lab	New Subject (100%)	B.Tech.- 6th Semester (CSE with Specialization in AI & Machine Learning) (Batch: 2023-27)
22	B.Tech.	BCSE-822	Fuzzy Logic	New Subject (100%)	B.Tech.- 6th Semester (CSE with Specialization in AI & Machine Learning) (Batch: 2023-27)
23	B.Tech.	BCSE-822L	Fuzzy Logic Lab	New Subject (100%)	B.Tech.- 6th Semester (CSE with Specialization in AI & Machine Learning) (Batch: 2023-27)
24	B.Tech.	BCSE-001	Computational & Problem Solving using ‘C’ Lab	New Subject (100%)	B.Tech.- CSE – 1st / 2nd Semester (Common for all branches) (Batch: 2025-29)
25	B.Tech.	BCSE-008	Computational & Problem Solving using ‘C’	New Subject (100%)	B.Tech.- CSE – 1st / 2nd Semester (Common for all branches) (Batch: 2025-29)

26	B.Tech.	BCSE-007	Data Structure	New Subject (100%)	B.Tech.- CSE – 1st / 2nd Semester (Common for all branches) (Batch: 2025-29)
27	B.Tech.	BCSE-010	Data Structure Lab	New Subject (100%)	B.Tech.- CSE – 1st / 2nd Semester (Common for all branches) (Batch: 2025-29)
28	B.Tech.	BCSE-004	Python Programming	New Subject (100%)	B.Tech.- CSE – 1st / 2nd Semester (Common for all branches) (Batch: 2025-29)
29	B.Tech.	BCSE-009	Python Programming Lab	New Subject (100%)	B.Tech.- CSE – 1st / 2nd Semester (Common for all branches) (Batch: 2025-29)

HoD, CSE

Deptt. of Computer Engg.
M.M. Engineering College
Mullana (Ambala)-133203 Har

MAHARISHI MARKANDESHWAR (DEEMED TO BE UNIVERSITY) MULLANA- AMBALA, HARYANA (INDIA) - 133207

(Established under Section 3 of the UGC Act 1956)
(NAAC Accredited Grade 'A++' University)

M. M. Engineering College, Mullana, Ambala

Department of Computer Science & Engineering

(NBA Accredited Department)

Ref. No.: MMEC/CSE/BoS/2025/6.1 **Date: 02/06/2025**

MINUTES of the meeting of the Board of Studies in Computer Science & Engineering department held on 31.05.2025 at 2:30 pm onwards in hybrid (online / offline) mode. The following members had attended this meeting:

1. Dr. Sandip Kumar Goyal, Professor & Head, CSE	In-Chair
2. Dr. Manoj Mishra, Professor, CSE Department, IIT Roorkee	External Expert (Online)
3. Mr. Ashish Raj, Principal Architect – Public Sector, Amazon Web Services	External Expert (Online)
4. Dr. Vishal Bharti, Professor, CSE	Member
5. Dr. Sanjeev Kumar, Professor, CSE	Member
6. Dr. Amit Bindal, Professor, CSE	Member
7. Dr. Neera Batra, Professor, CSE	Member
8. Dr. Deepak Dudeja, Professor, CSE	Member
9. Dr. Neeraj Mangla, Professor, CSE	Member
10. Dr. Sandhya Bansal, Professor, CSE	Member
11. Dr. Amandeep Kaur, Professor, CSE	Member
12. Dr. Suneet Kumar, Professor, CSE	Member
13. Dr. Vaishali Mehta, Professor, CSE	Member
14. Dr. Anil Lambha, Professor, CSE	Member
15. Dr. Rajeev Gupta, Professor, CSE	Member
16. Dr. Bandana Sharma, Associate Professor, CSE	Member
17. Dr. Satyaveer Singh, Associate Professor, CSE	Member
18. Dr. Naveen Malik, Assistant Professor, CSE	Member
19. Dr. Vinisha Sumra, Assistant Professor, CSE	Member

Agenda items were discussed one by one and following decisions were taken:

1. Minutes of meeting of Board of Studies held on 5th March, 2025 were confirmed.
2. Panels of paper setters / examiners of all the theory and practical papers for the examination to be held during (Oct / Nov 2025 & Apr / May 2026) of the following courses were recommended and as decided the panels of paper setters / examiners will be sent to the Controller of Examinations separately in a confidential cover:
   A) i) B. Tech (CSE & its various specializations) – 1st / 2nd semester.
   ii) B. Tech. (CSE) - 3rd, 4th, 5th, 6th, 7th & 8th semester.
   iii) B. Tech (CSE with specialization in Data Science) - 3rd, 4th, 5th, 6th, 7th & 8th semester.
   iv) B. Tech (CSE with specialization in Cloud Technology & Information Security)–3rd, 4th, 5th, 6th, 7th & 8th semester.
   v) B. Tech (CSE with specialization in Full Stack Development) – 3rd, 4th, 5th, 6th, 7th & 8th semester.
   vi) B. Tech (CSE with specialization in AI & Machine Learning) – 3rd, 4th, 5th & 6th semester.
   vii) B. Tech (CSE with specialization in Big Data And Analytics) – 3rd & 4th semester.
   viii) Open elective courses floated by CSE department in other departments of MMEC.
   B) M. Tech. (CSE) – 1st & 2nd semester.
   C) PhD (CSE) - Departmental subjects of course work examination.
3. For B. Tech. (CSE, CSE with Specialization in Cloud Technology & Information Security, CSE with Specialization in Data Science) (Batch 2022-2026 onwards):

Annexure-1

A) The house considered already approved 7th semester scheme for Batch 2021-2025 under these specializations and approved them also as 7th semester scheme for respective specializations with following major changes:
   i) New course (BCSE-525: Industrial Training) with 2 credits is added. After this updation, semester credits changed from 16 to 18 and semester marks from 600 to 700.
   ii) As per feedback from stakeholders, six months (semester) industrial internship based scheme(named as Scheme 1: Internship based scheme) is also added as an option along with academic course based scheme (named as Scheme 2: Non-Internship based scheme) with the same semester credit score as assigned to academic course based scheme. Scheme 1 consists of only 2 courses: (BCSE-525: Industrial Training) & (BIT-001: Industrial Internship-I). Student can choose any scheme with the approval of competent authority.

Annexure-2

B) Syllabi for departmental courses of 7th semester. This includes:
   i) Newly approved syllabus: (BCSE-525: Industrial Training), (BIT-001: Industrial Internship-I).
   ii) As departmental courses already existed in the scheme of previous batches with same/different code. So, no need to approve syllabi for these courses.

4. For B. Tech (CSE with Specialization in Full Stack Development) (Batch 2022-2026 onwards), the house considered and approved:

Annexure-3

A) Some major changes in the scheme of 7th semester. These changes involve:

i) In list of Elective-IV, course Software Architecture: Web API Design is replaced by (BCSE-731: Software Architecture Design), course code BCSE-732 is assigned to Web Application Deployment & course Application Deployment on Cloud is replaced by (BCSE-733: Software Test Automation). Credits also updated from 2 to 3.

ii) In list of Elective-V, following new courses are added in place of previous courses: BCSE-561: Blockchain Technology, BCSE-741: Version Control System, BCSE-742: Web Performance Optimization.

iii) In list of Open Elective-III, following new courses are added in place of previous courses: course (OME: Entrepreneurship and Family Business) is replaced by course (BECE-550: Internet of Things).

iv) New course (BCSE-518: Integrated Project-I) of 1 credits is added in place of Elective-IV Lab course.

v) New course (BCSE-525: Industrial Training) with 2 credits is added. After this updation, semester credits changed from 16 to 18 and semester marks from 600 to 700.

vii) Student can earn maximum 6 credits (instead of 3 credits) using MOOC/Swayam platform.

vii) As As per feedback from stakeholders, six months (semester) industrial internship based scheme(named as Scheme 1: Internship based scheme) is also added as an option along with academic course based scheme (named as Scheme 2: Non-Internship based scheme) with the same semester credit score as assigned to academic course based scheme. Scheme 1 consists of only 2 courses: (BCSE-525: Industrial Training) & (BIT-001: Industrial Internship-I). Student can choose any scheme with the approval of competent authority.

Annexure-4

B) Syllabi for departmental courses of 7th semester. This includes:

i) Newly approved syllabus: (BCSE-731: Software Architecture Design), (BCSE-732: Web Application Deployment), (BCSE-733: Software Test Automation), (BCSE-741: Version Control System) & (BCSE-742: Web Performance Optimization).

ii) As departmental courses already existed in the scheme of previous batches with same/different code. So, no need to approve syllabi for these courses.

5. For B. Tech. (CSE, CSE with Specialization in Cloud Technology & Information Security) (Batch 2022-2026 onwards):

Annexure-5

A) The house considered already approved 8th semester scheme for Batch 2021-2025 under these specializations and approved them also as 8th semester scheme for respective specializations with following minor changes:.

i) Course Industrial Project / In-house training is renamed as Industrial Internship-II with course code BIT-002.

ii) Total 165/166 credits are required to get B. Tech. Degree with these specializations respectively..

Annexure-6

B) Syllabi for departmental courses of 8th semester. This includes:

i) Newly approved syllabus: (BIT-002: Industrial Internship-II).

ii) As departmental courses already existed in the scheme of previous batches with same/different code. So, no need to approve syllabi for these courses.

6. For B. Tech. (CSE with Specialization in Data Science) (Batch 2022-2026 onwards):

Annexure-7

A) The house considered already approved 8th semester scheme for Batch 2021-2025 under this specializations and approved it also as 8th semester scheme for respective specialization with following minor changes:

i) Course code of Reinforcement Learning is renamed as BCSE-604 & Artificial Neural Networks as BCSE-605.

ii) Course Industrial Project / In-house training is renamed as Industrial Internship-II with course code BIT-002.

iii) Total 166 credits are required to get B. Tech. Degree with this specialization..

B) As departmental courses already existed in the scheme of previous batches with same/different code. So, no need to approve syllabi for these courses.

7. For B. Tech (CSE with Specialization in Full Stack Development) (Batch 2022-2026 onwards), the house considered and approved:

Annexure-8

A) Some minor changes in the scheme of 8th semester. These changes involve:

i) Replacement of course: Distributed Operating System with course (BCSE-705: Progressive Web Apps), & Advanced Database Management System with course (BCSE-706: AI & ML in Web Apps).

ii) Course: (BCSE-520: Integrated Project) is changed to (BCSE-521: Integrated Project-II).

iii) Course Industrial Project / In-house training is renamed as Industrial Internship-II with course code BIT-002.

iv) Total 166 credits are required to get B. Tech. Degree with this specialization.

Annexure-9

B) Syllabi for departmental courses of 8th semester. This includes:

i) Newly approved syllabus: (BCSE-705: Progressive Web Apps) & (BCSE-706: AI & ML in Web Apps).

ii) As departmental courses already existed in the scheme of previous batches with same/different code. So, no need to approve syllabi for these courses.

8. For B. Tech (CSE, CSE with Specialization in Cloud Technology & Information Security, CSE with Specialization in Data Science, CSE with Specialization in Full Stack Development) (Batch 2023-2027 onwards), the house considered and approved:

Annexure-10

A) Some minor changes in the scheme of 5th semester. These changes involve:

i) For Course (BPD-I:Personality Development Skills-I), teaching schedule is changed from : (L:0,T:0, P:2) to (L:0, T:2, P:0) and 100 marks weightage is assigned for internal category.

ii) Course (IIOT-5: Machine Learning for IIOT) is dropped and Course (PR-I: Project-I) is renamed as (PR-III: Project-III).

iii) New course (BCSE-527: Industrial Training-I) with 1 credit is added. After this updation:

a) Semester credits for CSE updated from 19 to 20 and semester marks from 1100 to 1200.

b) Semester credits for other specializations updated from 20 to 21 and semester marks from 1200 to 1300.

Annexure-11

B) Syllabi for departmental courses of 5th semester. This includes:

i) Newly approved syllabus: (BCSE-527: Industrial Training-I).

ii) As departmental courses already existed in the scheme of previous batches with same/different code. So, no need to approve syllabi for these courses.

9. For B. Tech (CSE with Specialization in AI & Machine Learning) (Batch 2023-2027 onwards), the house considered and approved:

Annexure-12

A) Some minor changes in the scheme of 5th semester. These changes involve:

i) New course (BPD-I : Personality Development Skills-I) is added as mandatory non-credit course and 100 marks weightage is assigned for internal category.

ii) Course (IIOT-5: Machine Learning for IIOT) is dropped and Course (PR-I: Project-I) is renamed as (PR-III: Project-III).

iii) New course (BCSE-527: Industrial Training-I) with 1 credit is added. After this updation, semester credits changed from 20 to 21 and semester marks from 1100 to 1300.

iv) Course code BCSE-802 is assigned to Computer Vision, BCSE-802L to Computer Vision Lab, BCSE-811 to Programming in R, BCSE-811L to Programming in R Lab, BCSE-812 to AI in HealthCare, BCSE-812L to AI in HealthCare Lab, BCSE-813 to PROLOG Programming & BCSE-813L to PROLOG Programming Lab .

Annexure-13

B) Syllabi for departmental courses of 5th semester. This includes:

i) Newly approved syllabus: (BCSE-802: Computer Vision), (BCSE-802L: Computer Vision Lab), (BCSE-811: Programming in R), (BCSE-811L: Programming in R Lab), (BCSE-812: AI in HealthCare), (BCSE-812L: AI in HealthCare Lab), (BCSE-813: PROLOG Programming) & (BCSE-813L: PROLOG Programming Lab) .

ii) As departmental courses already existed in the scheme of previous batches with same/different code. So, no need to approve syllabi for these courses.

10. For B. Tech (CSE, CSE with Specialization in Cloud Technology & Information Security, CSE with Specialization in Data Science, CSE with Specialization in Full Stack Development) (Batch 2023-2027 onwards), the house considered and approved:

Annexure-14

A) Some minor changes in the scheme of 6th semester. These changes involve:

i) For Course (BPD-II : Personality Development Skills-II), teaching schedule is changed from : (L:0, T:0, P:2) to (L:0,T:2, P:0) and 100 marks weightage is assigned for internal category.

ii) Course (IIOT-6: Artificial Intelligence) is dropped and Course (PR-II: Project-II) is renamed as (PR-IV:Project-IV).

iii) Six weeks industrial training / internship is mandatory. The evaluation of industrial training / internship will be done in the 7th semester. This instruction is added at the bottom of scheme.

B) As departmental courses already existed in the scheme of previous batches with same/different code. So, no need to approve syllabi for these courses.

11. For B. Tech (CSE with Specialization in AI & Machine Learning) (Batch 2023-2027 onwards), the house considered and approved:

Annexure-15

A) Some minor changes in the scheme of 6th semester. These changes involve:

i) New course (BPD-II: Personality Development Skills-II) is added as mandatory non-credit course and 100 marks weightage is assigned for internal category.

ii) Course (IIOT-6: Artificial Intelligence) is dropped and Course (PR-II: Project-II) is renamed as (PR-IV: Project-IV).

iii) Course code BCSE-803 is assigned to Reinforcement Learning, BCSE-803L to Reinforcement Learning Lab, Course Neural Network is renamed as Artificial Neural Network with code BCSE-821, Course Neural Network Lab is renamed as Artificial Neural Network Lab with code BCSE-821L, BCSE-822 to Fuzzy Logic & BCSE-822L to Fuzzy Logic Lab.

iv) Six weeks industrial training / internship is mandatory. The evaluation of industrial training / internship will be done in the 7th semester. This instruction is added at the bottom of scheme.

B) Syllabi for departmental courses of 6th semester. This includes: Annexure-16
   i) Newly approved syllabus: BCSE-803L: Reinforcement Learning Lab, BCSE-821L: Artificial Neural Network Lab, BCSE-822: Fuzzy Logic & BCSE-822L: Fuzzy Logic Lab.
   ii) As departmental courses already existed in the scheme of previous batches with same/different code. So, no need to approve syllabi for these courses.

12. For B. Tech (CSE, CSE with Specialization in Cloud Technology & Information Security, CSE with Specialization in Data Science, CSE with Specialization in Big Data and Analytics, CSE with Specialization in Full Stack Development, CSE with Specialization in AI & Machine Learning) (Batch 2024-2028 only), the house considered and approved:

A) Some minor changes in the scheme of 3rd semester. These changes involve: Annexure-17
   i) For Course (BET-I : Employability Training-I), teaching schedule is changed from : (L:0, T:0, P:2) to (L:0, T:2, P:0) and 100 marks weightage is assigned for internal category.
   ii) As Summer Internship is added as part of curriculum so course (PR-I: Project-I) of 2 credits is dropped. After this updation, semester credits updated from 27 to 25 and semester marks from 1300 to 1200.

B) As departmental courses already existed in the scheme of previous batches / same batch (other specialization) with same/different code. So, no need to approve syllabi for these courses.

13. For B. Tech (CSE, CSE with Specialization in Cloud Technology & Information Security, CSE with Specialization in Data Science, CSE with Specialization in Big Data and Analytics, CSE with Specialization in Full Stack Development, CSE with Specialization in AI & Machine Learning) (Batch 2024-2028 only), the house considered and approved:

A) Some minor changes in the scheme of 4th semester. These changes involve: Annexure-18
   i) For Course (BET-II : Employability Training-II), teaching schedule is changed from : (L:0, T:0, P:2) to (L:0, T:2, P:0) and 100 marks weightage is assigned for internal category.
   ii) As Summer Internship is added as part of curriculum so course (PR-II: Project-II) of 2 credits is dropped. After this updation, semester credits updated from 23 to 21 and semester marks from 1300 to 1200.
   iii) One month industrial training / internship is mandatory. The evaluation of industrial training / internship will be done in the 5th semester. This instruction is added at the bottom of scheme.

B) As departmental courses already existed in the scheme of previous batches / same batch (other specialization) with same/different code. So, no need to approve syllabi for these courses.

14. As per AICTE issued guidelines and suggestions (inclusion of internship/MOOC courses/Project work), for B. Tech. (CSE, CSE with Specialization in Cloud Technology & Information Security, CSE with Specialization in Data Science, CSE with Specialization in Big Data and Analytics, CSE with Specialization in Full Stack Development, CSE with Specialization in AI & Machine Learning) (Batch 2025-2029 onwards), the house considered and approved:

Annexure-19
A) Entire Scheme (1st to 8th semester).

Annexure 20
B) Syllabi for CSE departmental courses of 1st / 2nd semester (Common for all branches). This includes:
   i) Newly approved syllabus: (BCSE-001: Computational & Problem Solving using 'C' Lab), (BCSE-004: Python Programming), (BCSE-007: Data Structure), (BCSE-008: Computational & Problem Solving using 'C'), (BCSE-009: Python Programming Lab) & (BCSE-010: Data Structure Lab).

15. As per Stakeholders feedback (inclusion of Project Based Learning), CSE department is started new specialization named as CSE (Industry Integrated) (Batch 2025-2029 onwards), the house considered and approved:

Annexure-21
A) Entire Scheme (1st to 8th semester).

Annexure 22
B) Syllabi for CSE departmental courses of 1st / 2nd semester. This includes:
   i) Newly approved syllabus: (BCSE-001A: C Programming Lab), (BCSE-009A: Programming using Python Lab) & (BCSE-010A: Data Structure Lab using C).

16. From academic year 2025-2026 onwards, course on Human Values & Ethics will be offered under MOOC course category. Detailed guidelines will be issued from office of DAA.

17. Department has also approved the list of courses which can be floated as open elective course to students of other engineering branches during session Jul 2025 – Apr 2026. Only syllabus of course: Big Data is approved. Other subject already existed in the CSE scheme. So, no need to approve syllabi for these subjects. (Annexure-23)

18. Panel of examiners for the evaluation of PhD thesis of following research scholars were recommended and approved from BoS and will be sent to Controller of Examinations separately in confidential cover:
    i) Sandeep Kumar (10-ECM-581) on the topic, "An Efficient Machine Learning Model for Identification and Classification of Mango Plants Diseases".
    ii) Payal Chhabra (21-PhD-093) on the topic, "An Efficient Deep Learning based Approach to Detect Grocery and Currency for visually Impaired People".
    iii) Monika Sharma (08-ECM-3303) on the topic, "Secure & Robust IoT Based Framework for Healthcare System".
19. PhD synopsis of following research scholars were considered and approved by house (as per the mentioned minutes of RAC meetings):

Sr. No.	Name of the Research	Registration No.	Topic of Thesis	Supervisor	Date of Approval by
1	Diksha Rani	23-Ph.D-163	Prediction of "Missing Link" in Criminal Network using Machine Learning	Dr. Neera Batra, Professor, CSE Department	15.03.2025
2	Vibhor Gupta	23-PhD-289	Breast Cancer Prediction using Deep Learning	Dr. Amit Kumar Bindal, Professor, CSE Department	04.04.2025
3	Shilpa Narula	09-ECM-1867	AI-powered Named Entity Recognition for Early Detection and Classification of Mental Health Clues	Dr. Amit Kumar Bindal, Professor, CSE Department	15.04.2025
4	Gaurav Gulati	23-PhD-290	Early Stage Brain Tumor Detection by Using Machine Learning	Dr. Mohit Chabbra, Associate Professor, CSE Department	15.04.2025
5	Gaurav Sharma	10-ECM-850	An Efficient Machine Learning Model for the Identification and Classification of Rice Crop Diseases	Dr. Mohit Chabbra, Associate Professor, CSE Department	15.04.2025
6	Sonam Dung	24-PhD-180	Artificial Intelligence based Detection Model for Brain Tumor	Dr. Rajneesh Kumar, Professor, CSE Department	30.05.2025

20. The decision regarding CO/PO/PSO attainment levels which were approved during last year BoS meeting, is also approved by the house for various courses during upcoming sessions (for batches 2021 onwards):

For CO Attainment (Theory & Practical Courses):

Target Level	Recommended Criteria
Level 3	Average Percentage >70%
Level 2	Average Percentage (>=60 & <70)
Level 1	Average Percentage (>=50 & <60)
Level 0	Average Percentage (<50)

Note: The respective course instructor may recommend any updation in set target levels depending upon course nature with the prior approval of competent authorities.

For PO Attainment:

PO No.	Recommended Target Level (In Percentage)
PO1, PO2, PO3, PO5, PO8, PO9, PO11	65%
PO4, PO7, PO10, PO12	60%
PO6	50%

For PSO Attainment:

PSO No.	Recommended Target Level (In Percentage)
PSO1, PSO2, PSO4	65%
PSO3	60%

21. Stakeholders feedback report and research output of the department during session Apr 2024 – Mar 2025 was presented and discussed before the house.
22. Considered & approved the SWAYAM / MOOC courses which can be opted by students (Batch 2022-2026, Batch 2023-2027 and Batch 2024-2028) under the category of Swayam courses. Also list of approved courses can be expanded. (Annexure-24)
23. Panel of examiners for the evaluation of M.Tech. Dissertation of all those research scholars who will submit their Dissertation report upto 30.06.2026 was approved from BoS and will be sent to Controller of Examinations separately in confidential cover.
24. Discussion on level wise mapping of multiple entry & multiple exit as per NEP 2020 was also done.
25. Also resolved to authorize the HOD / Chairman Board of Studies of Computer Science & Engineering department to recommend the names of paper setters / examiners for any paper of any course taken by Computer Sc. & Engineering department for the examination to be held during session 2025-26 not covered by the panels of paper setters / examiners recommended under item no. 2 or if the names recommended for any paper in the panels already recommended have been exhausted.

The meeting ended with a vote of thanks to all the members especially to the external experts.

Note: This meeting has been conducted using Google meet online platform link: https://meet.google.com/ark-gees-ihd.
External expert attended this meeting in online mode.

HOD/CHAIRMAN

Head
Department of Computer
Science & Engineering
M.M. Engineering College
Maharishi Markandeshwar
(Deemed To Be University)
Mullana, Ambala, Haryana-133207

CC:
1. All Members of the Board of Studies.
2. PA to the Principal.
3. Controller of Examination.
4. DR (Academic).

B. Tech. (7th Sem)
(Common for CSE, CSE with Specialization in CT& IS, CSE with Specialization in DS, CSE with Specialization in FSD)
BIT-001 (Industrial Internship-I)

L	T	P
-	-	-

Continuous evaluation	**100**
End semester exam	**500**
Total marks	**600**
Credits	**16.0**

Course Objectives:

1. To learn about various phases of software development life cycle.
2. To learn about how to provide software solution for real life problems.
3. To learn about coding and testing of solutions.
4. To learn about report writing concepts.

The students are required to develop a project during industrial internship and project work evaluation will be entirely based upon project evaluation rubrics as given below:

	Marks Distribution & Criteria	Excellent	Very Good	Good	Poor
		5	4	3	2
Synopsis	Novelty of the Problem Definition / Motivation **(Max Marks 5)**	The given problem definition is novel in nature (81% to100%)	The given problem definition is somewhat novel in nature. (61% to 80%)	The given problem definition is novel in nature to some extent. (41% to 60%)	The given problem definition is not novel in nature. (<40%)
	Objectives / Modeling / Feasibility. Requirement and Scope of the Project **(Max Marks 5)**	Provide a clear purpose of the idea and evidence that supports the project concept. Software Development Process Model is used (Waterfall, Incremental, RAD etc.) (81% to 100%)	Somewhat clear purpose of the idea and evidence that supports the project concept And software Development Process Model is used (Waterfall, Incremental, RAD etc.) (61% to 80%)	Attempts to define purpose of the idea and evidence that support the project concept and Attempts to use software Development Process Model (Water fall, Incremental, RAD etc.) (41% to 60%)	Does not clearly define the purposeof the idea and evidence that supports the project concept. Does not clearly used software Development Process Model (Waterfall, Incremental, RAD etc.) (<40%)
Progress 1	Coding and Implementation **(Max Marks 5)**	5	4	3	2
		Code is correctly implemented. (81% to 100%)	Somewhat Code is correctly implemented. (61% to 80%)	Attempts to code and implement correctly (41% to 60%)	Code is not completely and correctly implemented <40%
	Unit Testing **(Max Marks 5)**	5	4	3	2
		Student delivered presentation covering Validation and Testing. (81% to 100%)	Student delivered somewhat presentation covering Validation and Testing.(61% to 80%)	Student delivered presentation covering few of Validation and Testing. (41% to 60%)	Student not delivered presentation covering Validation and Testing. <40%
	Understanding, Individual Involvement/ Contribution in Project. **(Max Marks 5)**	5	4	3	2
		Ability to work within the team. **Willingness** to perform tasks. **Punctuality** On time for team meetings. **Reliability** Perform tasks within time. **Creativity** Provide meaningful insight to the project team. (81% to 100%)	**Somewhat Ability** to work within the team. **Somewhat Willingness** to perform tasks. **Somewhat Punctuality -** On time for team meetings. **Somewhat Reliability** Perform tasks within time. **Somewhat Creativity** Provide meaningful insight to project team. (61% to 80%)	**Attempted Ability** to work within the team. **Attempted Willingness** to perform tasks. **Attempted Punctuality -** On time for team meetings. **Attempted Reliability Dependability** Perform tasks within time. **Attempted Creativity** Provide meaningful insight to project team. (41% to 60%)	**No Ability** to work within the team. **No Willingness** to perform tasks. **No Punctuality-**On time for team meetings. **No Reliability Dependability** Perform tasks within time. **No Creativity** Provide meaningful insight to project team. <40%
Progress 2	Coding and Implementation **(Max Marks 5)**	5	4	3	2
		Code is correctly implemented (81% to 100%)	Somewhat Code is correctly implemented. (61% to 80%)	Attempts to code and implement correctly (41% to 60%)	Code is not completely and correctly implemented <40%
	Testing **(Max Marks 5)**	5	4	3	2
		Student delivered presentation covering Validation and Testing. (81% to 100%)	Student delivered somewhat presentation covering Validation and Testing. (61% to 80%)	Student delivered presentation covering few of Validation and Testing. (41% to 60%)	Student not delivered presentation covering Validation and Testing. <40%
	Understanding, Individual Involvement/ Contribution in Project. **(Max Marks 5)**	5	4	3	2
		Ability to work within the team. **Willingness** to perform tasks. **Punctuality** On time for team meetings. **Reliability** Perform tasks within time. **Creativity** Provide meaningful insight to the project team. (81% to 100%)	**Somewhat Ability** to work within the team. **Somewhat Willingness** to perform tasks. **Somewhat Punctuality-** On time for team meetings. **Somewhat Reliability** Perform tasks within time. **Somewhat Creativity** Provide meaning full insight to project team. (61% to 80%)	**Attempted Ability** to work within the team. **Attempted Willingness** to perform tasks. **Attempted Punctuality-**On time for team meetings. **Attempted Reliability Dependability** Perform tasks within time. **Attempted Creativity** Provide meaningful insight to project team. (41% to 60%)	**No Ability** to work within the team. **No Willingness** to perform tasks. **No Punctuality-**On time for team meetings. **No Reliability Dependability** Perform tasks within time. **No Creativity** Provide meaningful insight to project team. <40%
Final Progress	Final Coding and Implementation **(Max Marks 5)**	5	4	3	2
		Code completely and correctly implemented. The design and language used for coding is Correctly chosen. (81% to 100%)	Somewhat Code completely and correctly implements the design and language used for coding is correctly chosen. (61% to 80%)	Attempts to code completely and correctly implement the design and language used for coding is Properly chosen. (41% to 60%)	Code not completely and correctly implement the design and language used for coding is not Correctly chosen. <40%
	Testing **(Max Marks 5)**	5	4	3	2
		Student delivered presentation covering Validation and Testing. (81% to 100%)	Student delivered somewhat presentation covering Validation and Testing (61% to 80%)	Student delivered presentation covering few of Validation and Testing (41% to 60%)	Student not delivered presentation covering Validation and Testing. <40%
	Demonstration cum Presentation **(Max Marks 5)**	5	4	3	2
		Presentation is well organized and reflects logical order. (81% to 100%)	Some of the Presentation does not reflect logical order. (61% to 80%)	Most of the Presentation does not reflect logical order. (41% to 60%)	Presentation does not reflect logical order. <40%
Project Report	Documentation & Report **(Max Marks 5)**	5	4	3	2
		Report as per format provided. The project may be carried for Participation in various contests, published, patented and applied for copyright (81% to 100%)	Report is provided somewhat as per format. The project may be carried for Participation in various contests, published, patented and applied for copyright (61% to 80%)	Report is provided as per format to some extent. Attempted Participation in various contests, Publications, Copyright, Patent (41% to 60%)	Report is not as per the format provided. Poor Participation In various contests, Publications, Copyright, Patent <40%

Course Outcomes:

i) Able to identify software solution corresponding to real life problems.
ii) Able to code software solution.
iii) Able to test software solution.
iv) Able to write reports.

B. Tech. (7th Sem)
(Common for CSE, CSE with Specialization in CT& IS, CSE with Specialization in DS, CSE with Specialization in FSD)
BCSE-525 (Industrial Training)

L	T	P
-	-	-

Continuous evaluation	**100**
Total marks	**100**
Credits	**2.0**

Course Objectives:

1. To learn about various phases of software development life cycle.
2. To learn about how to provide software solution for real life problems.
3. To learn about coding and testing of solutions.
4. To learn about report writing concepts.

The students are required to develop a project during industrial training and project work evaluation will be entirely based upon project evaluation rubrics as given below:

	Marks Distribution & Criteria	Excellent	Very Good	Good	Poor
		5	4	3	2
Synopsis	Novelty of the Problem Definition / Motivation **(Max Marks 5)**	The given problem definition is novel in nature (81% to100%)	The given problem definition is somewhat novel in nature. (61% to 80%)	The given problem definition is novel in nature to some extent. (41% to 60%)	The given problem definition is not novel in nature. (<40%)
	Objectives / Modeling / Feasibility. Requirement and Scope of the Project **(Max Marks 5)**	Provide a clear purpose of the idea and evidence that supports the project concept. Software Development Process Model is used (Waterfall, Incremental, RAD etc.) (81% to 100%)	Somewhat clear purpose of the idea and evidence that supports the project concept And software Development Process Model is used (Waterfall, Incremental, RAD etc.) (61% to 80%)	Attempts to define purpose of the idea and evidence that support the project concept and Attempts to use software Development Process Model (Water fall, Incremental, RAD etc.) (41% to 60%)	Does not clearly define the purposeof the idea and evidence that supports the project concept. Does not clearly used software Development Process Model (Waterfall, Incremental, RAD etc.) (<40%)
Progress 1	Coding and Implementation **(Max Marks 5)**	5	4	3	2
		Code is correctly implemented. (81% to 100%)	Somewhat Code is correctly implemented. (61% to 80%)	Attempts to code and implement correctly (41% to 60%)	Code is not completely and correctly implemented <40%
	Unit Testing **(Max Marks 5)**	5	4	3	2
		Student delivered presentation covering Validation and Testing. (81% to 100%)	Student delivered somewhat presentation covering Validation and Testing.(61% to 80%)	Student delivered presentation covering few of Validation and Testing. (41% to 60%)	Student not delivered presentation covering Validation and Testing. <40%
	Understanding, Individual Involvement/ Contribution in Project. **(Max Marks 5)**	5	4	3	2
		Ability to work within the team. **Willingness** to perform tasks. **Punctuality** On time for team meetings. **Reliability** Perform tasks within time. **Creativity** Provide meaningful insight to the project team. (81% to 100%)	**Somewhat Ability** to work within the team. **Somewhat Willingness** to perform tasks. **Somewhat Punctuality -** On time for team meetings. **Somewhat Reliability** Perform tasks within time. **Somewhat Creativity** Provide meaningful insight to project team. (61% to 80%)	**Attempted Ability** to work within the team. **Attempted Willingness** to perform tasks. **Attempted Punctuality -** On time for team meetings. **Attempted Reliability Dependability** Perform tasks within time. **Attempted Creativity** Provide meaningful insight to project team. (41% to 60%)	**No Ability** to work within the team. **No Willingness** to perform tasks. **No Punctuality-**On time for team meetings. **No Reliability Dependability** Perform tasks within time. **No Creativity** Provide meaningful insight to project team. <40%
Progress 2	Coding and Implementation **(Max Marks 5)**	5	4	3	2
		Code is correctly implemented (81% to 100%)	Somewhat Code is correctly implemented. (61% to 80%)	Attempts to code and implement correctly (41% to 60%)	Code is not completely and correctly implemented <40%
	Testing **(Max Marks 5)**	5	4	3	2
		Student delivered presentation covering Validation and Testing. (81% to 100%)	Student delivered somewhat presentation covering Validation and Testing. (61% to 80%)	Student delivered presentation covering few of Validation and Testing. (41% to 60%)	Student not delivered presentation covering Validation and Testing. <40%
	Understanding, Individual Involvement/ Contribution in Project. **(Max Marks 5)**	5	4	3	2
		Ability to work within the team. **Willingness** to perform tasks. **Punctuality** On time for team meetings. **Reliability** Perform tasks within time. **Creativity** Provide meaningful insight to the project team. (81% to 100%)	**Somewhat Ability** to work within the team. **Somewhat Willingness** to perform tasks. **Somewhat Punctuality-** On time for team meetings. **Somewhat Reliability** Perform tasks within time. **Somewhat Creativity** Provide meaning full insight to project team. (61% to 80%)	**Attempted Ability** to work within the team. **Attempted Willingness** to perform tasks. **Attempted Punctuality-**On time for team meetings. **Attempted Reliability Dependability** Perform tasks within time. **Attempted Creativity** Provide meaningful insight to project team. (41% to 60%)	**No Ability** to work within the team. **No Willingness** to perform tasks. **No Punctuality-**On time for team meetings. **No Reliability Dependability** Perform tasks within time. **No Creativity** Provide meaningful insight to project team. <40%
Final Progress	Final Coding and Implementation **(Max Marks 5)**	5	4	3	2
		Code completely and correctly implemented. The design and language used for coding is Correctly chosen. (81% to 100%)	Somewhat Code completely and correctly implements the design and language used for coding is correctly chosen. (61% to 80%)	Attempts to code completely and correctly implement the design and language used for coding is Properly chosen. (41% to 60%)	Code not completely and correctly implement the design and language used for coding is not Correctly chosen. <40%
	Testing **(Max Marks 5)**	5	4	3	2
		Student delivered presentation covering Validation and Testing. (81% to 100%)	Student delivered somewhat presentation covering Validation and Testing (61% to 80%)	Student delivered presentation covering few of Validation and Testing (41% to 60%)	Student not delivered presentation covering Validation and Testing. <40%
	Demonstration cum Presentation **(Max Marks 5)**	5	4	3	2
		Presentation is well organized and reflects logical order. (81% to 100%)	Some of the Presentation does not reflect logical order. (61% to 80%)	Most of the Presentation does not reflect logical order. (41% to 60%)	Presentation does not reflect logical order. <40%
Project Report	Documentation & Report **(Max Marks 5)**	5	4	3	2
		Report as per format provided. The project may be carried for Participation in various contests, published, patented and applied for copyright (81% to 100%)	Report is provided somewhat as per format. The project may be carried for Participation in various contests, published, patented and applied for copyright (61% to 80%)	Report is provided as per format to some extent. Attempted Participation in various contests, Publications, Copyright, Patent (41% to 60%)	Report is not as per the format provided. Poor Participation In various contests, Publications, Copyright, Patent <40%

Course Outcomes:

i) Able to identify software solution corresponding to real life problems.
ii) Able to code software solution.
iii) Able to test software solution.
iv) Able to write reports.

B. Tech. (7th Sem) Computer Science & Engineering with Specialization in Full Stack Development
BCSE-731 (Software Architecture Design)

L	T	P
3	0	0

Continuous evaluation	**40**
End semester exam	**60**
Total marks	**100**
Credits	**3.0**

Course Objectives:

1. Implement and apply learned concepts in real-world scenarios.
2. Examine and differentiate between architectural patterns, security principles, and design decisions.
3. Critically assess architectural trade-offs and make informed decisions.
4. Construct and develop secure, scalable, and maintainable software architectures.

Unit-1 Fundamentals of Software Architecture

Introduction to Software Architecture: Definition, Importance, and Role of a Software Architect, Software Architecture vs. Software Design, Key Architectural Attributes (Scalability, Maintainability, Security, Performance).**Architectural Styles & Design Patterns**: Layered Architecture, Microservices vs. Monolithic, Event-Driven Architecture, Client-Server vs. Peer-to-Peer, Architectural Patterns (MVC, MVVM, CQRS, Hexagonal). **Software Architecture Documentation & Modeling**: C4 Model: Context, Container, Component, Code. UML Diagrams (Component, Deployment, Sequence Diagrams), Architectural Decision Records (ADR). **Architectural Evaluation & Trade-offs**: Evaluating Performance, Reliability, and Maintainability, Trade-off Analysis (CAP Theorem, Latency vs. Throughput, Security vs. Usability).

Unit-2 Scalable, Secure, and Cloud-Native Architectures

Designing for Scalability & Performance: Vertical vs. Horizontal Scaling, Load Balancing Strategies (Round Robin, Least Connections), Caching Strategies (Redis,CDN), Database Optimization (Sharding, Indexing, Replication). **Service-Oriented & Cloud-Based Architectures**: Service-Oriented Architecture (SOA) vs. Microservices, API Gateway & Service Mesh, Cloud-Native Design, Containerization & Orchestration (Docker, Kubernetes). **Secure Software Architectures**: Secure by Design Principles, Authentication & Authorization, Threat Modeling & Security Best Practices, Fault Tolerance & Disaster Recovery Strategies

Unit-3 Event-Driven, Real-Time & DevOps Architectures

Event-Driven & Real-Time Architectures: Event Sourcing & Command Query Responsibility Segregation (CQRS), Message Brokers (Apache Kafka), WebSockets, Server-Sent Events (SSE). **DevOps & CI/CD for Software Architecture**: Continuous Integration (CI) & Continuous Deployment (CD), Infrastructure as Code, Observability & Monitoring. **Performance Optimization & High Availability**: Rate Limiting & Circuit Breakers, Multi-Region Deployment & Edge Computing, Serverless Architecture & Auto-Scaling.

Unit-4 Case Studies, Decision Making

Architectural Decision Making: Trade-offs in Choosing an Architecture, Cost vs. Performance vs. Maintainability Considerations, Architectural Refactoring & Evolution Strategies. **Industry Case Studies & Best Practices**: Case Studies: Netflix, Uber, Amazon, Google. Open-Source Architectural Frameworks & Industry Standards, Future Trends in Software Architecture.

Course Outcomes:

1. Understand and apply key architectural patterns and principles.
2. Design secure, scalable, and high-performance software architectures.
3. Make data-driven architectural decisions with trade-off analysis.
4. Implement modern DevOps practices in software architecture.

Instructions for paper setter: All Questions are compulsory. The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C Comprises of 4 questions of 4 marks each, one from each unit. Section D Comprises of 4 questions of 6 marks each, one from each unit. There is no overall choice, however internal choice may be provided in section C and D, if paper setter so desires.

Textbooks:

1. "Software Architecture in Practice" by Len Bass, Paul Clements, Rick Kazman, Addison-Wesley Professional, 2021 (4th Edition).
2. "Designing Software Architectures: A Practical Approach" by Humberto Cervantes, Rick Kazman, Addison-Wesley Professional, 2016.
3. "Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions" by Gregor Hohpe, Bobby Woolf, Addison-Wesley Professional, 2003.
4. "Cloud Native Architectures: Design high-availability and scalable cloud-native applications" by Tom Laszewski, Kamal Arora, Packt Publishing, 2017.

Reference Books:

1. "The Software Architect Elevator: Redefining the Architect's Role in the Digital Enterprise" by Gregor Hohpe, O'Reilly Media, 2020.
2. "Building Evolutionary Architectures: Support Constant Change" by Neal Ford, Rebecca Parsons, Patrick Kua, O'Reilly Media, 2017.
3. "Fundamentals of Software Architecture: An Engineering Approach" by Mark Richards, Neal Ford, O'Reilly Media, 2020.
4. "Cloud Architecture Patterns: Using Microsoft Azure" by Bill Wilder, O'Reilly Media, 2012.

B. Tech. (7th Sem) Computer Science &Engineering with Specialization in Full Stack Development
BCSE-732 (Web Application Deployment)

L	T	P
3	0	0

Continuous evaluation	**40**
End semester exam	**60**
Total marks	**100**
Credits	**3.0**

Course Objectives:

1. Analyze and implement various web application deployment strategies.
2. Configure and manage cloud infrastructure for MERN stack applications.
3. Automate deployment pipelines using CI/CD tools for seamless integration.
4. Optimize security, scalability, and performance in production environments.

Unit-1 Preparing Web Applications for Deployment

Overview of Deployment Stages: Development, Staging, Production, Cloud vs On-Premise Hosting, Differences between PaaS, IaaS, and Serverless**. Choosing the Right Deployment Strategy:** Hosting Providers: AWS, Azure, GCP, DigitalOcean, When to Choose Vercel, Netlify, Railway. **Node.js Best Practices for Production:** Handling Environment Variables (dotenv, config), Process Management with PM2 &system, Setting Up Load Balancing with NGINX. **Optimizing React for Production:** Minification, Compression & Tree Shaking, React Code Splitting & Lazy Loading. **MongoDB Deployment Strategies:** MongoDB Atlas vs Self-hosted MongoDB, Setting Up Database Replication & Sharding, Data Backup.

Unit-2 Server Deployment & Cloud Infrastructure

Setting Up a Linux Server for Node.js: Creating a Virtual Machine on AWS/GCP, Configuring Firewall & SSH Access, Installing Node.js, MongoDB & NGINX.**Deploying on VPS:** Uploading MERN App using SCP & FTP, Running Node.js in the Background with PM2. **Hosting React Frontend on Vercel & Netlify:** Configuring CI/CD for Auto Deployment, Handling Environment Variables Securely. **Introduction to Docker & Containers:** Writing a Dockerfile for a MERN Application. **Deploying Containers with Docker Compose:** Multi-Container Setup for MongoDB & Node.js, Networking & Persistent Storage in Docker

Unit-3 CI/CD & Automated Deployments

Introduction to CI/CD Pipelines: Benefits of Continuous Integration & Deployment, Overview of GitHub Actions, Jenkins**,** Automating Linting & Unit Tests. **Automating Tests with Jest & Cypress:**Writing Unit & Integration Tests, Running Tests Before Deployment. **GitHub Actions for Automated Deployment:** Writing a Workflow for CI/CD, Deploying Containers via GitHub Actions.**Deploying Docker Containers Using CI/CD:** Setting Up AWS Elastic Beanstalk for Automated Deployments, Configuring Kubernetes for Scaling.

Unit-4 Security, Performance & Monitoring

Security Best Practices for Web APIs: Implementing JWT Authentication,Preventing SQL Injection & NoSQL Injection. **Optimizing API Performance:** Caching Strategies (Redis, Cloudflare), Database Indexing for Faster Queries. **Load Testing & Stress Testing:** Using k6 & JMeter for Load Testing, Identifying Performance Bottlenecks. **Logging Strategies:** Centralized Logging with Winston & Morgan.

Course Outcomes:

1. Deploy MERN applications on cloud platforms like AWS, Vercel, and Netlify.
2. Utilize CI/CD pipelines for automated and efficient deployment workflows.
3. Implement security and performance best practices for web applications.
4. Manage and troubleshoot deployments to ensure application stability.

Instructions for paper setter: All Questions are compulsory. The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C Comprises of 4 questions of 4 marks each, one from each unit. Section D Comprises of 4 questions of 6 marks each, one from each unit. There is no overall choice, however internal choice may be provided in section C and D, if paper setter so desires.

Textbooks:

1. "Web Development and Deployment: A Practical Guide" – Richard Wagner, Wiley, 2022.
2. "Node.js, MongoDB, and React: Deployment & Best Practices" – Eric Bush, Apress, 2023.
3. "The DevOps Handbook: How to Create World-Class Agility" – Gene Kim, Patrick Debois, Jez Humble, John Willis, IT Revolution Press, 2021.
4. "Cloud Computing: Concepts, Technology & Architecture" – Thomas Erl, Prentice Hall, 2020.

Reference Books:

1. "Full Stack Serverless: Modern Application Development" – Nader Dabit, O'Reilly Media, 2021.
2. "Deploying to AWS: Automating the Cloud with Terraform, Ansible & Jenkins" – Yogesh Raheja, BPB Publications, 2022.
3. "Docker Up & Running: Shipping Reliable Containers in Production" – Sean Kane, Karl Matthias, O'Reilly Media, 2021.
4. "Kubernetes Up & Running: Dive into the Future of Infrastructure" – Kelsey Hightower, O'Reilly Media, 2022.

B. Tech. (7th Sem) Computer Science & Engineering with Specialization in Full Stack Development
BCSE-733 (Software Test Automation)

L	T	P
3	0	0

Continuous evaluation	**40**
End semester exam	**60**
Total marks	**100**
Credits	**3.0**

Course Objectives:

1. Understand test automation concepts, frameworks, and strategies in Agile & DevOps.
2. Develop and execute UI, API, and E2E tests using Cypressand Postman.
3. Integrate test automation into CI/CD pipelines with GitHub Actions, Jenkins, and Docker.
4. Enhance application quality with automated performance, security, and reliability testing.

Unit-1 Foundations of Software Test Automation

Introduction to Testing & Test Automation: Introduction to Testing & Test Automation, Importance of Software Testing in Agile & DevOps, Manual Testing vs. Automation Testing, CI/CD & Role of Automation in Modern Development. **Test Automation Frameworks & Strategies**: Choosing the Right Test Automation Tool, Overview of Selenium, Cypress, Playwright, Jest, Mocha.

Unit-2UI & API Test Automation

UI Automation Testing: Cypress for Frontend Testing, Handling DOM Elements, Events, Assertions, Handling Dynamic Elements, Stubs, Mocks, and Fixtures. **API Testing & Automation:** RESTful API Testing with Postman, Contract Testing with OpenAPI, Automating API Testing in CI/CD Pipelines

Unit-3Advanced Test Automation & CI/CD

End-to-End (E2E) Testing & Cross-Browser Testing: Automating User Workflows with Cypress & Playwright, Handling Authentication & Data-Driven Testing, Running Tests on Cloud Platforms (Sauce Labs, BrowserStack). **Performance & Load Testing**: Introduction to K6 for Load Testing, Simulating High Traffic Scenarios & Measuring Performance

Unit-4Security, DevOps Integration & Industry Best Practices

Security Testing & Vulnerability Scanning: OWASP Security Testing Basics, Automating Security Tests with ZAP (Zed Attack Proxy). **CI/CD Integration & Test Automation in DevOps:** Running Automated Tests in CI/CD (GitHub Actions, Jenkins), Dockerizing Test Automation Frameworks, Reporting & Test Metrics (Mocha Reports).

Course Outcomes:

1. Apply automation testing for web, API, and database validation in real-world scenarios.
2. Implement scalable test automation frameworks for frontend, backend, and integration testing.
3. Optimize DevOps pipelines by integrating test automation with CI/CD workflows.
4. Analyze software quality through performance testing, security assessments, and test reports.

Instructions for paper setter: All Questions are compulsory. The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C Comprises of 4 questions of 4 marks each, one from each unit. Section D Comprises of 4 questions of 6 marks each, one from each unit. There is no overall choice, however internal choice may be provided in section C and D, if paper setter so desires.

Textbooks:

1. "Software Testing: Principles and Practices" by Srinivasan Desikan & Gopalaswamy Ramesh, Pearson, 2006.
2. "Software Test Automation: Effective Use of Test Execution Tools" by Mark Fewster & Dorothy Graham, Addison-Wesley, 1999.
3. "Continuous Testing for DevOps Professionals" by Eran Kinsbruner, Packt Publishing, 2018.
4. "Cypress: End-to-End Testing Framework" by Gaurav Shetty, BPB Publications, 2022.

Reference Books:

1. "Agile Testing: A Practical Guide for Testers and Agile Teams" by Lisa Crispin & Janet Gregory, Addison-Wesley, 2008.
2. Effective Software Testing: A Developer's Guide" by Maurício Aniche, Manning Publications, 2022.
3. "Hands-On Selenium WebDriver with Java" by Boni Garcia, O'Reilly, 2022.
4. "Mastering API Testing with Postman" by Dave Westerveld, Packt Publishing, 2023.

B. Tech. (7th Sem) Computer Science & Engineering with Specialization in Full Stack Development
BCSE-741 (Version Control Systems)

L	T	P
3	0	0

Continuous evaluation	**40**
End semester exam	**60**
Total marks	**100**
Credits	**3.0**

Course Objectives:

1. Understand version control concepts, Git workflows, and collaboration techniques.
2. Implement branching strategies, conflict resolution, and CI/CD automation.
3. Apply Git security, hooks, and GitOps for infrastructure automation.
4. Optimize team workflows with industry best practices and real-world version control strategies.

Unit-1 Introduction to Version Control Systems

Fundamentals of VCS: Importance, benefits, centralized vs. distributed VCS (CVCS vs. DVCS). **Git Basics:** Installation, Git workflow, repositories, commits, branching, and merging. **Working with Git**: Staging area, commit history, undoing changes, interactive rebase, and cherry-picking. **Introduction to GitHub/GitLab/Bitbucket**: Remote repositories, SSH authentication, and basic pull/push operations.

Unit-2 Advanced Git & Collaborative Development

Branching Strategies: Git Flow, GitHub Flow, and trunk-based development. **Conflict Resolution & Code Review:** Merge conflicts, rebasing, resolving conflicts, pull requests (PRs), and code reviews. **Managing Large Projects:**Monorepos vs. Polyrepos, submodules, LFS (Large File Storage). **Continuous Integration (CI) with Git:** GitHub Actions, GitLab CI/CD, Jenkins integration for automated builds and testing.

Unit-3 Security, Automation & Workflow Optimization

Git Hooks & Automation: Pre-commit, pre-push hooks, enforcing coding standards, and automated testing workflows. **Securing Git Repositories**: Signed commits, GPG verification, access control, and handling sensitive data with. gitignore & GitHub Secrets. **GitOps & Infrastructure as Code (IaC**): Managing deployments using Git, Terraform, and Kubernetes with GitOps. **Debugging & Recovery:** Using git bisect, git reflog, and recovering lost commits.

Unit-4 Industry Best Practices & Real-World Applications

Handling Open-Source Contributions: Forking, issue tracking, pull requests, and community best practices. **Scaling Git in Large Teams:** Managing repositories in enterprise environments, distributed workflows, and multi-repo strategies. **Industry Case Studies:** Real-world version control strategies from companies like Google, Facebook, and Microsoft.

Course Outcomes:

1. Apply Git for efficient source code management, collaboration, and version tracking.
2. Implement advanced Git workflows, CI/CD pipelines, and automation scripts.
3. Secure Git repositories, manage access controls, and handle large-scale projects.
4. Utilize GitOps methodologies and industry best practices for software deployment.

Instructions for paper setter: All Questions are compulsory. The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C Comprises of 4 questions of 4 marks each, one from each unit. Section D Comprises of 4 questions of 6 marks each, one from each unit. There is no overall choice, however internal choice may be provided in section C and D, if paper setter so desires.

Textbooks:

1. "Pro Git" by Scott Chacon & Ben Straub, Apress, 2014.
2. "Version Control with Git" by Jon Loeliger& Matthew McCullough, O'Reilly, 2012.
3. "Git Pocket Guide" by Richard E. Silverman, O'Reilly, 2013.
4. GitHub Essentials" by Achilleas Pipinellis, Packt Publishing, 2018.

Reference Books:

1. "Git for Teams" by Emma Jane Hogbin Westby, O'Reilly, 2015.
2. “Mastering Git" by Ferdinando Santacroce, Packt Publishing, 2019.
3. "The DevOps Handbook" by Gene Kim, Jez Humble, Patrick Debois & John Willis, IT Revolution, 2016.
4. "GitOps and Kubernetes" by Billy Yuen, Alexander Matyushentsev, Todd Ekenstam & Jesse Suen, O'Reilly, 2021.

B. Tech. (7th Sem) Computer Science &Engineering with Specialization in Full Stack Development
BCSE-742 (Web Performance Optimization)

L	T	P
3	0	0

Continuous evaluation	**40**
End semester exam	**60**
Total marks	**100**
Credits	**3.0**

Course Objectives:

1. Understand web performance fundamentals, Core Web Vitals, and industry benchmarks.
2. Optimize frontend performance using efficient HTML, CSS, JavaScript, and media strategies.
3. Enhance backend performance with caching, CDN integration, and database tuning.
4. Implement real-world performance monitoring, profiling, and AI-driven optimizations.

Unit-1 Fundamentals of Web Performance Optimization

Introduction to Web Performance: Importance, impact on UX, SEO, and conversions. **Performance Metrics & Tools:** Core Web Vitals (LCP, FID, CLS), Lighthouse, WebPageTest, Chrome DevTools. **Optimizing HTML & CSS:** Minification, critical CSS, avoiding render-blocking resources, optimizing font loading. **JavaScript Performance Best Practices:** Asynchronous loading (defer vs. async), tree shaking, lazy loading, code splitting.

Unit-2 Frontend Performance Optimization

Efficient Image & Media Optimization: Next-gen formats (WebP), responsive images, lazy loading, CDN usage. **Client-Side Caching & Compression:** Browser caching strategies, HTTP caching headers, Gzip & Brotli compression. **Optimizing Third-Party Scripts & Web Fonts:** Impact on performance, reducing unused scripts, self-hosting fonts

Unit-3 Backend & Network Optimization

Server-Side Performance Enhancements: Load balancing, caching strategies (Redis), server tuning. **Database Optimization:** Query optimization, indexing, denormalization, and caching strategies. **CDN & Edge Computing:** Content Delivery Networks (CDNs), reducing latency, edge caching. **API Performance Optimization:** REST vs. GraphQL, reducing over-fetching/under-fetching, implementing rate limiting.

Unit-4 Advanced Performance Techniques & Real-World Applications

Performance Monitoring & Profiling: Real-time monitoring with Google Analytics, New Relic, and Sentry. **Security & Performance:** HTTPS, HTTP/2, HTTP/3, CORS, Content Security Policy (CSP). **AI-Driven Performance Optimization:** AI-based image compression, predictive preloading, automated performance testing.

Course Outcomes:

1. Apply Core Web Vitals and optimization techniques to enhance web application speed.
2. Implement efficient frontend and backend performance strategies for scalability.
3. Utilize tools like Lighthouse, WebPageTest, and CDNs to analyze and improve performance.
4. Develop real-world high-performance applications with best practices and security considerations.

Instructions for paper setter: All Questions are compulsory. The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C Comprises of 4 questions of 4 marks each, one from each unit. Section D Comprises of 4 questions of 6 marks each, one from each unit. There is no overall choice, however internal choice may be provided in section C and D, if paper setter so desires.

Textbooks:

1. "High Performance Web Sites" by Steve Souders, O'Reilly, 2007.
2. "Web Performance in Action" by Jeremy Wagner, Manning Publications, 2016.
3. "Optimizing JavaScript" by Evan Burchard, O'Reilly, 2017.
4. "Image Optimization for the Web" by Addy Osmani, Google Developer Publications, 2021.

Reference Books:

1. "Even Faster Web Sites" by Steve Souders, O'Reilly, 2009.
2. "Web Page Size, Speed, and Performance Optimization" by Andy King, Pearson, 2013.
3. "Programming the Web with HTTP/2" by Stephen Ludin & Javier Garza, O'Reilly, 2017.
4. "Scaling Up: Performance Engineering for Web Apps" by Michael T. Nygard, Pragmatic Bookshelf, 2020.

B. Tech. (8th Sem)
(Common for CSE, CSE with Specialization in CT& IS, CSE with Specialization in DS, CSE with Specialization in FSD)
BIT-002 (Industrial Internship-II)

L	T	P
-	-	-

Continuous evaluation	**100**
End semester exam	**200**
Total marks	**300**
Credits	**8.0**

Course Objectives:

1. To learn about various phases of software development life cycle.
2. To learn about how to provide software solution for real life problems.
3. To learn about coding and testing of solutions.
4. To learn about report writing concepts.

The students are required to develop a project during industrial internship and project work evaluation will be entirely based upon project evaluation rubrics as given below:

	Marks Distribution & Criteria	Excellent	Very Good	Good	Poor
		5	4	3	2
Synopsis	Novelty of the Problem Definition / Motivation **(Max Marks 5)**	The given problem definition is novel in nature (81% to100%)	The given problem definition is somewhat novel in nature. (61% to 80%)	The given problem definition is novel in nature to some extent. (41% to 60%)	The given problem definition is not novel in nature. (<40%)
	Objectives / Modeling / Feasibility. Requirement and Scope of the Project **(Max Marks 5)**	Provide a clear purpose of the idea and evidence that supports the project concept. Software Development Process Model is used (Waterfall, Incremental, RAD etc.) (81% to 100%)	Somewhat clear purpose of the idea and evidence that supports the project concept And software Development Process Model is used (Waterfall, Incremental, RAD etc.) (61% to 80%)	Attempts to define purpose of the idea and evidence that support the project concept and Attempts to use software Development Process Model (Water fall, Incremental, RAD etc.) (41% to 60%)	Does not clearly define the purposeof the idea and evidence that supports the project concept. Does not clearly used software Development Process Model (Waterfall, Incremental, RAD etc.) (<40%)
Progress 1	Coding and Implementation **(Max Marks 5)**	5	4	3	2
		Code is correctly implemented. (81% to 100%)	Somewhat Code is correctly implemented. (61% to 80%)	Attempts to code and implement correctly (41% to 60%)	Code is not completely and correctly implemented <40%
	Unit Testing **(Max Marks 5)**	5	4	3	2
		Student delivered presentation covering Validation and Testing. (81% to 100%)	Student delivered somewhat presentation covering Validation and Testing.(61% to 80%)	Student delivered presentation covering few of Validation and Testing. (41% to 60%)	Student not delivered presentation covering Validation and Testing. <40%
	Understanding, Individual Involvement/ Contribution in Project. **(Max Marks 5)**	5	4	3	2
		Ability to work within the team. **Willingness** to perform tasks. **Punctuality** On time for team meetings. **Reliability** Perform tasks within time. **Creativity** Provide meaningful insight to the project team. (81% to 100%)	**Somewhat Ability** to work within the team. **Somewhat Willingness** to perform tasks. **Somewhat Punctuality -** On time for team meetings. **Somewhat Reliability** Perform tasks within time. **Somewhat Creativity** Provide meaningful insight to project team. (61% to 80%)	**Attempted Ability** to work within the team. **Attempted Willingness** to perform tasks. **Attempted Punctuality -** On time for team meetings. **Attempted Reliability Dependability** Perform tasks within time. **Attempted Creativity** Provide meaningful insight to project team. (41% to 60%)	**No Ability** to work within the team. **No Willingness** to perform tasks. **No Punctuality-**On time for team meetings. **No Reliability Dependability** Perform tasks within time. **No Creativity** Provide meaningful insight to project team. <40%
Progress 2	Coding and Implementation **(Max Marks 5)**	5	4	3	2
		Code is correctly implemented (81% to 100%)	Somewhat Code is correctly implemented. (61% to 80%)	Attempts to code and implement correctly (41% to 60%)	Code is not completely and correctly implemented <40%
	Testing **(Max Marks 5)**	5	4	3	2
		Student delivered presentation covering Validation and Testing. (81% to 100%)	Student delivered somewhat presentation covering Validation and Testing. (61% to 80%)	Student delivered presentation covering few of Validation and Testing. (41% to 60%)	Student not delivered presentation covering Validation and Testing. <40%
	Understanding, Individual Involvement/ Contribution in Project. **(Max Marks 5)**	5	4	3	2
		Ability to work within the team. **Willingness** to perform tasks. **Punctuality** On time for team meetings. **Reliability** Perform tasks within time. **Creativity** Provide meaningful insight to the project team. (81% to 100%)	**Somewhat Ability** to work within the team. **Somewhat Willingness** to perform tasks. **Somewhat Punctuality-** On time for team meetings. **Somewhat Reliability** Perform tasks within time. **Somewhat Creativity** Provide meaning full insight to project team. (61% to 80%)	**Attempted Ability** to work within the team. **Attempted Willingness** to perform tasks. **Attempted Punctuality-**On time for team meetings. **Attempted Reliability Dependability** Perform tasks within time. **Attempted Creativity** Provide meaningful insight to project team. (41% to 60%)	**No Ability** to work within the team. **No Willingness** to perform tasks. **No Punctuality-**On time for team meetings. **No Reliability Dependability** Perform tasks within time. **No Creativity** Provide meaningful insight to project team. <40%
Final Progress	Final Coding and Implementation **(Max Marks 5)**	5	4	3	2
		Code completely and correctly implemented. The design and language used for coding is Correctly chosen. (81% to 100%)	Somewhat Code completely and correctly implements the design and language used for coding is correctly chosen. (61% to 80%)	Attempts to code completely and correctly implement the design and language used for coding is Properly chosen. (41% to 60%)	Code not completely and correctly implement the design and language used for coding is not Correctly chosen. <40%
	Testing **(Max Marks 5)**	5	4	3	2
		Student delivered presentation covering Validation and Testing. (81% to 100%)	Student delivered somewhat presentation covering Validation and Testing (61% to 80%)	Student delivered presentation covering few of Validation and Testing (41% to 60%)	Student not delivered presentation covering Validation and Testing. <40%
	Demonstration cum Presentation **(Max Marks 5)**	5	4	3	2
		Presentation is well organized and reflects logical order. (81% to 100%)	Some of the Presentation does not reflect logical order. (61% to 80%)	Most of the Presentation does not reflect logical order. (41% to 60%)	Presentation does not reflect logical order. <40%
Project Report	Documentation & Report **(Max Marks 5)**	5	4	3	2
		Report as per format provided. The project may be carried for Participation in various contests, published, patented and applied for copyright (81% to 100%)	Report is provided somewhat as per format. The project may be carried for Participation in various contests, published, patented and applied for copyright (61% to 80%)	Report is provided as per format to some extent. Attempted Participation in various contests, Publications, Copyright, Patent (41% to 60%)	Report is not as per the format provided. Poor Participation In various contests, Publications, Copyright, Patent <40%

Course Outcomes:

i) Able to identify software solution corresponding to real life problems.
ii) Able to code software solution.
iii) Able to test software solution.
iv) Able to write reports.

B. Tech. (8th Sem) Computer Science & Engineering with Specialization in Full Stack Development
BCSE-705 (Progressive Web Apps)

L	T	P
3	0	0

Continuous evaluation	**40**
End semester exam	**60**
Total marks	**100**
Credits	**3.0**

Course Objectives:

1. Understand Progressive Web App (PWA) fundamentals, architecture, and benefits over native apps.
2. Implement service workers, caching, offline support, and push notifications.
3. Enhance PWA performance, security, and access to device features.
4. Deploy real-world PWAs with backend integration and industry best practices.

Unit-1 Fundamentals of Progressive Web Apps

Introduction to PWAs: Evolution of web apps, benefits over traditional web & native apps, industry adoption. **Core Principles of PWAs**: Reliable, fast, engaging experiences, Web App Manifest, Service Workers.PWA vs. Native Apps: Performance, capabilities, and business impact. **Setting Up a PWA Project**: Using modern frameworks (React, Next.js) with PWA support.

Unit-2 Service Workers & Caching Strategies

Understanding Service Workers: Lifecycle, registration, activation, and update strategies. **Caching & Offline Support**: Cache API, IndexedDB, Workbox, handling offline requests. **Push Notifications & Background Sync**: Web Push API, Firebase Cloud Messaging (FCM), offline data sync. **Performance Optimization in PWAs**: Lazy loading, code splitting, reducing render-blocking resources.

Unit-3 Advanced PWA Features & Security

PWA Security Best Practices: HTTPS, Content Security Policy (CSP), preventing cross-site scripting (XSS).**Accessing Device Features:** Camera, GPS, Bluetooth, background tasks via Web APIs.**PWA Installation & Distribution**: Add to home screen, standalone mode, app store listing (Google Play & Microsoft Store).**PWA Performance Auditing:** Using Lighthouse, Core Web Vitals, automated performance testing.

Unit-4 Real-World Applications & Deployment

Building a Full-Stack PWA: End-to-end development with backend integration (Node.js, Firebase, GraphQL). **Case Studies of Successful PWAs**: Twitter Lite, Uber, Pinterest, Starbucks. **Deploying PWAs:** Hosting on Firebase, Netlify, Vercel, GitHub Pages.

Course Outcomes:

1. Develop responsive and high-performance PWAs with offline capabilities.
2. Implement service workers, caching strategies, and push notifications for real-world use.
3. Optimize PWA performance using Core Web Vitals and Lighthouse audits.
4. Deploy secure, scalable, and installable PWAs on cloud platforms.

Instructions for paper setter: All Questions are compulsory. The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C Comprises of 4 questions of 4 marks each, one from each unit. Section D Comprises of 4 questions of 6 marks each, one from each unit. There is no overall choice, however internal choice may be provided in section C and D, if paper setter so desires.

Textbooks:

1. "Progressive Web Apps" by Jason Grigsby, O'Reilly, 2018.
2. "Building Progressive Web Apps" by Tal Ater, O'Reilly, 2017.
3. "PWA Development by Example" by Chris Love, Packt Publishing, 2021.
4. "Learning Progressive Web Apps" by John M. Wargo, Addison-Wesley, 2020.

Reference Books:

1. "The Web App Manifest Guide" by Maximiliano Firtman, Leanpub, 2021.
2. "Service Workers in Action" by Jeremy Keith & Jeffrey Sambells, Manning Publications, 2019.
3. "High-Performance PWAs" by Dean Alan Hume, Apress, 2019.
4. "Building Offline-First Web Apps" by Kyle Simpson, O'Reilly, 2022.

B. Tech. (8th Sem) Computer Science &Engineering with Specialization in Full Stack Development
BCSE-706 (AI & ML in Web Apps)

L	T	P
3	0	0

Continuous evaluation	**40**
End semester exam	**60**
Total marks	**100**
Credits	**3.0**

Course Objectives:

1. Understand AI & ML fundamentals and their integration into modern web applications.
2. Implement frontend AI features like chatbots, speech processing, and image recognition.
3. Deploy backend AI models for real-time analytics, recommendations, and fraud detection.
4. Optimize AI-driven web applications for performance, security, and scalability.

Unit-1 Fundamentals of AI & ML in Web Applications

Introduction to AI & ML in Web Apps: Role, benefits, and industry adoption. **Essential AI & ML Concepts**: Supervised vs. unsupervised learning, deep learning basics. **AI & ML Frameworks for Web Apps**: TensorFlow.js, PyTorch, ONNX, ml5.js. **Integrating ML Models in Web Apps**: REST & GraphQL APIs, WebAssembly, WebGPU.

Unit-2 Frontend AI Implementation & User Experience Enhancement

AI-Powered UX Features: Smart search, recommendations, chatbots, accessibility enhancements. **Client-Side AI Processing**: Face recognition, sentiment analysis, object detection in browsers**. Web Speech & NLP Features**: Speech-to-text, language translation, AI-powered autocomplete. **Performance Considerations**: Running AI models efficiently on low-power devices.

Unit-3 Backend AI & Scalable Data Processing

Backend AI Model Deployment: Using Flask, FastAPI, TensorFlow Serving, AWS Lambda. **Real-Time AI Features**: Fraud detection, anomaly detection, predictive analytics. **AI & ML with Databases**: Vector databases, AI-powered search indexing (Elasticsearch). **Security & Privacy in AI Models**: Data protection, model explainability, ethical considerations.

Unit-4 Real-World Applications & Optimization

AI for Web Performance Optimization: AI-driven caching, image optimization, predictive preloading. **Case Studies of AI in Web Apps**: Google Lens, Netflix recommendations, AI-powered coding assistants. **Deployment & Monitoring**: Cloud-based AI deployment, CI/CD for AI models, model monitoring.

Course Outcomes:

1. Develop AI-enhanced web apps with features like smart search, NLP, and predictive analytics.
2. Integrate client-side AI models for interactive user experiences with TensorFlow.js and ml5.js.
3. Deploy scalable AI/ML models using cloud services, APIs, and edge computing.
4. Implement AI-based web performance optimizations and ensure ethical AI use in applications.

Instructions for paper setter: All Questions are compulsory. The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C Comprises of 4 questions of 4 marks each, one from each unit. Section D Comprises of 4 questions of 6 marks each, one from each unit. There is no overall choice, however internal choice may be provided in section C and D, if paper setter so desires.

Textbooks:

1. "Hands-On Machine Learning with JavaScript" by Burak Kanber, O'Reilly, 2018.
2. "Deep Learning for Web Developers" by Kai Sasaki, Packt Publishing, 2021.
3. "TensorFlow.js Deep Learning" by Gant Laborde, Manning Publications, 2021.
4. "Artificial Intelligence in Web Applications" by Michael McCarthy, Springer, 2022.

Reference Books:

1. "Machine Learning for Web Developers" by Antonio Gulli, Packt Publishing, 2019.
2. "Real-World AI Applications in Web Development" by John Paul Mueller, Wiley, 2020.
3. "Building Intelligent Web Applications" by Ryan Hemphill, Apress, 2021.
4. "Deep Learning with JavaScript" by Shanqing Cai & Nikhil Thorat, O'Reilly, 2020.

B. Tech. (5th Sem)

(Common for CSE, CSE with Specialization in CT&IS, CSE with Specialization in DS, CSE with Specialization in FSD, CSE with Specialization in AI & ML)

BCSE-527 (Industrial Training-I)

L	T	P		
-	-	-	**Continuous evaluation**	**100**
			Total marks	**100**
			Credits	**1.0**

Course Objectives:

1. To learn about various phases of software development life cycle.
2. To learn about how to provide software solution for real life problems.
3. To learn about coding and testing of solutions.
4. To learn about report writing concepts.

The students are required to develop a project during industrial training and project work evaluation will be entirely based upon project evaluation rubrics as given below:

	Marks Distribution & Criteria	**Excellent**	**Very Good**	**Good**	**Poor**
		5	**4**	**3**	**2**
Synopsis	Novelty of the Problem Definition / Motivation **(Max Marks 5)**	The given problem definition is novel in nature (81% to100%)	The given problem definition is somewhat novel in nature. (61% to 80%)	The given problem definition is novel in nature to some extent. (41% to 60%)	The given problem definition is not novel in nature. (<40%)
	Objectives / Modeling / Feasibility. Requirement and Scope of the Project **(Max Marks 5)**	Provide a clear purpose of the idea and evidence that supports the project concept. Software Development Process Model is used (Waterfall, Incremental, RAD etc.) (81% to 100%)	Somewhat clear purpose of the idea and evidence that supports the project concept And software Development Process Model is used (Waterfall, Incremental, RAD etc.) (61% to 80%)	Attempts to define purpose of the idea and evidence that support the project concept and Attempts to use software Development Process Model (Water fall, Incremental, RAD etc.) (41% to 60%)	Does not clearly define the purposeof the idea and evidence that supports the project concept. Does not clearly used software Development Process Model (Waterfall, Incremental, RAD etc.) (<40%)
Progress 1	Coding and Implementation **(Max Marks 5)**	**5**	**4**	**3**	**2**
		Code is correctly implemented. (81% to 100%)	Somewhat Code is correctly implemented. (61% to 80%)	Attempts to code and implement correctly (41% to 60%)	Code is not completely and correctly implemented <40%
	Unit Testing **(Max Marks 5)**	**5**	**4**	**3**	**2**
		Student delivered presentation covering Validation and Testing. (81% to 100%)	Student delivered somewhat presentation covering Validation and Testing.(61% to 80%)	Student delivered presentation covering few of Validation and Testing. (41% to 60%)	Student not delivered presentation covering Validation and Testing. <40%
	Understanding, Individual Involvement/ Contribution in Project. **(Max Marks 5)**	**5**	**4**	**3**	**2**
		Ability to work within the team. **Willingness** to perform tasks. **Punctuality** On time for team meetings. **Reliability** Perform tasks within time. **Creativity** Provide meaningful insight to the project team. (81% to 100%)	**Somewhat Ability** to work within the team. **Somewhat Willingness** to perform tasks. **Somewhat Punctuality -** On time for team meetings. **Somewhat Reliability** Perform tasks within time. **Somewhat Creativity** Provide meaningful insight to project team. (61% to 80%)	**Attempted Ability** to work within the team. **Attempted Willingness** to perform tasks. **Attempted Punctuality -** On time for team meetings. **Attempted Reliability Dependability** Perform tasks within time. **Attempted Creativity** Provide meaningful insight to project team. (41% to 60%)	**No Ability** to work within the team. **No Willingness** to perform tasks. **No Punctuality-**On time for team meetings. **No Reliability Dependability** Perform tasks within time. **No Creativity** Provide meaningful insight to project team. <40%
Progress 2	Coding and Implementation **(Max Marks 5)**	**5**	**4**	**3**	**2**
		Code is correctly implemented (81% to	Somewhat Code is correctly	Attempts to code and implement correctly	Code is not completely and

		100%)	implemented. (61% to 80%)	(41% to 60%)	correctly implemented <40%
	Testing **(Max Marks 5)**	**5**	**4**	**3**	**2**
		Student delivered presentation covering Validation and Testing. (81% to 100%)	Student delivered somewhat presentation covering Validation and Testing. (61% to 80%)	Student delivered presentation covering few of Validation and Testing. (41% to 60%)	Student not delivered presentation covering Validation and Testing. <40%
	Understanding, Individual Involvement/ Contribution in Project. **(Max Marks 5)**	**5**	**4**	**3**	**2**
		Ability to work within the team. **Willingness** to perform tasks. **Punctuality** On time for team meetings. **Reliability** Perform tasks within time. **Creativity** Provide meaningful insight to the project team. (81% to 100%)	**Somewhat Ability** to work within the team. **Somewhat Willingness** to perform tasks. **Somewhat Punctuality-** On time for team meetings. **Somewhat Reliability** Perform tasks within time. **Somewhat Creativity** Provide meaning full insight to project team. (61% to 80%)	**Attempted Ability** to work within the team. **Attempted Willingness** to perform tasks. **Attempted Punctuality-** On time for team meetings. **Attempted Reliability Dependability** Perform tasks within time. **Attempted Creativity** Provide meaningful insight to project team. (41% to 60%)	**No Ability** to work within the team. **No Willingness** to perform tasks. **No Punctuality-**On time for team meetings. **No Reliability Dependability** Perform tasks within time. **No Creativity** Provide meaningful insight to project team. <40%
Final Progress	Final Coding and Implementation **(Max Marks 5)**	**5**	**4**	**3**	**2**
		Code completely and correctly implemented. The design and language used for coding is Correctly chosen. (81% to 100%)	Somewhat Code completely and correctly implements the design and language used for coding is correctly chosen. (61% to 80%)	Attempts to code completely and correctly implement the design and language used for coding is Properly chosen. (41% to 60%)	Code not completely and correctly implement the design and language used for coding is not Correctly chosen. <40%
	Testing **(Max Marks 5)**	**5**	**4**	**3**	**2**
		Student delivered presentation covering Validation and Testing. (81% to 100%)	Student delivered somewhat presentation covering Validation and Testing (61% to 80%)	Student delivered presentation covering few of Validation and Testing (41% to 60%)	Student not delivered presentation covering Validation and Testing. <40%
	Demonstration cum Presentation **(Max Marks 5)**	**5**	**4**	**3**	**2**
		Presentation is well organized and reflects logical order. (81% to 100%)	Some of the Presentation does not reflect logical order. (61% to 80%)	Most of the Presentation does not reflect logical order. (41% to 60%)	Presentation does not reflect logical order. <40%
Project Report	Documentation & Report **(Max Marks 5)**	**5**	**4**	**3**	**2**
		Report as per format provided. The project may be carried for Participation in various contests, published, patented and applied for copyright (81% to 100%)	Report is provided somewhat as per format. The project may be carried for Participation in various contests, published, patented and applied for copyright (61% to 80%)	Report is provided as per format to some extent. Attempted Participation in various contests, Publications, Copyright, Patent (41% to 60%)	Report is not as per the format provided. Poor Participation In various contests, Publications, Copyright, Patent <40%

Course Outcomes:

i) Able to identify software solution corresponding to real life problems.
ii) Able to code software solution.
iii) Able to test software solution.
iv) Able to write reports.

B. Tech. (5th Sem) Computer Science & Engineering with Specialization in AI & Machine Learning
BCSE-802 (Computer Vision)

L	T	P
2	0	0

Continuous evaluation	**40**
End semester exam	**60**
Total marks	**100**
Credits	**2.0**

Course Objectives:

1. To understand the basic concepts of image processing.
2. To enhance knowledge about fundamental steps in image processing.
3. To apply different image processing concepts to solve research problems.
4. To Design and implement object detection systems using machine learning.
5. To Integrate computer vision and machine learning methods into practical projects.

Unit: -1 **(7 Hours)**

Introduction to Features: Detecting Features, Extracting Features, Matching Features, working with Features: Refining Feature Detection, Feature Detection and Extraction Reference, Image Registration: Transformations. Feature-Based Image Registration, Visually Selecting Control Points and Image Stitching: Introduction to Image Stitching, Stitching Images Example, Mars Rover: Final Project

Unit: -2 **(7 Hours)**

Introduction to Machine Learning for Computer Vision, Image Classification with Machine Learning: The Machine Learning Workflow. Introduction to Classification Models: Preparing Your Images for Classification, Training Image Classification Models, Image Classification Using Bag of Features: Introduction to Bag of Features,

Unit: -3 **(7 Hours)**

Introduction: Classifying Images with Bag of Features, Evaluating Classification Models: Evaluating Classification Models, Evaluating Classification Models in MATLAB, Common Issues in Image Classification: Object Detection with Machine Learning: Object Detection with Machine Learning, Labeling your Images for Machine Learning, Introduction to the Object Detection Project

Unit: -4 **(7 Hours)**

Detecting Objects: Introduction to Object Tracking, Motion Detection, Detecting Objects with Pretrained Models, Detecting Objects with Segmentation, Motion Detection: Detecting Motion, Stabilizing Video with Template Matching, Applying Optical Flow, Detection and Tracking: Introduction to Object Tracking, Implementing Object Tracking 1: Concepts, Implementing Object Tracking 2: Execution, Final Project: Introduction to the Traffic Flow Project, Integrating Your Code.

Course Outcomes: After completion of this course, student will be able to:

1. Explain the fundamental concepts of computer vision, including feature detection and image stitching.
2. Apply machine learning techniques for image classification using standard workflows.
3. Build and implement object detection models using labeled image datasets.
4. Analyze and apply methods for object tracking and motion detection in video data.
5. Develop and integrate complete computer vision solutions through practical projects.

Instructions for paper setter: All Questions are compulsory. The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one-word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C Comprises of 4 questions of 4 marks each, one from each unit. Section D Comprises of 4 questions of 6 marks each, one from each unit. There is no overall choice, however internal choice may be provided in section C and D, if paper setter so desires.

Text Books:

1. Gonzalez and Woods: Digital Image Processing ISDN 0-201-600- 781, Addison Wesley 1992.
2. Forsyth and Ponce: Computer Vision a Modern Approach Pearson Education Latest Edition.

Reference Books:

1. Pakhera Malay K: Digital Image Processing and Pattern Recognition, PHI.
2. Trucco & Verri: Introductory Techniques for 3-D Computer Vision, Prentice Hall, Latest Edition.
3. Low: Introductory Computer Vision and Image Processing, McGraw-Hill 1991, ISBN 0-07- 707403-3.

B. Tech. (5th Sem) Computer Science & Engineering with Specialization in AI & Machine Learning
BCSE-802L (Computer Vision Lab)

L	T	P
0	0	3

Continuous evaluation	**60**
End semester exam	**40**
Total marks	**100**
Credits	**1.5**

Course Objectives:

1. Understand and apply various feature extraction and matching techniques.
2. Analyze the role of feature refinement and control point selection in image processing.
3. Evaluate and compare different machine learning models for image classification.
4. Implement and assess object detection and tracking algorithms using machine learning and optical flow.
5. Explore video analysis techniques including real-time tracking and stabilization.

List of Practical

1. Write a program to implement various feature extraction techniques for image classification.
2. Write a program to assess various feature matching algorithms for object recognition.
3. Write a program to analyze the impact of refining feature detection for image segmentation.
4. Write a program to evaluate the efficacy of human-guided control point selection for image alignment.
5. Write a program to compare the performance of different classification models in image recognition
6. Write a program to interpret the effectiveness of Bag of Features in enhancing image classification performance.
7. Write a program to analyze various object detection algorithms with machine learning.
8. Write a program to determine the effectiveness of incorporating optical flow analysis into object tracking algorithms.
9. Write a program to examine the performance of various pretrained deep learning models for real-time object tracking tasks.
10. Write a program to interpret the effectiveness of template matching techniques for video stabilization tasks.

Integrated Project (Mandatory) based upon the learnt concepts:

Real-Time Object Tracking and Video Stabilization using Deep Learning: -in this project, students will be required to read a continuous video feed or a pre-recorded video, detect and track moving objects in real time using pretrained deep learning models, and stabilize shaky video footage using template matching techniques. The goal is to create a system that combines object detection, motion analysis, and video enhancement to demonstrate a practical and intelligent computer vision pipeline.

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

1. Implement various feature extraction techniques for image classification and evaluate their effectiveness.
2. Assess and compare the performance of different feature matching algorithms for object recognition.
3. Analyze the impact of refining feature detection on image segmentation tasks and understand its significance.
4. Evaluate the efficacy of human-guided control point selection for image alignment and understand its implications in image processing.
5. Compare and interpret the performance of different classification models in image recognition and gain insights into their strengths and weaknesses.

B. Tech. (5th Sem) Computer Science & Engineering with Specialization in AI & Machine Learning
BCSE-811 (Programming in R)

L	T	P
3	0	0

Continuous evaluation	**40**
End semester exam	**60**
Total marks	**100**
Credits	**3.0**

Course Objectives:

1. Navigate the R ecosystem at a basic level (RStudio).
2. Learn Fundamentals of R.
3. Covers how to use different functions in R, how to read data into R, accessing R packages, writing R functions, debugging, and organizing data using R functions.
4. Perform simple data modeling and statistical analyses in R, Regression Analysis.

Unit: -1 **(9 Hours)**

Introduction to R: Installing R, How to Run R, Functions, Start-up Files, Reading and Writing R, Arithmetic operations in R. **R Programming Structures:** Control Statements, Loops, If-Else, Arithmetic and Boolean Operator values, Type Conversions-Functions.

Unit: -2 **(9 Hours)**

R Data Structures: Lists Creation, Accessing List Elements, Adding or Deleting List Elements, Recursive Lists, Data Frames.
Vectors: Declaration, Arithmetic and logic operations, Indexing, Vector Elements-operations on vectors, Filtering, Matrices, Math Functions, Set operations.
Matrices and Arrays: Creating Matrices, Applying Functions to Matrix Rows and Columns, Adding and Deleting Matrix Rows and Columns, Naming Matrix Rows and Columns, Higher-Dimensional Arrays.

Unit: -3 **(9 Hours)**

Data Frames: Creating Data Frames, Merging Data Frames, Applying Functions to Data Frames.
Factors and Tables: Factors and Levels, Common Functions Used with Factors, Working with Tables, Other Factor- and Table-Related Functions.
Input /Output: Reading from the keyboard, Reading and Writing to a File, Reading a Matrix or Data Frame from a file, Accessing files on Remote Machines, String Manipulations, Interfacing R from other languages.

Unit: -4 **(9 Hours)**

Packages in R, Installation process of various packages in R, Data science packages in R, Building R packages.
Regression Analysis: Introduction to Regression Analysis. Types of Regression Analysis Models, Linear Regression, Non-Linear Regression.

Course Outcomes: After completion of this course, student will be able to:

1. Identify and execute basic syntax and programs in R.
2. Perform the Matrix operations using R built in functions.
3. Understand how data is analyzed and visualized using statistic functions.
4. Create the list and data frames.
5. Exploit the graph using ggplot2.

Instructions for paper setter: All Questions are compulsory. The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one-word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C Comprises of 4 questions of 4 marks each, one from each unit. Section D Comprises of 4 questions of 6 marks each, one from each unit. There is no overall choice, however internal choice may be provided in section C and D, if paper setter so desires.

Text Books:

1. Tilman M.Davies, "THE BOOK OF R - A FIRST PROGRAMMING AND STATISTICS" Library of Congress Cataloging-in-Publication Data, 2016.
2. Roger D. Peng, "R Programming for Data Science"Lean Publishing, 2016.
3. Hadley Wickham, Garrett Grolemund," R for Data Science", OREILLY Publication, 2017.

Reference Books:

1. Steven Keller, "R Programming for Beginners", CreateSpace Independent Publishing Platform 2016.
2. Kun Ren,"Learning R Programming", Packt Publishing, 2016.

B. Tech. (5th Sem) Computer Science & Engineering with Specialization in AI & Machine Learning
BCSE-811L (Programming in R Lab)

L	T	P
0	0	2

Continuous evaluation	**40**
End semester exam	**60**
Total marks	**100**
Credits	**1.0**

Course Objectives:

1. Demonstrate use of basic functions.
2. Create their own customized functions.
3. Construct tables and figures for descriptive statistics.
4. Learn to understand new data sets and functions by yourself.
5. Work on built in real time cases for analysis, regression and visualization.

List of Practical

1. Write a program to check whether a year (integer) entered by the user is a leap year or not?
2. Write an R program to find the sum of natural numbers without formula using the if–else statement and the while loop.
3. Write an R program to make a simple calculator that can add, subtract, multiply and divide using switch cases and functions.
4. Write a program to perform searching within a list (1 to 50). If the number is found in the list, print that the search is successful otherwise print that the number is not in the list.
5. Create a list and data frame that stores the marks of any three subjects for 10 students. Find out the total marks, average, maximum marks and minimum marks of every subject.
6. Write the steps to import data from Excel to CSV files and apply data viewer functions like rm(),dim(), head(), tail(), sorting, filtering, searching to view few set of rows.
7. Write a program to create two 3 X 3 matrices A and B and perform the following operations a. Transpose of the matrix b. Addition c. Subtraction.
8. Write an R program to create a list containing strings, numbers, vectors and logical values and do the following manipulations over the list.

a. Access the first element b. Give the names to the elements c. Add element at some position d. Remove the element e. Print the fourth element f. Update the third element

9. Let us use the built-in dataset air quality which has Daily air quality measurements in New York, May to September 1973. Create a histogram by using appropriate arguments for the following statements:

a. Assigning names, using the air quality data set. b. Change colors of the Histogram c. Remove Axis and Add labels to Histogram d. Change Axis limits of a Histogram e. Create a Histogram with density and Add Density curve to the histogram.

10. Design a data frame in R for storing about 20 employee details. Create a CSV file named "input.csv" that defines all the required information about the employee such as id, name, salary, start_date, dept. Import into R and do the following analysis.

a. Find the total number rows & columns b. Find the maximum salary c. Retrieve the details of the employee with maximum salary d. Retrieve all the employees working in the IT Department e. Retrieve the employees in the IT Department whose salary is greater than 20000 and write these details into another file "output.csv".

11. Create a dataset or table ['Smart Phone"] in an excel sheet that stores the mobile information [price, company name, model, SalePercent] of five different companies. Store at least 20 rows. Write the scripts and find out the output for the following information.

a. Maximum price of the mobile of each company b. Minimum price of mobile of each company.
c. Average price of mobile of each company. d. Total Price of mobile of each company.

12. Program to predict weather using Linear and Logistic Regression.

Mini project: Implementation of Apriori Algorithm on R in-built Groceries dataset.

Description: Apriori algorithm is used for finding frequent item sets in a dataset for association rule mining. It uses prior knowledge of frequent item set properties. We apply an iterative approach or we call level-wise search where k-frequent item sets are used to find k+1 item sets. To improve the efficiency of the level-wise generation of frequent item sets an important property is used called Apriori property which helps by reducing the overall search space.

Requirement(s): 1. Library/Packages: Install arules and Arulesviz packages.
2. Dataset: Import Groceries dataset, it is predefined that contains 9835 records.

Goal: Import the dataset and apply Apriori algorithm to find out the customer's recommendation based on his/her current buying pattern as conclusion.

Course Outcomes: After completion of this course, student will be able to:

1. Build programming logic and thereby developing skills in Programming.
2. Organize data and analyze data using real time examples.
3. Design and present data based solutions through case-based mini-projects.

B. Tech. (5th Sem) Computer Science & Engineering with Specialization in AI & Machine Learning
BCSE-812 (AI in HealthCare)

L	T	P
3	0	0

Continuous evaluation	**40**
End semester exam	**60**
Total marks	**100**
Credits	**3.0**

Course Objectives:

1. Introduce foundational concepts of Artificial Intelligence and Machine Learning in healthcare.
2. Explain various ML algorithms and their role in diagnostics, monitoring, and medical data analysis.
3. Explore the use of neural networks, deep learning, and NLP for intelligent healthcare systems.
4. Analyze the integration of IoT with AI and understand its application in real-time health data monitoring.

Unit: -1 Introduction to AI and ML in Healthcare (10 Hours)
Fundamentals of Artificial Intelligence, Basics of Machine Learning, Role of AI in healthcare: diagnostics and monitoring, Hospital management and AI systems, Types of machine learning: Supervised, Unsupervised, Reinforcement, Key algorithms: Decision Trees, Naive Bayes, Logistic Regression, Tools: Orange ML, Teachable Machine, AutoML, Explainable AI, SHAP & LIME.

Unit: -2 Neural Networks and Deep Learning in Healthcare (8 Hours)
Perceptron and Multi-Layer Perceptron, Introduction to deep learning, CNNs for medical image classification, RNNs and time-series data in healthcare, NLP in healthcare – chatbots and summarization, AI for radiology and pathology.

Unit: -3 Healthcare Data and Preprocessing (8 Hours)
Types of healthcare data: EHR, sensors, genomics, Data cleaning and missing value handling, Normalization and feature engineering, Overview of public datasets: UCI, MIMIC-III, etc (Example).

Unit: -4 IoT and AI Integration in Healthcare (10 Hours)
Role of IoT in healthcare: wearable's and remote monitoring, IoT data acquisition and processing, Integration with AI: architecture and case flow, Case study: AI-driven remote patient monitoring system, Case studies: AI in surgery planning, diagnostics, Ethics, Regulations & Future of AI in healthcare.

Course Outcomes: After completion of this course, student will be able to:

1. Understand the foundational principles and scope of Artificial Intelligence in healthcare.
2. Explain and differentiate various machine learning approaches relevant to medical applications.
3. Explore neural network architectures and their use in diagnostic systems and health monitoring.
4. Analyze the role of IoT and AI integration in modern healthcare systems.

Instructions for paper setter: All Questions are compulsory. The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one-word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C Comprises of 4 questions of 4 marks each, one from each unit. Section D Comprises of 4 questions of 6 marks each, one from each unit. There is no overall choice, however internal choice may be provided in section C and D, if paper setter so desires.

Text Books:

1. Russell, S. and Norvig, P. (2014). Artificial Intelligence: A Modern Approach, 3rd Edition, Pearson.
2. Alpaydin, E. (2020). Introduction to Machine Learning, 4th Edition, MIT Press.

Reference Books:

1. Rich, E., Knight, K., and Nair, B. (2009). Artificial Intelligence, 3rd Edition, Tata McGraw-Hill.
2. Luger, G.F. (2009). Artificial Intelligence: Structures and Strategies for Complex Problem Solving, 6th Edition, Pearson Education.

B. Tech. (5th Sem) Computer Science & Engineering with Specialization in AI & Machine Learning

BCSE-812L (AI in HealthCare Lab)

L	T	P		
0	0	2	Continuous evaluation	40
			End semester exam	60
			Total marks	100
			Credits	1.0

Course Objectives:

1. To equip students with practical skills to implement AI models using Python and modern healthcare-focused tools.
2. To enable hands-on application of machine learning and deep learning algorithms to real-world healthcare datasets.
3. To promote effective use of data visualization and interpretation platforms like Orange ML and Teachable Machine.
4. To develop the ability to evaluate and demonstrate AI-based healthcare solutions through guided lab sessions and mini-projects.

List of Practical

1. Introduction to Google Colab and Jupyter Notebook.
2. Python basics and decision tree model on diabetes dataset.
3. Build basic ANN with Keras.
4. Pneumonia detection using CNN on X-ray images.
5. Clean and analyze UCI Heart Disease dataset using Pandas.
6. Visualization and encoding features.
7. Simulate wearable sensor data (heart rate, temp.).
8. ML on IoT-collected patient data.
9. Orange ML workflow for medical classification.
10. Teachable Machine for image/audio classification.
11. SHAP/LIME interpretation of AI predictions

Mini project: Presenting a complete AI healthcare solution.

Course Outcomes: After completion of this course, student will be able to:

1. Implement AI techniques in healthcare scenarios using Python and relevant development environments.
2. Apply practical machine learning and deep learning workflows to healthcare-specific datasets.
3. Visualize, interpret, and communicate insights using tools like Orange ML and Teachable Machine.
4. Design and present comprehensive AI-driven healthcare solutions through case-based mini-projects.

B. Tech. (5th Sem) Computer Science & Engineering with Specialization in AI & Machine Learning
BCSE-813 (PROLOG Programming)

L	T	P
3	0	0

Continuous evaluation	**40**
End semester exam	**60**
Total marks	**100**
Credits	**3.0**

Course Objectives:

1. Be able to write programs in Prolog using techniques such as accumulators and difference structures.
2. To know how to model the backtracking behavior of program execution.
3. To appreciate the unique perspective Prolog gives to problem solving and algorithm design.
4. To understand how larger programs can be created using the basic programming techniques used in this course.

Unit: -1 **(8 Hours)**

An example program: defining family relations, Extending the example program by rules, A recursive rule definition, How Prolog answers questions, Declarative and procedural meaning of programs.

Unit: -2 **(10 Hours)**

Data objects, Matching, Declarative meaning of Prolog programs, Procedural meaning, Example: monkey and banana, Order of clauses and goals, Remarks on the relation between Prolog and logic. Lists, Operators, Arithmetic: Representation of lists, Some operations on lists, Operator notation, Arithmetic.

Unit: -3 **(9 Hours)**

Retrieving structured information from a database, Doing data abstraction, Simulating a non-deterministic automaton, Travel planning, The eight queens problem, Preventing backtracking, Examples using cut, Negation as failure Problems with cut and negation, Input and Output: Communication with files, Processing files of terms.

Unit: -4 **(9 Hours)**

Manipulating characters, Constructing and decomposing atoms, Reading programs: consult, reconsult.
Testing the type of terms, Constructing and decomposing terms: arg, name, Various kinds of equality, Various kinds of equality, Control facilities, bagof, setof and findall. General principles of good programming, How to think about Prolog programs, Programming style, Debugging, Efficiency.

Course Outcomes: After completion of this course, student will be able to:

1. Identify and execute basic syntax and programs in PROLOG.
2. Perform the operations on Lists, Operators using PROLOG built in functions.
3. Understand how data is analyzed and visualized using statistic functions.
4. Perform Input/Output Operations in PROLOG

Instructions for paper setter: All Questions are compulsory. The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one-word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C Comprises of 4 questions of 4 marks each, one from each unit. Section D Comprises of 4 questions of 6 marks each, one from each unit. There is no overall choice, however internal choice may be provided in section C and D, if paper setter so desires.

Text Books:

1. PROLOG PROGRAMMING FOR ARTIFICIAL INTELLIGENCE - Ivan Bratko.

B. Tech. (5th Sem) Computer Science & Engineering with Specialization in AI & Machine Learning

BCSE-813L (PROLOG Programming Lab)

L	T	P
0	0	2

Continuous evaluation	**40**
End semester exam	**60**
Total marks	**100**
Credits	**1.0**

Course Objectives:

1. Demonstrate use of basic functions.
2. Create their own customized Logics.
3. Construct predicate and Logic for real time problems.
4. Learn to understand new data sets and functions by yourself.

List of Practical

1. Study of PROLOG programming language and its functions.
2. Write simple facts for statements using PROLOG.
3. Write a program to perform simple arithmetic operations.
4. Write a program to perform factorial and Fibonacci of given number.
5. Write predicate one converts centigrade temperature to Fahrenheit, the other checks if the temperature is below freezing.
6. Write a program to implement Depth First Search in PROLOG Programming.
7. Implementation of Breadth First Search for Tic-Tac-Toe Problem.
8. Write a program to solve Water-Jug Problem.
9. Write a program to solve N-Queen Problem.
10. Solve 8-Puzzle problem using Best First Search.

Mini project: Implementation of all concepts covered using some real life project.

Course Outcomes: After completion of this course, student will be able to:

1. Build programming logic and thereby developing skills in PROLOG Programming.
2. Solve real time problems using PROLOG.

B. Tech. (6th Sem) Computer Science & Engineering with Specialization in AI & Machine Learning
BCSE-803L (Reinforcement Learning Lab)

L	T	P
0	0	4

Continuous evaluation	**60**
End semester exam	**40**
Total marks	**100**
Credits	**2.0**

Course Objectives:

1. Understand core concepts of reinforcement learning, including agents, environments, states, actions, and rewards.
2. Implement fundamental RL algorithms such as Q-learning, SARSA, Value Iteration, and Policy Iteration.
3. Develop and test RL agents in standard environments using Python and libraries like OpenAI Gym.
4. Analyze agent performance through reward tracking, learning curves, and parameter tuning.
5. Apply RL techniques to solve real-world inspired problems and build simple AI projects.

List of Practical

1. Installation of Code Standards and Libraries used in Reinforcement Learning (Python/Keras/Tensorflow).
2. Write a program to solve Multi Armed Bandit Problem.
3. Write a program to implement Dynamic programming algorithms for solving MDPs (Markov Decision Process), Policy Evaluation, Policy Iteration, Policy Improvement and Value Iteration.
4. Write a program to implement Dynamic programming algorithms for Policy Evaluation, Policy Iteration and Value Iteration.
5. Write a program to implement Grid-world by using Policy Iteration.
6. Write a program to perform Monte Carlo Prediction, Monte Carlo Off-Policy Control Importance Sampling.
7. Write a program to implement SARSA and Q-Learning in a grid-world or Frozen Lake environment based on Temporal Difference Learning.
8. Write a program to implement Cliff Walking problem using Q-learning.
9. Write a program to implement model-based planning with simulated experience for Dyna-Q Algorithm (Model-Based).
10. Write a program to implement a simple DQN agent using PyTorch or TensorFlow.
11. Write a program to implement Smart Traffic Light Controller using Reinforcement Learning.
12. Write a program to implement Cart Pole problem using a random policy and visualize how long it lasts.

Integrated Project (Mandatory) based upon the learnt concepts:

1. **Tic-Tac-Toe Game Agent using Q-Learning:** Develop an AI agent that learns optimal strategies for Tic-Tac-Toe through self-play and rewards-based learning using Q-values.
2. **Maze Solver using Q-Learning/SARSA:** To Train an agent to find the optimal path from the start point to the goal in a grid-based maze environment using model-free reinforcement learning algorithms.

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

1. Demonstrate various Components of Reinforcement Learning.
2. Make use of various exploration and exploitation strategies.
3. Apply Model based and Model Free Prediction techniques.
4. Make use of different value based Reinforcement Learning Algorithms.
5. Demonstrate various Policy based Reinforcement Learning Algorithms.

B. Tech. (6th Sem) Computer Science & Engineering with Specialization in AI & Machine Learning
BCSE-821L (Artificial Neural Network Lab)

L	T	P
0	0	2

Continuous evaluation	**60**
End semester exam	**40**
Total marks	**100**
Credits	**1.0**

Course Objectives:

1. To understand the fundamentals of neural networks and deep learning through practical implementation.
2. To design, implement, and evaluate different neural network architectures.
3. To apply neural networks to real-world problems in vision, sequence prediction, and classification.

List of Practical

1. Introduction to Neural Network Fundamentals and Perceptron.
2. Implement a basic neuron model and the Perceptron learning algorithm.
3. Create a perceptron from scratch using Python to solve logical problems like AND, OR, XOR.
4. Use the MNIST dataset to build a digit classifier with multiple hidden layers.
5. Implement a back propagation algorithm using only NumPy without ML libraries.
6. Plot and compare Sigmoid, Tanh, ReLU, and LeakyReLU with real input data.
7. Learn to load, preprocess, and evaluate neural network models on standard datasets. (Calculate and interpret evaluation metrics such as accuracy, precision, recall, F1-score for classification; MSE, RMSE for regression)
8. Create a CNN for image classification using CIFAR-10 or Fashion-MNIST.
9. Apply LSTMs/GRUs to a simple sequence prediction task (e.g., time series forecasting with a synthetic dataset or sentiment analysis on a small text dataset).
10. Learn and implement techniques to improve neural network performance and prevent over fitting. (Experiment with different hyper parameters (learning rate, batch size, number of epochs, optimizers)).

Integrated Project (Mandatory) based upon the learnt concepts:

1. Apply CNNs and transfer learning to a practical image classification task: Classify X-rays for pneumonia, dermatological images for skin conditions (using public datasets).
2. Build a neural network model to classify text based on sentiment or category: Classify news articles into different topics (e.g., sports, politics, technology).

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

i) Gain practical experience in implementing various neural network architectures.
ii) Demonstrate the training and evaluation methodologies for neural networks.
iii) Apply neural networks to solve real-world problems in domains like image processing, natural language processing and time series analysis.
iv) Demonstrate modern deep learning frameworks and best practices.

B. Tech. (6th Sem) Computer Science & Engineering with Specialization in AI & Machine Learning
BCSE-822 (Fuzzy Logic)

L	T	P
2	0	0

Continuous evaluation	**40**
End semester exam	**60**
Total marks	**100**
Credits	**2.0**

Course Objectives:

1. To understand the concept and mathematical foundation of fuzzy logic.
2. To design fuzzy systems for reasoning, inference, and control.
3. To apply fuzzy logic in real-world applications such as robotics, decision-making, and AI.

Unit: -1 Introduction to Fuzzy Logic and Fuzzy Sets (7 Hours)

Crisp sets vs. Fuzzy sets, Fuzzy set theory: definitions, membership functions, Properties of fuzzy sets: support, core, α-cuts, Operations on fuzzy sets: union, intersection, complement, Types of membership functions: triangular, trapezoidal, Gaussian, sigmoidal, Conversion from crisp to fuzzy and vice versa (fuzzification and defuzzification)

Unit: -2 Fuzzy Relations and Composition (7 Hours)

Fuzzy relations and their properties, Composition of fuzzy relations, Max-min and min-max compositions, Fuzzy relation equations, Fuzzy compatibility and ordering, Projection and cylindrical extension, Similarity relations and fuzzy equivalence.

Unit: -3 Fuzzy Inference and Reasoning (7 Hours)

Fuzzy propositions and fuzzy logic, Fuzzy implication and inference, Mamdani vs. Sugeno inference systems, Fuzzy rule base system and inference mechanism, Fuzzy if-then rules, Defuzzification techniques: Centroid, Bisector, MOM, SOM, LOM, Introduction to fuzzy decision-making and approximate reasoning.

Unit: -4 Applications of Fuzzy Logic (7 Hours)

Fuzzy logic in control systems (temperature control, washing machines, etc.), Fuzzy classification in AI and data mining, Fuzzy logic in pattern recognition and image processing, Fuzzy clustering (e.g., Fuzzy C-Means algorithm), Fuzzy logic in natural language processing (NLP), Fuzzy logic applications in business intelligence, robotics, and IoT, Case studies using MATLAB or Python (scikit-fuzzy).

Course Outcomes: After completion of this course, student will be able to:

1. Understand the fundamental concepts of fuzzy sets, membership functions, and their mathematical operations.
2. Apply fuzzy relations, compositions, and relational equations to model real-world uncertainties and vagueness.
3. Design fuzzy inference systems (Mamdani and Sugeno) and evaluate fuzzy rule-based reasoning using appropriate defuzzification techniques.
4. Develop fuzzy logic-based applications in domains such as control systems, pattern recognition, and decision-making using tools like MATLAB or Python.

Instructions for paper setter: All Questions are compulsory. The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one-word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C Comprises of 4 questions of 4 marks each, one from each unit. Section D Comprises of 4 questions of 6 marks each, one from each unit. There is no overall choice, however internal choice may be provided in section C and D, if paper setter so desires.

Text Books:

1. "Fuzzy Sets and Fuzzy Logic: Theory and Applications" by George J. Klir & Bo Yuan.
2. "Fuzzy Logic with Engineering Applications" by Timothy J. Ross.

Reference Books:

1. "Introduction to Fuzzy Logic using MATLAB" by S. N. Sivanandam.

B. Tech. (6th Sem) Computer Science & Engineering with Specialization in AI & Machine Learning
BCSE-822L (Fuzzy Logic Lab)

L	T	P
0	0	2

Continuous evaluation	**60**
End semester exam	**40**
Total marks	**100**
Credits	**1.0**

Course Objectives*:*

1. To understand fuzzy set theory, fuzzy inference, and fuzzy control systems.
2. To implement fuzzy systems using MATLAB / Python (with scikit-fuzzy or similar libraries).
3. To apply fuzzy logic to real-world problems.

List of Practical

1. Create and plot triangular, trapezoidal, and Gaussian membership functions.
2. Understand the role of linguistic variables and manually tune membership functions.
3. Perform union, intersection, complement on fuzzy sets.
4. Convert crisp values to fuzzy (fuzzification) and vice versa (defuzzification).
5. Implement centroid, bisector, mean of maxima, smallest/largest of maxima.
6. Define IF-THEN fuzzy rules for a simple system (e.g., temperature control).
7. Implement a Mamdani fuzzy inference system.
8. Implement Sugeno-Type Fuzzy Inference System.
9. Model and simulate Fuzzy Logic Controller for Washing Machine.
10. Perform unsupervised clustering using fuzzy logic on iris dataset.

Integrated Project (Mandatory) based upon the learnt concepts:

1. Design and simulate a Smart Home Temperature Control System.
2. Design and simulate a Fuzzy-Based Medical Diagnosis System

Course Outcomes*:* On successful completion of this course, students will be able to:

i) Design and simulate fuzzy systems.
ii) Implement fuzzy inference systems (FIS).
iii) Apply fuzzy logic to control and decision-making problems.
iv) Develop mini-projects solving practical engineering problems using fuzzy techniques.

B. Tech. (1st Sem) (Common for All Streams except CSE-Industry Integrated)
BCSE-001 (Computational and Problem Solving using 'C' Lab)

L	T	P		
0	0	2	**Continuous evaluation**	**60**
			End semester exam	**40**
			Total marks	**100**
			Credits	**1.0**

Course Objectives:

1. To make the student learn a programming language.
2. To teach the student to write programs in C and to solve the problems.

List of Practical

1. Write a program that reads two numbers from the keyboard and give result after performing following operations on them: i) Addition ii) Subtraction iii) Multiplication iv) Division v) Modulo
2. Write a program to Input distance between two cities (in KM). Convert and print this distance in: i) Meters ii) Feet iii) Inches iv) Centimeters.
3. Write a program to implement the working of all Bit-wise operators.
4. Write a program to find the largest out of three numbers using the ternary operator.
5. Write a program to check whether an entered year is a leap year or not.
6. Write a program to print grade of a student based on marks of 5 subjects entered by the user.
7. Write a program to implement increment and decrement operators.
8. Write a menu-driven program that allows the user to perform any one of the following operations based on input:
   i) Check if a number is even or odd ii) Check if a number is positive or negative
   iii) Print the square of the number iv) Print the square root of the number
9. Write a program to find sum of all integers greater than 100 & less than 200 and are divisible by 5.
10. Write a program to print series of arm-strong numbers from m to n where value of m and n will be input by user.
11. Write a program to search an element from an array.
12. Write a program to perform various matrix operations (Addition, Subtraction, Multiplication, Transpose) using switch-case statement.
13. Write a program to illustrate various strings inbuilt functions (strrev, strcmp, strlen, strcpy, strcat).
14. Write user defined functions for all the inbuilt functions of the above Program.
15. Illustrate the concept of call by value vs. call by reference by taking example of swapping of two numbers
16. Write a recursive function for computing factorial of a number.
17. Write a program to read an array of elements and print the same in the reverse order along with their addresses.
18. Write a function code that is returning pointer to the larger value out of two passed values.
19. Define a structure type, personal, that would contain person name, date of joining and salary. Using this structure, write a program to read this information for one person from the key board and print the same on the screen.
20. Write a program to store a character string in block of memory space created by malloc and then modify the same to store a large string.
21. Write a program to create a file named Employee and store record of 15 employees in this file. Each record must contain following details: (Name, Employee Code, Contact No., and Department).

Project: Pacman Game

Pacman Game is a project that can make game for entertainment purpose. In this game, your goal is to eat as many small dots as possible while navigating a maze. Pacman's movement is managed using the key board's navigation keys up, down, left, and right. The score card is provided on one side of the maze. The Pacman Game is created as a C application; the user can play the game just through executable file provided. The user can do many things in the system, he/she can move through arrow keys and note the score achieved. The **Pacman Game** is built using a simple C language coding and logic concepts that can be easier to understand for all beginners.

Features: i) Movement using arrow keys ii) Eating Dots iii) Increasing the size and making out on wrong movement iv) Display the Score

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

i) Read, understand and trace the execution of programs written in C language.
ii) Write the C code for a given algorithm.
iii) Implement Programs with pointers and arrays, perform pointer arithmetic.
iv) Write programs that perform operations using files.

B. Tech. (1st Sem) (Common for All Streams except CSE-Industry Integrated)
BCSE-008 (Computational and Problem Solving using 'C')

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Continuous evaluation	**40**
End semester exam	**60**
Total marks	**100**
Credits	**2.0**

Course Objectives:

1. To impart adequate knowledge on the need of programming languages and problem solving techniques.
2. To develop an in-depth understanding of functional and logical concepts of C Programming.
3. To familiarize the basic syntax and semantics of C Language.
4. To provide exposure to problem-solving through C programming.

Unit-1 Programming Fundamentals and Problem Solving

Problem solving techniques: Introduction to problem solving, Computational problem & its classification, Logic & its Types, Algorithm Design, Flowchart Creation, Writing Pseudo code, Basics of Programming Logic, Stepwise Refinement, Debugging and Testing Strategies, Introduction to Time and Space Complexity, Basic Input / Output Operations, Tracing and Dry Run of Code.

Introduction to C Programming: Computer language (High Level language, Low level Language), Translator (Compiler, Interpreter, Assembler), Features and applications of C, Structure of a C program, syntax and semantics, memory layout of a C program, input/output functions, indentation and comments.

Unit-2 Core Programming Concepts and Control Structures

Core Programming Concepts: Data types, constants, variables, operators and expressions, Precedence and Associativity, type conversion (implicit and explicit), header files.

Decision Control structure: Decision making statements (if, if-else, if-else-if, switch), nesting of decision control structures.

Loop Control structure: Looping statements (for, while, do-while), nested loop, use of jumping statements (goto, break, continue).

Unit-3 Data Handling (using Arrays, Strings & Functions) and Modular Programming

Array & String: Concepts of array, one- and two-dimensional arrays, declaration and initialization of arrays, searching and sorting, string handling, string storage, Storage class (auto, register, static, extern).

Functions: Concepts of library functions, Built-in-string functions, user defined functions, prototypes, definition of function, parameters types, parameter passing, calling a function, recursive function, Macros.

Modular Programming: Concept of modularity, functions and procedure-based design.

Unit-4 Advanced Data Handling and Dynamic Memory Management

Pointers: Pointers: Basics of pointers, Types of pointer (Null, Void, Wild, Dangling, Function, Near, Far, and Huge Pointers), pointer and array, pointer to array, array of pointers, functions returning a pointer.

Structure: Basics of structure, structure members, structure vs. union, accessing structure members, nested structures, array of structures, structure and functions, structures and pointers.

File Handling: Introduction about file, type of files, file operations (fopen, fscanf, fprintf, fclose).

Dynamic memory allocation: Introduction, malloc, calloc, realloc.

Course Outcomes: After completion of this course, student will be able to:

i) Recollect various programming constructs and to develop C programs.
ii) Understand the fundamentals of C programming.
iii) Choose the right data representation formats based on the requirements of the problem.
iv) Implement different Operations on arrays, functions, pointers, structures, unions and files.

Instructions for paper setter: All Questions are compulsory. The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C Comprises of 4 questions of 4 marks each, one from each unit. Section D Comprises of 4 questions of 6 marks each, one from each unit. There is no overall choice, however internal choice may be provided in section C and D, if paper setter so desires.

Textbooks:

1. Programming In Ansi C -by E. Balagurusamy.
2. Let us C – by Yashavant P. Kanetkar.

Reference Books:

1. A First Course in Programming with C- by T Jeyapoovan.

B. Tech. (2nd Sem) (Common for All Streams except CSE-Industry Integrated)
BCSE-007 (Data Structure)

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Continuous evaluation	**40**
End semester exam	**60**
Total marks	**100**
Credits	**2.0**

Course Objectives:

1. To impart the basic concepts of data structures and algorithms.
2. To introduce various techniques for representation of the data in the real world.
3. To introduce the concept of data structures through ADT including List, Stack, Queues.
4. To introduce the concepts of Tree and Graph and their traversal algorithms.

Unit:-1

Introduction: Basic Terminologies, Elementary Data Organizations, Linear & Non-Linear Data Structure, Data Structure Operations (insertion, deletion, traversal), Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off.
Arrays: Definition, Single Dimensional Array and its operations, Two-Dimensional Array, Sparse Matrix, Representation of Linear Arrays in Memory.
Searching and Sorting: Linear Search and Binary Search Techniques and their complexity analysis, Selection Sort, Bubble Sort, Insertion Sort, Merge Sort.

Unit:-2

ADT Stack: Introduction, stack operations and their complexity analysis, Applications of Stacks- Expression Conversion (Infix to Postfix), Evaluation of Postfix Expression.
Iteration and Recursion- Principles of recursion, Problem solving using iteration and recursion (Fibonacci numbers, and Hanoi towers).

Unit:-3

ADT Queue: Introduction, Types of Queue (Simple Queue, Circular Queue) and its Operations, Priority Queue, Applications of Queue.
Linked Lists: Introduction about dynamic memory allocation, Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion, Deletion; Linked representation of Stack and Queue, Introduction of Doubly linked list and Circular Linked Lists.

Unit:-4

Graph: Basic Terminologies and Representations, Graph traversal algorithms: Breadth First Search, Depth First Search, Applications of Graphs in real life.
Tree: Basic Terminologies and Representations, Binary Tree, Complete Binary Tree, Full Binary Tree, Binary Search Tree (Introduction, Traversal Operations), Applications of Trees in real life.

Course Outcomes: After completion of this course, student will be able to:

i) Select appropriate data structures as applied to specified problem definition.
ii) Implement Linear and Non-Linear data structures.
iii) Implement appropriate sorting/searching technique for given problem.
iv) Implement real life applications using relevant data structures.

Instructions for paper setter: All Questions are compulsory. The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C Comprises of 4 questions of 4 marks each, one from each unit. Section D Comprises of 4 questions of 6 marks each, one from each unit. There is no overall choice, however internal choice may be provided in section C and D, if paper setter so desires.

Text Books:

1. Ellis Horowitz and Sartaj Sahni, “Fundamentals of Data Structures”, Illustrated Edition, Computer Science Press.
2. Seymour Lipschutz, “Data Structures”, Schaum's Outline Series, McGraw Hill Publication.

Reference Books:

1. R. L. Kruse, B.P. Leary and C.L Tondo, “Data structure and program design in C”, PHI.
2. A. V. Aho, J. E. Hopcroft and T. D. Ullman, “Data Structures and Algorithms”, Addison-Wesley.

B. Tech. (2nd Sem) (Common for All Streams except CSE-Industry Integrated)
BCSE-010 (Data Structure Lab)

L	T	P
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Continuous evaluation	**60**
End semester exam	**40**
Total marks	**100**
Credits	**1.0**

Course Objectives:

1. To assess how the choice of data structures and algorithm design methods impacts the performance of programs.
2. To choose the appropriate data structure and algorithm design method for a specified application.
3. To solve problems using data structures such as linear lists, stacks, queues, binary trees, binary search trees, and graphs and writing programs for these solutions.

List of Practical

1. Declare a 2D Array with dimensions of 9x9 .Implement the following operations on this array:
   i) Search ii) Traversal iii) Sum of all elements iv) Insertion v) Deletion.
   Use the learned concept of this practical to solve **Su-Do-Ku Puzzle** whose statement is:
   Su-Do-Ku Puzzle – A Sudoku is a problem where there are is an incomplete 9 x 9 table of numbers which must be filled according to several rules:
   - ✓ Within any of the 9 individual 3x3 boxes, each of the numbers 1 to 9 must be found.
   - ✓ Within any column of the 9 x9 grid, each of the numbers 1 to 9 must be found.
   - ✓ Within any row of the 9x9 grid, each of the numbers 1 to 9 must be found.
2. Write a program that uses both recursive and non-recursive functions to perform the following searching operations for a Key value in a given list of integers: a) Linear search b) Binary search.
3. Implement various operations of Stack.
   Use the learned concept of this practical to solve **Tower of Hanoi** problem whose statement is:
   Tower of Hanoi – The Tower of Hanoi is a mathematical problem which consists of three rods and multiple disks. Initially, all the disks are placed on one rod, one over the other in ascending order of size similar to a cone-shaped tower. The objective of this problem is to move the stack of disks from the initial rod to another rod, following these rules:
   - A disk cannot be placed on top of a smaller disk.
   - No disk can be placed on top of the smaller disk.
4. Implement various operations of Queue.
   Use the learned concept of this practical to implement job scheduling algorithms used to solve **Job scheduling problem** whose statement is:
   Job Scheduling – Job scheduling is the process of allocating system resources to many different tasks / jobs by an operating system (OS). The system handles prioritized job queues that are waiting CPU time and it should determine which job to be taken from which queue and the amount of time to be allocated for the job.
5. Write a program that implements the Quick Sort to sort a given list of integers in ascending order
6. Write a program that implements the Merge Sort to sort a given list of integers in ascending order.
7. Implement memory representation of binary tree using array and link list.
8. Write a program to perform the following operations: a) Insert an element into a binary search tree. b) Delete an element from a binary search tree. c) Search for a key element in a binary search tree.
9. Implement memory representation of given location in graph.
10. Write a program to illustrate Graph traversals a) Breadth First Search b) Depth First Search

Integrated Project (Mandatory) based upon the learnt concepts
Dictionary Management – In this project, students will be required to read a dictionary file into different data structures (Array, Linked List, Stack, Queue) to perform various operations (Search, Insert (with sorting), Delete, View) and improve searching using hashing techniques.

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

i) Write well-structured procedure-oriented programs.
ii) Implement the Stack ADT using both array based and linked-list based data structures.
iii) Implement the Queue ADT using array based, circular queue and linked-list based data structures.
iv) Implement binary search trees and graphs.

B. Tech. (2nd Sem) (Common for All Streams except CSE-Industry Integrated)
BCSE-004 (Python Programming)

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Continuous evaluation	**40**
End semester exam	**60**
Total marks	**100**
Credits	**2.0**

Course Objectives:

1. To understand why Python is a useful scripting language for developers.
2. To learn how to design and program Python applications by using basic elementary concepts.
3. To learn how to use lists, tuples, and dictionaries in Python programs.
4. To learn how to identify Python object types and implement advanced concepts in real-life scenarios.

Unit:-1

Introduction to Programming and Python: Introduction to programming, Algorithm, program and programming languages, Why python, History and versions of Python, Applications of Python, Tools used for working with Python, Components/basic elements of Python, Installation steps of Python, Structure of Python program, Elements of Python, Python Interpreter, Python shell, Indentation, Variable, Keywords, Identifiers, Literals, Comments, input and output statements, Basic Data Types.
Operators: Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator.

Unit:-2

Decision making and Branching: Control statements (Branching, Looping, Conditional Statement), Difference between break, continue.
Functions: Built-in and Customized Functions, Defining and Calling a function, Date and Time Functions.

Unit:-3

Data Types in Python: Fundamental List Operations; Accessing, Updating, Deleting; Indexing, Slicing of list, Built-in List Functions & Methods.
Tuples: Basic tuples Operations; Accessing, Inserting, Deleting, Updating elements; Built- in tuple Functions & Methods.
Dictionary: Properties of Dictionary Keys; Basic operations on Dictionary; Built-in Dictionary Functions & methods.

Unit:-4

File Handling: An introduction to File Handling, open, close read and write functions, Access modes.
Object-oriented programming in Python: Basics of objects, class, operator overloading, overriding, special methods. Inheritance, polymorphism and composition.

Course Outcomes: After completion of this course, student will be able to:

i) Learn and acquire programming skills in core Python.
ii) Understanding the Object Oriented Skills in Python and real life examples.
iii) Learn and enhance the skill of programming by using lists, tuples and dictionaries in Python.
iv) Explore Python as “glue code”.

Instructions for paper setter: All Questions are compulsory. The Question paper is divided in to four sections A, B, C and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 2 marks each, one from each unit. Section C Comprises of 4 questions of 4 marks each, one from each unit. Section D Comprises of 4 questions of 6 marks each, one from each unit. There is no overall choice, however internal choice may be provided in section C and D, if paper setter so desires.

Text Books:

i) John V Guttag, Introduction to Computation and Programming Using Python, PHI, 2nd ed., 2017.
ii) R. Nageswara Rao, Core Python Programming, Dreamtech, 1st ed., 2017.
iii) Wesley J. Chun, Core Python Programming, Prentice Hall, 3rd ed., 2017.

Reference Books:

1. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, Data Structures and Algorithms in Python, Wiley Publications, 2013.
2. Kenneth A. Lambert, Fundamentals of Python–First Programs, Cengage Publication, 2nd ed., 2021.

B. Tech. (2nd Sem) (Common for All Streams except CSE-Industry Integrated)
BCSE-009 (Python Programming Lab)

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Continuous evaluation	**60**
End semester exam	**40**
Total marks	**100**
Credits	**1.0**

Course Objectives:

1. To understand basics of programming and Python.
2. To develop basic elementary programs using python.
3. To learn how to use lists, tuples, and dictionaries in Python programs.
4. To learn how to identify implement python concepts in real-life scenarios.

List of Practical

1. Installation procedure of python and Anaconda (IDE for Python) and test a basic python program in both Script and Interactive mode.
2. Write a program to demonstrate the use of different operators in python.
3. Write a program in python to find
   i) Standard Deviation ii) roots of quadratic equation
4. A cashier has currency notes of denominations 10, 50, and 100. If the amount to be withdrawn is input through the keyboard using input ( ) function in hundreds, write a python program to find the total number of currency notes of each denomination the cashier will have to give to the withdrawer.
5. Write a program in Python, A library charges a fine for every book returned late. For first 5 days the fine is 50 paisa, for 6-10 days fine is one rupee and above 10 days fine is 5 rupees. If you return the book after 30 days your membership will be cancelled. Write a program to accept the number of days the member is late to return the book and display the fine or the appropriate message.
6. Write program in python to demonstrate the string basic operation. Input a string like " Hello World " and provide the output as how many number of times a particular character appear in the input string like {'H':1, 'e': 1, 'l':3, 'o':2, 'W':1, 'd':1}
7. Write a program in python to create a list and apply all the operation applicable for the list and tuple and show the difference among list and tuples.
8. Write a program in python to create Dictionary and apply all the operation applicable for the dictionary. Develop a program for telephone directory.
9. Write a program in python for reading and writing student's record data on an external file.
10. Write a program in python to create a class and apply the following concepts of Object Oriented Programming i) Inheritance ii) Function Overloading iii) Operator Overloading.

Project: Python-based Library Management System

Project Description: Design a **Library Management System (LMS)** that allows users to manage books, members, and track overdue book fines using Python. The system should handle tasks such as book issuance, fine calculation, member registration, and storing data in external files or dictionaries.

The system should include basic functionalities such as:

- **Book Management** (Add, Remove, List)
- **Member Management** (Add, Remove, View)
- **Issuing Books** to members
- **Return of Books** and **Fine Calculation** (based on days overdue)
- **Report Generation** for fines, book lists, and member details

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

i) Understand and Use Python Programming Constructs.
ii) Solve Mathematical and Logical Problems Using Python.
iii) Work with Data Structures in Python.
iv) Implement Object-Oriented Programming (OOP) Concepts.

MAHARISHI MARKANDESHWAR
(DEEMED TO BE UNIVERSITY)
(Established under section 3 of the UGC Act, 1956)
(Accredited by NAAC with Grade 'A++')
M.M. INSTITUTE OF COMPUTER TECHNOLOGY & BUSINESS MANAGEMENT
(HOTEL MANAGEMENT)
MULLANA, AMBALA, HARYANA - 133207

Board of Studies Minutes of the Meeting:
A meeting of Board of Studies will be held on 31/07/2024 at 11:00 am in the office of Principal, MMICT&BM(HM), Mullana, Ambala in offline/ online mode.

1.	Dean, Faculty of Management	Chairman BOS (ex Officio)
2.	Dr.Mohinder Chand	External Member
3.	Chef. Parminder Dhillon	External Member (ONLINE)
4.	Ms. Poonampreet Kaur	External Member (ABSENT)
5.	Dr. Rekha Kaushik	Member
6.	Ms. Suman Rajput	:-do-
7.	Dr. Suresh Kumar Chauhan	:-do-
8.	Mr. Gurucharan Singh	:-do-
9.	Dr. Sukriti Singh	:-do-

Discussion of the agenda points resolutions:

1. Propose the Panel of examiners for PhD Course Work for the Session 2024-2025.

2. **Minor modification of Scheme and Syllabus of the BFS (FT) & BFS (ND) for the session 2023 and onwards as per NEP 2020.**

   The meeting addressed the need for minor modifications to the scheme and syllabus of the BFS (FT) & BFS (ND) programs to better align with the guidelines of the National Education Policy (NEP) 2020. The proposed modifications aim to incorporate a more holistic and multidisciplinary approach, emphasizing skill development, critical thinking, and flexibility in learning. The Board agreed to the proposed minor modifications in the list of electives and elective basket for the BFS (FT) and BFS (ND) programs. These changes will be implemented for the batch admitted in 2022-23 and onwards.

3. **Update to the List of Practicals for BHMCT Practical Courses, effective from the academic session 2024-25.**

   The current list of practicals for BHMCT courses was reviewed, with particular attention to the relevance and applicability of the exercises. It was suggested to include new practicals that align with the latest industry trends and technologies in the hospitality and culinary fields. The modification aims to provide students with updated and industry-relevant practical experience. The Board approved the updated list of practica's for BHMCT courses, effective from the academic session 2024-25.

4. **Discussion on the Review of Feedback Received from Stakeholders Regarding the Curriculum**

   The meeting proceeded with a review of the feedback collected from various stakeholders, including students, faculty, industry partners, and alumni, regarding the current curriculum. The

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feedback highlighted several areas of strength, such as the comprehensive nature of the theoretical components and the practical applicability of certain modules. However, concerns were raised about the need for updated course content in certain areas to reflect recent industry advancements and emerging trends. Suggestions were made to incorporate more experiential learning opportunities to enhance practical skills. Stakeholders also emphasized the importance modern technological tools into the curriculum to better prepare students for the evolving job market.

The Board acknowledged the valuable insights provided by the stakeholders and agreed on the necessity to update and enhance the curriculum.

5. **Revision of Internal Assessment Criteria for Practical Courses through Continuous Evaluation**

The need for revising the internal assessment pattern for practical courses was discussed in detail. It was proposed to shift towards a continuous evaluation model, which would better assess students' understanding and skills throughout the course. This new model includes multiple assessments, such as lab reports, conduct of practical exams, grooming standards and viva voce, rather than a single end-term practical exam. Members agreed that continuous assessment would provide a more comprehensive evaluation of students' practical abilities and encourage consistent performance.

The Board unanimously approved the modification of the internal assessment pattern for practical courses to incorporate continuous evaluation. This change will be implemented from the academic session 2024-25.

6. **Discussion and Recommendation of Outcome Based Education Curriculum Framework**
   - Institute Vision and Mission
   - Program Educational Objectives (PEOs)
   - Program Specific Outcomes (PSOs)
   - Program Outcomes (POs)

The meeting commenced with a review of the Institute's Vision and Mission, ensuring alignment with the current educational objectives and outcomes. The Program Educational Objectives (PEOs) were discussed, with suggestions for refining them to better reflect industry needs and student career paths. The Program Specific Outcomes (PSOs) and Program Outcomes (POs) were reviewed to ensure they align with the PEOs and support the overall educational mission. The emphasis was placed on making the outcomes measurable and achievable. Members discussed integrating more interdisciplinary content and real-world applications to enhance student learning and employability.

7. **Discussion and recommendation on the benchmarking and attainment level of POs and COs**

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Attainment levels for Theory courses are –

- Level 1 – 60% students with 60% marks
- Level 2 – 65% students with 65% marks
- Level 3 – 70% students with 70 % marks

Attainment levels for Practical courses are –

- Level 1 – 60% students with 60% marks
- Level 2 – 70% students with 65% marks
- Level 3 – 75% students with 70 % marks

The current benchmarking and attainment levels for Program Outcomes (POs) and Course Outcomes (Cos) were presented and analyzed. The group discussed the need for more rigorous benchmarks to ensure continuous improvement in both theoretical and practical courses.

The proposed attainment levels were approved for Theory and Practical courses. It was agreed that these attainment levels would serve as a new benchmark for evaluating course and program effectiveness, and should be reviewed annually.

8. **Introduction of MOOCs/SWAYAM Courses**

The discussion focused on how SWAYAM/MOOC courses can supplement the current curriculum, offering students additional learning opportunities in various subjects. A list of currently approved SWAYAM/MOOC courses was reviewed, with an emphasis on identifying courses that align with the institution's academic programs and student interests. It was noted that the integration of these courses could enhance students' skills, provide exposure to diverse subjects, and potentially offer credits towards their degree programs. The Board recommended expanding the list of approved SWAYAM/MOOC courses to provide students with a broader selection. The expansion should focus on courses that offer advanced knowledge, practical skills, and emerging trends in various fields.

9. **Propose the panel of expert for the PhD Viva- Voce & Thesis Evaluation for the Batch.**

S No.	Batch	Name of Student	Registration No.
1	2018-19	Mr. Ashish Ahlawat	12 BHM-002
2	2018-19	Ms. Amisha Panchal	18-Ph.D-029
3	2019-20	Ms. Reema Beri	19-Ph.D-029
4	2021-22	Mr. Lalit Mehta	21-Ph.D-125

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5	2021-22	Mr. Pardeep	21-Ph.D-126
6	2021-22	Mr. Karan Berry	21-Ph.D-127
7	2021-22	Mr Manpravesh Singh Chahal	14-BHM-081

Decision: - The Panel of Examiners for the thesis evaluation for the above listed PhD Scholars was considered in BOS and approved.

10. **Propose the recommendation of the RAC which was held on the following dates:**

PhD Batch 2018-19, 2019-20, 2020-21 Date 15 July, 2024.
PhD Batch 2022-23 (2) Date 17 July, 2024.
PhD Batch 2021-22, 2022-23 (1) April 2023 Date 18 July, 2024.
PhD Batch 2021-22, Date 22 July, 2024.

11. **To Approve the Panel of Examiners/Paper Setters (Theory &Practical) for MSc. (Dietetics & Nutrition) 1st, 2nd, 3rd, 4th Semester for the Session 2024- 25.**

The Chairman proposed the Panel of Examiners /Paper Setters (Theory & practical) for MSc,(Dietetics & Nutrition)1st, 2nd, 3rd, 4th semester for the session 2024-25. Board members discussed the name of Panel of Examiners and approved the same.

12. **To Approve the Panel of Examiners/Paper Setters (Theory) for Diploma in Hotel Management with specialization in Food Production 1st& 3rd Semester, Diploma in Hotel Management with specialization in Bakery & Confectionary 1st& 3rd Semester and Diploma in Hotel Management with specialization in ATHM 1st& 3rd Semester for the Session 2024-25.**

The Chairman proposed the Panel of Examiners / Paper Setters (Theory) for Diploma in Hotel Management with specialization in Food Production 1st & 3rd Semester, Diploma in Hotel Management with specialization in Bakery & Confectionary 1st & 3rd Semester, and Diploma in Hotel Management with specialization in ATHM 1st & 3rd Semester for the Session 2024-25. The suggestions were incorporated and the Panel was approved for academic year 2024-25.

13. **To Approve the Panel of Examiners/Paper Setters (Theory & Practicals) for BSc. Food Science with Specialization in Food Science and Technology 1st, 2nd , 3rd , 4th ,5th Semester and BSc. Food Science with Specialization in Nutrition & Dietetics 1st, 2nd , 3rd , 4th ,5th Semester for the Session 2024- 25.**

The Chairman proposed the Panel of Examiners / Paper Setters (Theory) for BSc Food Science with specialization in Food Science and Technology 1st, 2nd, 3rd, 4th, 5th Semester and BSc Food Science with specialization in Nutrition & Dietetics 1st, 2nd, 3rd , 4th, 5th semester for the academic

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session 2024-25. The suggestions were incorporated and the Panel was approved for academic year 2024-25.

14. **To Approve the Panel of Examiners / Paper setters (Theory & Practical) for BHM&CT 1st , 2nd ,3rd, 5th, 6th & 7th Semester and BSc (HHA) 1st, 2nd, 4th & 5th Semester for the session 2024-25.**

Panel of Examiners /Paper setter (Theory & practical) for BHM&CT 1st, 2nd, 3rd, 5th, 6th & 7th Semester, BSc (HHA) 1st, 2nd, 4th & 5th Semester for the session 2024-25 were proposed in the meeting. The suggestions were incorporated and the Panel was approved for academic year 2024-25.

15. **Allotment of PhD Supervisor to the Research Scholar Mr Rajat Gupta, 19-PhD - 031**

Upon receiving request from Mr Rajat Gupta, Research Scholar (19 PhD-031), regarding the allotment of New PhD Supervisor, the board discussed the possibilities of allotting the new supervisor. The scholar has already fulfilled all the conditions of DRC/ RAC and on the verge of pre submission. Keeping the progress of the scholar and university norms in mind, the board of members unanimously agreed on the name of Dr. Rekha Kaushik as his new supervisor.

Chairman
Board of Studies
Director
M.M. Institute of Management
Maharishi Markandeshwar
(Deemed to be university)
Mullana-Ambala-133207
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Syllabus Revision

Programme Name: BHM&CT

Academic Year: 2024-25

Name of Course	Course Code	Percentage of revision
Regional Cuisine of India I	HM 303 a (Pr)	100 %
Accommodation Management I	HM 303 c (Pr)	100 %
Regional Cuisine of India II	HM 304 a (Pr)	100 %
Accommodation Management II	HM 304 c (Pr)	100 %
Food Service Management	HM 407/ HM 409/ HM 411- II Pr	100 %
Event Management	HM 407/ HM 409/ HM 411- VII Pr	100 %
Accommodation Management	HM 407/ HM 409/ HM 411- III Pr	100 %
Front Office Management	HM 407/ HM 409/ HM 411- VI Pr	100 %
Culinary Management	HM 407/ HM 409/ HM 411- IV Pr	100 %
Foreign Cuisine (Chinese and Italian)	HM 407/ HM 409/ HM 411- VIII Pr	100 %

Principal

Principal
MMICT & BM (Hotel Management)
Maharishi Markandeshwar
(Deemed to be University)
Mullana, Ambala-133207

Subject Name: Regional Cuisine of India I Course: BHM&CT 5th Sem Subject Code: HM 303 a (Pr)

Practical Maximum Marks : 100	**Credits :2**
Internal Marks	**60**
External Marks	**40**

Course Objectives

This course will enable students to

CO1. Know about famous preparations, simultaneously discussing about unique cooking techniques, key ingredients and special equipment used in cuisine of Kashmir, Himachal and Uttarakhand.

CO2. Familiarize with famous preparations, simultaneously discussing about unique cooking techniques, key ingredients and special equipment used in cuisine of Punjab, Haryana & Delhi.

CO3. Understand famous preparations, simultaneously discussing about unique cooking techniques, key ingredients and special equipment used in cuisine of Rajasthan & Gujarat.

CO4. Learn famous preparations, simultaneously discussing about unique cooking techniques, key ingredients and special equipment used in cuisine of Maharashtra & Goa.

Practical:

MAHARASTRIAN	KASHMIRI	HIMACHAL	GOAN
MENU 01 1. Masala Bhat 2. Kolhapuri Mutton 3. Batata Bhajee 4. Masala Poori or 1. Moong Dal Khichdee 2. Patrani Macchi 3. Tomato Saar 4. Tilgul Chapatti 5. Basundi	MENU 02 1. Yakhni Pulao 2. Mughlai Paratha 3. Gosht Do Piaza 4. Badin Jaan or 1. Murg Kebab 2. Bakarkhani 3. Gosht Korma 4. Paneer Pasanda 5. Muzzafar	MENU 03 1. Chana Madra 2.Babru 3.Dham 4.Chana Madra 5.Mittha or 1.Aloo Palda 2.Patore 3.Kullu Trout 4.Chana Madra 5.Sidu	MENU 04 1. Arroz 2. Galina Xacutti 3. Toor Dal Sorak 4. Alle Belle or 1. Coconut Pulao 2. Fish Caldeen 3. Cabbage Foogath 4. Bibinca
PUNJABI	RAJASTHANI	UTTARAKHAND	HARYANVI
MENU 01 1. Rada Meat 2. Matar Pulao 3. Kadhi 4. Punjabi Gobhi	MENU 01 1. Gatte Ka Pulao 2. Lal Maas 3. Makki Ka Soweta	MENU 01 1. Aloo Ke Gutke 2. Chainsoo 3. Kafuli	MENU 01 1.Bathua Raita 2.Bajra Khichdi 3.Hara DhaniaCholia 4.Besan Masala Roti

5. Kheer MENU 02 1. Amritsari Macchi 2. Rajmah Masala 3. Pindi Chana 4. Bhaturas 5. Row Di Kheer	4. Chutny (Garlic) 5. Dal Halwa MENU 02 1. Dal 2. Batti 3. Churma 4. Besan Ke Gatte 5.Safed Mass	4. Bhatt ki Churkani 5. Jhangora Ki Kheer MENU 02 1. 1.Pahadi Raita 2. 2.Rasmi Badi 3. 3.Aloo Tamatar Jhol 4. 4.Gahat Dal (Kulath) 5. 5.Arsa	5.Mithe Chawal MENU 02 1.Kachri Ki Chutney 2.Alsi Ki Pinni 3.Kadhi Pakora 4.Zeera rice 5.Churma
DELHI MENU01 1.Aloo Tikki 2.Butter Chicken 3.Dal Makhani 4.Butter roti 5.Gajar Ka Halwa MENU 02 1.Chole Bhature 2.Shahi Paneer 3.Matar pulao 4.Rabri	GUJRAT MENU 01 Kachori Gujrati kadhi Rice Shrikhand MENU 02 1.Fafda 2.Sev tameta nu shaak 3.Roti 4.Lauki halwa		

Learning Outcomes:

After successful completion of this course, the student will have reliably demonstrated the ability to:

LO1. Make & present a few famous dishes from different regional cuisines vis a vis Kashmir, Himachal, Uttarakhand.

LO2. Make & present a few famous dishes from different regional cuisines vis a vis Punjab, Haryana, Delhi

LO3. Make & present a few famous dishes from different regional cuisines vis a vis Rajasthan & Gujarat.

LO4. Make & present a few famous dishes from different regional cuisines vis a vis Maharashtra & Goa.

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Course Articulation Matrix

CO Statement (HM 303a)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2	PSO 3	PSO 4
HM 303a.1	3	2	1	-	-	-	1	-	2	-	2	2	-	-
HM 303a.2	3	2	1	-	-	-	1	-	2	-	2	2	-	-
HM 303a.3	3	2	1	-	-	-	1	-	2	-	2	2	-	-
HM 303a.4	3	2	1	-	-	-	1	-	2	-	2	2	-	-
	3	2	1	-	-	-	1	-	2	-	2	2	-	-

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Subject Name: Accommodation Management I Course: BHM&CT 5th Sem
Subject Code: HM 303 c (Pr)

Practical Maximum Marks : 100	**Credits :2**
Internal Marks	**60**
External Marks	**40**

Course Objective:
This course will enable students to
CO1. Know about the cleaning and Maintenance of Guest Room Flooring
CO2. Familiarize with guest room Amenities
CO3. Learn about the Various records and Formats
CO4. Understand about Various emergency situations

Practical

1. Care & Maintenance of Flooring
2. Types of Flooring
3. Cleaning of Carpet area
4. Planning layouts of Guest Rooms
5. Designing of Guest room and lobby area
6. Types of curtains
7. Preparing Guest Folio
8. Practice Various records & Performa / Formats
9. Role Play
10. Group Discussion
11. Public Speaking
12. Calculation of Various occupancies.

Learning Outcomes:

After successful completion of this course, the student will have reliablydemonstrated the ability to
LO1. Prepare the record for the cleaning and Maintenance of Guest Room Flooring
LO2. Prepare the list of theguest room Amenities
LO3. Draw and explain the Various records and Formats
LO4. Explain about Various emergency situations

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Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	2	2	-	-	-	-	-	1	-	2	1	1	1
CO 2	2	1	1	-	-	-	-	-	1	-	2	1	1	1
CO 3	2	1	-	-	-	-	-	-	1	-	2	1	1	1
CO 4	3	1	-	2	-	1	-	-	1	-	2	1	1	1
	2.5	1.25	1.5	1	-	1	-	-	1	-	2	1	1	1

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Subject Name: Regional Cuisine of India II **Course: BHM&CT 6th Sem**
Subject Code: HM 304 a (Pr)

Practical Maximum Marks : 100	**Credits :2**
Internal Marks	**60**
External Marks	**40**

Course Objectives

This course will enable students to

CO1. Get involved in famous preparations, simultaneously discussing about unique cooking techniques, key ingredients and special equipment used in cuisine of Andhra Pradesh, Tamil Nadu and Kerala.

CO2. Learn famous preparations, simultaneously discussing about unique cooking techniques, key ingredients and special equipment used in cuisine of Awadh, Bengal & Odisha.

CO3. Know about famous preparations, simultaneously discussing about unique cooking techniques and special equipment used for preparation of some of the famous Indian sweets & snacks.

CO4. Get involved in famous preparations, simultaneously discussing about unique features of people pertaining to Jain &Parsi, North Eastern cuisine in India. Also demonstrate tandoor cooking.

Practical:

Andhra Pradesh Menu	**Tamil Nadu Menu**	**Kerala Menu**	**Awadh Menu**
Menu 1: 1. Pesarattu 2. Gutti Vankaya Kura 3. Pulihora 4. Andhra Chicken Fry 5. Payasam	**Menu 1:** 1. Idli 2. Kuzhi Paniyaram 3. Chettinad Chicken 4. Kootu 5. Payasam	**Menu 1:** 1. Appam 2. Puttu 3. Meen Moilee 4. Avial 5. Ada Pradhaman	**Menu 1:** 1. Galouti Kebab 2. Awadhi Biryani 3. Nihari 4. Sheermal 5. Shahi Tukda
Menu 2: 1. Ulava Charu 2. Kodi Pulao 3. Royyala Iguru 4. Bommidala Pulusu 5. Bobbatlu	**Menu 2:** 1. Vadai 2. Meen Kuzhambu 3. Karuveppilai Podi Sadam 4. Poriyal 5. Sakkarai Pongal	**Menu 2:** 1. Idiyappam 2. Thalassery Biryani 3. Nadan Kozhi Varuthathu 4. Erissery 5. Palada Payasam	**Menu 2:** 1. Kakori Kebab 2. Dum Pukht 3. Murgh Musallam 4. Roomali Roti 5. Sewaiyan

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Bengal Menu **Menu 1:** 1. Shorshe Ilish 2. Kosha Mangsho 3. Cholar Dal 4. Luchi 5. Sandesh **Menu 2:** 1. Macher Jhol 2. Bhapa Chingri 3. Begun Bhaja 4. Mishti Pulao 5. Rasgulla	**Odisha Menu** **Menu 1:** 1. Dalma 2. Chhena Poda 3. Machha Besara 4. Santula 5. Pakhala Bhata **Menu 2:** 1. Pakhala Bhata 2. Kanika 3. Dahi Machha 4. Alu Potala Rasa 5. Rasabali	**Jain Cuisine Menu** **Menu 1:** 1. Sabudana Khichdi 2. Paneer Makhmali 3. Dal Baati Churma 4. Gatte Ki Sabzi 5. Aamras **Menu 2:** 1. Methi Thepla 2. Dal Dhokli 3. Khandvi 4. Bharwan Tinda 5. Shrikhand	**Parsi Cuisine Menu** **Menu 1:** 1. Dhansak 2. Sali Boti 3. Patra Ni Machhi 4. Parsi Mutton Cutlets 5. Lagan Nu Custard **Menu 2:** 1. Akuri 2. Kolmi No Patio 3. Jardaloo Salli Murgh 4. Parsi Brown Rice 5. Ravo
Madhya Pradesh Cuisine Menu **Menu 1:** 1. Poha 2. Bhutte Ka Kees 3. Dal Bafla 4. Seekh Kebabs 5. Mawa Bati **Menu 2:** 1. Sabudana Khichdi 2. Palak Puri 3. Rogan Josh 4. Bhopali Gosht Korma 5. Shikanji	**North East Indian Cuisine Menu** **Menu 1:** 1. Smoked Pork with Bamboo Shoot (Nagaland) 2. Eromba (Manipur) 3. Chikhvi (Tripura) 4. Aloo Pitika (Assam) 5. Pukhlein (Meghalaya) **Menu 2:** 1. Bamboo Shoot Fry (Mizoram) 2. Fish Tenga (Assam) 3. Vawksa Rep (Mizoram)	**Tandoori Cuisine Menu** **Menu 1:** 1. Tandoori Chicken 2. Tandoori Roti 3. Paneer Tikka 4. Seekh Kebab 5. Tandoori Naan **Menu 2:** 1. Tandoori Fish 2. Chicken Tikka 3. Tandoori Prawns 4. Tandoori	

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	4. Sanpiau (Mizoram) 5. Chura Sabzi (Arunachal Pradesh)	Mushroom 5. Tandoori Paneer	

Learning Outcomes:

After successful completion of this course, the student will have reliably demonstrated the ability to:

LO1. Demonstrate the famous dishes from different regional cuisines vis a vis Andhra, Tamil Nadu, Kerala.

LO2. Demonstrate the famous dishes from different regional cuisines vis a vis Awadh, Bengal, Odisha.

LO3. Demonstrate the famous Indian sweet dishes from different regional cuisines.

LO4. Demonstrate the famous dishes from Jain, Parsi, North east, Tandoori and Madhya Pradesh cuisine

Course articulation matrix

CO Statement (HM 304a)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4
HM 304a.1	3	3	3	2	3	2	2	3	2	3	2	2	2	3
HM 304a.2	3	2	-	-	3	2	3	2	2	-	2	2	3	2
HM 304a.3	2	2	-	2	3	-	2	2	-	2	-	3	-	3
HM 304a.4	3	2	-	-	3	2	3	2	-	-	2	-	3	2

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Mullana, Ambala-133207

Subject Name: Accommodation Management II **Course: BHM&CT 6th Sem**

Subject Code: HM 304 c (Pr)

Practical Maximum Marks : 100	**Credits :2**
Internal Marks	**60**
External Marks	**40**

Course Objective:

This course will enable students to

CO1. Learn about Interior Decoration

CO2. Understand the principles of Interior Decoration.

CO3. Know about various types formats and records

CO4. Field visit to local resources.

Practical:

1. Designing Concepts
2. Interior Designing - Using Various elements of arts , Principles of Design
3. Preparing Duty Roster
4. Preparing Work Schedules
5. Planning & Staffing for various situations
6. Preparation of various Formats performa related to housekeeping Department
7. Inspection Checklist
8. Overall Planning for Hotel
9. Special Decoration
10. Front office Statistics
11. Charting Credit Policies / Floor Limits and Billing Procedures
12. Guest Room Supplies

Learning Outcomes:

After successful completion of this course, the student will have reliably demonstrated the ability to:

LO1. Describe the importance & functions of Interior Decoration

LO2. Demonstrate the Interior Decoration techniques

LO3. Demonstrate Front office Statistics

LO4. Describe Guest Room Supplies

Course Articulation Matrix

CO Statement (HM 304 c PR)	**PO1**	**PO 2**	**PO 3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PSO 1**	**PSO 2**	**PSO 3**	**PS O 4**
HM 304 c PR.1	2	-	3	2	3	-	-	3	1	3	3	3	3	2
HM 304 c PR.2	2	1	1	3	-	-	2	3	2	3	3	3	3	3
HM 304 c PR.3	3	-	-	3	-	1	-	3	3	2	3	3	3	3
HM 304 c PR.4	2	2	-	1	-	3	2	2	1	3	3	2	2	3

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Subject Name: Food Service Management **Course: BHM&CT 7th Sem**
Subject Code: HM 407/ HM 409/ HM 411- II Pr

Practical Maximum Marks : 100	**Credits :1**
Internal Marks	**60**
External Marks	**40**

Course Objective:
This course will enable students to
CO1. Learn the Layout of Food Service Outlets &Organisations
CO2. Know the steps involved in Food Service Operations
CO3. Know about Conferencing & Banqueting Functions
CO4. Learn about the Equipment and Furnishings required for food service outlets

Practical

F&B Operations Skills
- Layout of Food Service Outlets & Organisations
- Food Service Operations
- Conferencing & Banqueting
- Equipment and Furnishings, Environmental Management in Food Service Operations
- Visit to a professional Food Service Outlet

Supervisory Skills
- Conducting Briefing & Debriefing
- Restaurant, Bar, Banquets & Special events
- Drafting Standard Operating Systems (SOPs) for various F & B Outlets
- Supervising Food & Beverage operations
- Preparing Restaurant Log

Learning Outcomes:

After successful completion of this course, the student will have reliably demonstrated the ability to:
LO1. Focuses on Layout of Food Service outlets in different organizations.
LO2. Express food Service Operations
LO3. Examine conferencing & banqueting functions
LO4. Suggest requirement of equipment and furnishingsfor food service outlets

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Course Articulation Matrix

CO Statement HM 407/ HM 409/ HM 411- II Pr.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4
HM 407/ HM 409/ HM 411- II Pr	3	NA	NA	NA	NA	1	NA	NA	2	1	1	1	2	2
HM 407/ HM 409/ HM 411- II Pr	3	NA	NA	NA	NA	2	NA	2	2	2	2	2	3	2
HM 407/ HM 409/ HM 411- II Pr	2	NA	NA	NA	NA	2	NA	2	3	2	1	2	3	2
HM 407/ HM 409/ HM 411- II Pr	2	NA	NA	NA	NA	NA	NA	NA	2	1	2	1	2	2
	2.5	**NA**	**NA**	**NA**	**NA**	**1.67**	**NA**	**2**	**2.25**	**1.25**	**1.5**	**1.5**	**2.5**	**2**

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MMCT & BM (Hotel Management)
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Subject Name: Event Management Course: BHM&CT 7th Sem Subject Code: HM 407/ HM 409/ HM 411- VII Pr

Practical Maximum Marks : 100	**Credits :1**
Internal Marks	**60**
External Marks	**40**

Course Objective:

This course will enable students to

CO1. Know about the different types and arrangement of events.

CO2. Familiarize with planning, designing and organizing a theme based event.

CO3. Understand the process of marketing and promotion of events

CO4. Learn about financial, human resource and safety management at an event

Practical

Practical No.	**Practical Title**
Practical 1	Organizing Social Events - Children's Birthday Party, Marriage
Practical 2	organizing a Cultural Event
Practical 3	Organizing Corporate Events – Conference, Seminar, Exhibition
Practical 4	Organizing Festivals
Practical 5	Organizing Sports Event
Practical 6	Designing A site plan for event management
Practical 7	Event logistics
Practical 8	Crowd management and Diversion
Practical 9	Event Safety and Security
Practical 10	Planning the event menu, Breakfast, Lunch & Dinner Menu, Break food and Reception Menu.
Practical 11	Marketing Communication: image Branding Advertisement Publicity
Practical 12	Conduct Event Marketing Mix: Product Price Promotion Distribution Partnership Physical Evidence

Learning Outcome:

After successful completion of this course, the student will have reliably demonstrated the ability to:

LO1. Explain the meaning, concept and scope of Events with their advantage and disadvantages.

LO2. Actually able to plan & organize an event.

LO3. Suggest ways of marketing and promoting an event.

LO4. Exhibit effective leadership in managing various aspects of an event.

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Course Articulation Matrix

CO Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4
HM 411-VII 1	3	1	NA	NA	NA	2	1	1	2	1	2	2	2	2
HM 411-VII 2	2	1	NA	NA	NA	2	1	2	2	1	2	3	3	2
HM 411-VII 3	2	1	NA	NA	NA	1	1	1	2	1	1	2	3	3
HM 411-VII 4	1	1	NA	NA	NA	2	1	1	1	1	2	2	2	2
	2	**1**	**NA**	**NA**	**NA**	**1.75**	**1**	**1.25**	**1.75**	**1**	**1.75**	**2.25**	**2.5**	**2.25**

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Subject Name: Accommodation Management Course: BHM&CT 7th Sem Subject Code: HM 407/ HM 409/ HM 411- III Pr

Practical Maximum Marks : 100	**Credits :1**
Internal Marks	**60**
External Marks	**40**

Course Objective:

This course will enable students to

CO1. Know about layout and sub sections of Linen Room and Laundry

CO2. Learn about Flower Arrangement

CO3. Identify equipment and furnishing of Housekeeping

CO4. Learn about Housekeeping Control Desk .

Practical

1. Layout of Linen and uniform Room
2. Laundry Process .
3. Case Studies with Emergency Situations
4. Treatment of VIP guest
5. Stain Removal
6. Flower arrangement Parts and style .
7. Vouchers / Documents Genaration
8. Energy Conservation & Eco friendly Concepts
9. Practice with mock sessions of interviewing candidates
10. Waste Disposal
11. Guest Room inspection
12. Records of Housekeeping department
13. Role of Housekeeping Control Desk

Learning Outcomes:

After successful completion of this course, the student will have reliably demonstrated the ability to:

LO1. Design andexplain the layout of Linen Room and laundry

LO2. Acknowledge about theFlower Arrangement

LO3. Identify various equipment and furnishing of Housekeeping

LO4. Mention the Role of Housekeeping Control Desk .

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Course Articulation Matrix

CO Statement (HM 407 /HM409/ HM411-III PR)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4
HM 407 /HM409/ HM411-III PR.1	2	NA	NA	NA	NA	NA	NA	1	2	NA	2	1	1	1
HM 407 /HM409/ HM411-III PR.2	3	NA	NA	NA	NA	1	NA	1	2	1	2	2	2	2
HM 407 /HM409/ HM411-III PR.3	2	NA	NA	NA	NA	NA	NA	1	2	1	2	1	1	1
HM 407 /HM409/ HM411-III PR.4	3	NA	NA	NA	NA	1	NA	2	2	1	2	2	1	1
	2.5	NA	NA	NA	NA	1	NA	1.25	2	1	2	1.5	1.25	1.25

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Subject Name: Front Office Management Course: BHM&CT 7th Sem Subject Code: HM 407/ HM 409/ HM 411- VI Pr

Practical Maximum Marks : 100	**Credits :1**
Internal Marks	**60**
External Marks	**40**

Course Objective:

This course will enable students to

CO1. Know about Front Office Layout and functions of different sub sections in five star hotel.

CO2. Know about various Front Office procedures in a five star hotel.

CO3. Learn about Cashiering Procedure in Guest Cycle

CO4. Familiarize with Front Office Operations

Practical

1. Professional Front Office Layout & Organizations
2. Front Office Operations : Activities, Records & Regulations
3. Preparation of various Formats
4. Case Studies with emergencies situations
5. Guest check In and Check Out Procedure
6. Role Play
7. Group Discussion
8. Luggage handling Procedure
9. Cashiering while checking of VIP / FIT / Group
10. Cashiering Procedure during the stay of the guest
11. Cashiering while Guest Check out
12. Yield Management in Front Office Operations

Learning Outcome:

After successful completion of this course, the student will have reliably demonstrated the ability to:

LO1. Explain Front Office Layout and various sub-sections of front office with their functions in a hotel.

LO2. Discuss about various functions of sub sections of Front Office department.

LO3. Apply various methods of Cashiering

LO4. Describe Front Office Operations.

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Course Articulation Matrix

CO Statement : HM 407/ HM 409/ HM 411 Pr- VI	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4
HM 407/ HM 409/ HM 411 pr- VI.1	2	NA	1	NA	NA	NA	NA	NA	1	1	1	1	1	1
HM 407/ HM 409/ HM 411- VI pr .2	2	NA	2	NA	1	2	NA	1	1	2	1	2	3	2
HM 407/ HM 409/ HM 411- VI pr .3	2	NA	1	NA	NA	NA	NA	1	1	2	1	1	2	1
HM 407/ HM 409/ HM 411- VI pr.4	3	NA	2	NA	1	3	NA	2	2	2	1	2	3	2
	2.25	**NA**	**1.5**	**NA**	**1**	**2.5**	**NA**	**1.33**	**1.25**	**1.75**	**1**	**1.5**	**2.25**	**1.5**

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Subject Name: Culinary Management **Course: BHM&CT 7th Sem**
Subject Code: HM 407/ HM 409/ HM 411- IV Pr

Practical Maximum Marks : 100	**Credits :1**
Internal Marks	**60**
External Marks	**40**

Course Objectives

This course will enable students to

CO1. Familiarize the importance of sanitation & hygiene for maintaining food safety standards in food service industry& emphasize the concept of menu planning based upon several influential factors and food costing management in food service industry.

CO2. Determine the preparation of International 3 course menus to arouse more interest in the student to learn about famous International preparations.

CO3. Understand the various salad dressings and salads, preservation techniques, sandwiches, and continental breakfast preparations.

CO4. Learn the techniques of making Pâtés, Terrines, and other cold foods.

Practical

Menu 1 Chicken al king Garlic rice	Menu 2 Crème de champignons Pommes Alumettes	Menu 3 Vegetable in cream sauce Bread and butter pudding	Menu 4 Pasta Napolitana Butter toasted garlic bread
Menu 5 Pesto chicken Garlic soup (Italian style)	Menu 6 Creamy chicken marsala Veg Spaghetti	Menu 7 Minestrone soup Tomato basil penne pasta	Menu 8 Lemon coriander soup Pasta Alferdo
Menu 9 Chicken in Lemon butter sauce Ginger and basil rice	Menu 10 Potage Saint Germain Exotic saluted Vegetable	Menu 11 Chilled spring pea soup Cold pasta salade	Menu 12 Baked spinach corn Mushroom risotto

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Learning Outcomes:

After successful completion of this course, the student will have reliably demonstrated the ability to:

LO1. Discuss the International menus based upon various considerations& determine the food cost and supervise small kitchen operations.

LO2. Prepare simple International 3 course menu & execute it independently.

LO3. Demonstrate the preparation of simple salads, sandwiches and continental breakfast dishes.

LO4. Prepare cold meat products like Pate & Terrine, Roulade

Course articulation matrix

CO Statement (HM 411IV)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4
HM 411IV.1	1	NA	NA	NA	NA	1	1	2	1	1	2	2	1	2
HM 411IV.2	3	1	NA	NA	NA	NA	1	NA	2	2	3	2	1	2
HM 411IV.3	3	2	NA	NA	NA	NA	1	NA	2	2	3	2	1	2
HM 411IV.4	3	2	NA	NA	NA	NA	1	NA	2	2	3	2	1	2
	2.5	**1.67**	**NA**	**NA**	**NA**	**1**	**1**	**2**	**1.75**	**1.75**	**2.75**	**2**	**1**	**2**

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Subject Name: Foreign Cuisine **Course: BHM&CT 7th Sem**
(Chinese and Italian)
Subject Code: HM 407/ HM 409/ HM 411- VIII Pr

Practical Maximum Marks : 100	**Credits :1**
Internal Marks	**60**
External Marks	**40**

Course Objectives

This course will enable students to

CO1. Know about the salient features and basics of Chinese & Italian cooking.

CO2. Determine the various utensils and any special equipment & tools used in Chinese cuisine & Italian Cuisine

CO3. Familiarize with actual preparation of some of the famous dishes of Chinese cuisine.

CO4. Learn how to make some of the famous & exotic preparations of Italian cuisine.

Menu 1 Zuppa di Porcini Garlic Bruschetta	Menu 2 Dragon Chicken Egg fried noodles	Menu 3 Fish in Szechuan sauce Garlic mushroom fried rice	Menu 4 Peking style chicken Noodles in Peking sauce
Menu 5 Kung pao chicken Scallion pancake	Menu 6 Lumpiang shanghai Shangai borscht	Menu 7 Lemon chicken orzo soup Italian meat balls	Menu 8 Pesto chicken Garlic soup(Italian style)
Menu 9 Minestrone soup Tomato basil penne pasta	Menu10 Pasta napolitana With Butter toasted garlic bread	Menu 11 Creamy chicken marsala Veg Spaghetti	Menu 12 Chicken in Lemon butter sauce Ginger and basil rice

Learning Outcomes:

After successful completion of this course, the student will have reliably demonstrated the ability to:

LO1. Mention the unique features of Chinese & Italian cooking.

LO2. Select correct tool/ equipment, fresh ingredients & right cooking method to be used for Chinese& Italian cooking.

LO3. Demonstrate how to prepare some popular Chinese delicacies.

LO4. Demonstrate the preparation of a three-course menu based on Chinese & Italian cuisine independently.

Principal

Course Articulation matrix

CO Statement (HM 411VIII)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4
HM 411VIII.1	2	NA	NA	NA	NA	NA	NA	NA	1	1	1	1	1	1
HM 411VIII.2	3	NA	NA	NA	NA	NA	NA	NA	1	2	1	1	1	1
HM 411VIII.3	3	2	NA	1	NA	1	NA	1	2	2	2	1	2	3
HM 411VIII.4	3	1	NA	1	NA	1	NA	1	2	2	2	1	2	3
	2.75	**.1.5**	**NA**	**1**	**NA**	**1**	**NA**	**1**	**1.5**	**1.75**	**1.5**	**1**	**1.5**	**2**

Principal

Principal
MMICT & BM (Hotel Management)
Maharishi Markandeshwar
(Deemed to be University)
Mullana, Ambala-133207

M.M. INSTITUTE OF PHYSIOTHERAPY AND REHABILITATIO
MAHARISHI MARKANDESHWAR (DEEMED TO BE UNIVERSIT
(Accredited by NAAC with Grade 'A')
MULLANA-AMBALA, HARYANA (INDIA)

Ref. No.: MMIPR/24/8374

Date: 31.07.2024

BOARD OF STUDIES – MINUTES OF MEETING

The meeting of Board of Studies in MMIPR was held on 31st July 2024 at 10:30 AM. The following members were present -

1.	Dr. Manu Goyal, Professor, MMIPR (Principal)	Chairman of BOS
2.	Dr. Nidhi Sharma, Professor, MMIPR	Internal Member
3.	Dr. Shantha Kumar, Professor, MMIPR	Internal Member
4.	Dr. Amita Aggarwal, Professor, MMIPR	Internal Member
5.	Dr. Sunita Sharma, Associate Professor, MMIPR	Internal Member
6.	Dr. Mandeep Kumar Jangra, Assistant Professor, MMIPR	Internal Member
7.	Dr. Akanksha Saxena, Assistant Professor, MMIPR	Internal Member

External Experts

1.	Prof. (Dr.) Narkeesh Arumugam, Punjabi University, Patiala	External member
2.	Prof. (Dr.) Maneesh Arora, SBS University, Dehradun	External Member

The following agenda items were discussed and decision were made.

AGENDA – 1: **Confirming the minutes of meeting of the previous Board of Studies meetings held during the academic session 2023-24.**

Decision: The BOS members unanimously approved the minutes of meeting of the previous Board of Studies meeting held on **12.08.2023** and **02.12.2023** during the academic session 2023-24.

AGENDA – 2: **Approval of panel of Paper setters for BPT, MPT and PhD course work.**

Decision: The board unanimously approved the proposed panel of paper setters for BPT, MPT and PhD course work for the academic session 2024-25. **(Annexures I, II, III)**

M.M. INSTITUTE OF PHYSIOTHERAPY & REHABILITATION ★ MULLANA, AMBALA ★ PRINCIPAL 31/7/24

M.M. INSTITUTE OF PHYSIOTHERAPY & REHABILITATION 31/7/24

AGENDA – 3: Approval of panel of External Practical Examiners and Dissertation examiners for MPT.

Decision: The board unanimously approved the proposed panel of practical examiners and dissertation examiners for MPT 4th semester for the academic session 2024-25. **(Annexures IV, V)**

AGENDA – 4: Approval of Introduction of SWAYAM and NPTEL courses for MPT and BPT students.

Decision: The board approved the courses offered by SWAYAM and NPTEL for BPT and MPT students during the academic session 2024-25. **(Annexure VI)**

AGENDA – 5: Approval of RAC minutes of meetings held on 07/12/2023, 14/12/2023, 20/12/2023, 11/01/2024, 16/01/2024, 25/01/2024, 29/01/2024, 31/01/2024, 20/02/2024, 28/03/2024, 17/05/2024, 15/06/2024 and 27/07/2024.

08/07/2023

Decision: The board approved minutes of meetings of RAC meetings held in the institute on 07/12/2023, 14/12/2023, 20/12/2023, 11/01/2024, 16/01/2024, 25/01/2024, 29/01/2024, 31/01/2024, 20/02/2024, 28/03/2024, 17/05/2024, 15/06/2024 and 27/07/2024.

03/7/2024

AGENDA – 6: Approval of panel of Ph.D. thesis evaluators for Ms. Kanika (Reg. no. 21-PhD-024), Ms. Sumedha Sangwan (Reg. no. 21-PhD-025), Ms. Kavita Sharma (Reg. no. 09-PCM-005) and Ms. Neha Thakur (Reg. no. 21-PhD-027).

Decision: The board unanimously approved the evaluators for Ph.D. thesis of Ms. Kanika (Reg. no. 21-PhD-024), Ms. Sumedha Sangwan (Reg. no. 21-PhD-025), Ms. Kavita Sharma (Reg. no. 09-PCM-005) and Ms. Neha Thakur (Reg. no. 21-PhD-027). **(Annexure VII)**

AGENDA – 7: Approval of Value added courses to be offered for all students of the university during the academic session 2024-25.

a) **Ergonomics at Workplace**
b) **A Perspective for Stress Management**
c) **Menstrual Health and Fitness**
d) **Health Insights: Promotion & Education**

M.M. INSTITUTE OF PHYSIOTHERAPY & REHABILITATION ★ MULLANA, AMBALA ★ PRINCIPAL 31/8/24

31/8/24

Decision: The board approved the following Value Added Courses, their brochure, syllabus and evaluation process for UG and PG students during the session 2024-25.

a) Ergonomics at Workplace **(Annexure VIII)**
b) A Perspective for Stress Management **(Annexure IX)**
c) Menstrual Health and Fitness **(Annexure X)**
d) Health Insights: Promotion & Education **(Annexure XI)**

AGENDA – 8: Approval of revision in Syllabus of PhD Course work (MP05).

Decision: The board unanimously approved the syllabus revision based on the feedback received by all the stakeholders on the curriculum – Students, Alumni, Teachers, Professionals and Employers in PhD Course work (MP05) - from July 2024 onwards. **(Annexure XII)**

AGENDA – 9: Approval of syllabus revision in BPT (B304, B305, B401, B402, B701) and MPT (MP104, MM104, MM303, MM402, MM403, MN104, MN204, MN303, MN402 and MN403) courses.

Decision: The board unanimously approved the syllabus revision based on the feedback received by all the stakeholders on the curriculum – Students, Alumni, Teachers, Professionals and Employers in following programs -

a) BPT (B304, B305, B401, B402, and B701) – from July 2024 onwards
b) MPT (MP104, MM104, MM303, MM402, MM403, MN104, MN204, MN303, MN402 and MN403) – from July 2024 onwards.

AGENDA – 10: Approval of revised Course Objectives and Course Outcomes for BPT, MPT and PhD.

Decision: The members of the board approved the revised Course Objectives and Course Outcomes for BPT, MPT and PhD.

AGENDA – 11: Any other items

The meeting ended with the Vote of Thanks to the Chair.

PRINCIPAL 31/1/24

Prof. (Dr.) Manu Goyal
Chairman BOS
(Physically Present)

Prof. (Dr.) Narkeesh Arumugam
External Member
(Virtually Present)

Prof. (Dr.) Maneesh Arora
External Member
(Virtually Present)

Prof. (Dr.) Nidhi Sharma
Internal Member
(Physically Present)

Prof. (Dr.) Shantha Kumar
Internal Member
(Physically Present)

Prof. (Dr.) Amita Aggarwal
Internal Member
(Physically Present)

Dr. Sunita Sharma
Internal Member
(Physically Present)

Dr. Mandeep Kumar Jangra
Internal Member
(Physically Present)

Dr. Akanksha Saxena
Internal Member
(Physically Present)

PRINCIPAL
M.M. INSTITUTE OF PHYSIOTHERAPY & REHABILITATION
MULLANA AMBALA

M.M. INSTITUTE OF PHYSIOTHERAPY AND REHABILITATION

MAHARISHI MARKANDESHWAR DEEMED TO BE UNIVERISTY

Mullana-Ambala, Haryana – 133207, India

(Accredited by NAAC with Grade 'A++')

Details of the Revised Syllabus – 2024-25

S. No.	Program Code	Program	Name of the subject as per syllabus 2023-24	Name of the subject as per syllabus 2024-25	Percentage Revision
1	18PHD01	PhD (Physio-therapy)	Innovative Practices in Physiotherapy MP-05 (D)	Innovative Practices in Physiotherapy MP-05 (D)	Addition – 30%
2	18PGR01	MP104	Pediatric Disorders I – Assessment & Examination	Pediatric Disorders I – Assessment & Examination	Deletion: 5%, Addition: 12%
3	18PGR01	MM 104	Musculoskeletal Disorders I – Assessment & Evaluation	Musculoskeletal Disorders I – Assessment & Evaluation	Addition – 1% Deletion: 0.5%
4	18PGR01	MM 303	Physiotherapy Management in Traumatic Musculoskeletal Conditions	Physiotherapy Management in Traumatic Musculoskeletal Conditions	Addition – 1%
5	18PGR01	MM402	Advance Concepts in Physiotherapy in Musculoskeletal Disorders	Advance Concepts in Physiotherapy in Musculoskeletal Disorders	Addition - 15%, Deletion - 5%
6	18PGR01	MM403	Physiotherapy Management in Spinal Conditions	Physiotherapy Management in Spinal Conditions	Deletion - 7%, Replacement - 1%
7	18PGR01	MN104	Neurological Disorders 1: Assessment and Evaluation	Neurological Disorders 1: Assessment and Evaluation	Addition – 10%
8	18PGR01	MN204	Physiotherapy Management in Neurological Disorders II	Physiotherapy Management in Neurological Disorders II	Addition - 4%, Deletion - 4%
9	18PGR01	MN303	Physiotherapy Management in Neurological Disorders III	Physiotherapy Management in Neurological Disorders III	Addition:1%, Deletion - 12%
10	18PGR01	MN402	Advance Concepts in Physiotherapy in Neurological Disorders	Advance Concepts in Physiotherapy Management in Neurological Disorders	Addition - 10%, Replacement - 30%
11	18PGR01	MN 403	Physiotherapy Management in Neurological Disorders IV	Physiotherapy Management in Neurological Disorders IV	Addition: 5%
12	18UGR01	B304	Exercise Therapy – I	Exercise Therapy – I	Deletion – 1%
13	18UGR01	B305	Exercise Therapy Practical –	Exercise Therapy Practical –	Deletion – 1%

INSTITUTE OF PHYSIOTHERAPY & REHABILITATION PRINCIPAL MULLANA, AMBALA

			I	– I	
14	18UGR01	B401	Exercise Therapy – II	Exercise Therapy – II	Addition – 2%
15	18UGR01	B402	Exercise Therapy Practical – II	Exercise Therapy Practical – II	Replacement – 1%
16	18UGR01	B701	Physiotherapy in Neurological Disorders (Theory)	Physiotherapy in Neurological Disorders (Theory)	Addition – 20% Deletion – 5% Replacement – 15%

Principal
MMIPR (MMDU)
Mullana-Ambala

Paper 5 (MP-05D) Innovative practices in Physiotherapy (Pediatric)

MP-05 (D)

Time Allowed-3 Hrs

Theory

External Assessment: 70

Internal Assessment: 30

Total Marks: 100

Pass Marks: 50

Instruction for the paper setter:

There shall be 8 questions, covering the entire syllabus uniformly, out of which the candidates shall have to answer any 5. All questions shall carry equal marks.

Instruction for the Candidate:

Attempt any 5 of 10 questions. The pass percentage is 50%.

SECTION A: RESEARCH AND TOOLS WITH REFERENCE TO PHYSIOTHERAPY

Ethics in physiotherapy, Spirometer, Dynamometer, Nerve conduction Velocity, Electromyography, Sensory evaluation kit, Biofeedback, Skinfold caliper, Sliding caliper, Gait and pain assessment scales.

SECTION B: CURRENT CONCEPTS IN PAEDIATRIC

1. Electrocardiography in Pediatrics
2. Palliative care in Pediatrics
3. Neonatal aquatic therapy
4. Multimodal coma stimulation in neonatology and Pediatrics
5. Advances in neonatal thoraco-abdominal surgeries
6. Neonatal and Pediatric resuscitation
7. Functional electrical stimulation in Pediatrics
8. Trans cranial direct current stimulation
9. Paediatric Oncology Rehabilitation
10. Paediatric learning disorders

29/02/2020

Master of Physiotherapy - Pediatrics- Part I
Semester – I
Paper Code- MP104

Pediatric Disorders 1: Assessment and Examination (Theory)

External Assessment-70 | Internal Assessment- 30
Total Marks-100 | Pass Marks-50
Time- 3 hrs

INSTRUCTION FOR THE PAPER SETTER: The question paper will consist of three sections i.e. A, B, and C. Section A will have four long answer type questions, out of which students have to attempt two questions of 10 marks each and will carry 20 marks in all. Section B will have four long answer type questions, out of which students have to attempt two questions of 10 marks each and will carry 20 marks in all. Section C will consist of 15 short answer type questions of 2 marks each and will carry 30 marks in all. All the sections will cover the entire syllabus uniformly.

INSTRUCTIONS FOR THE CANDIDATES: Candidates are required to attempt two questions each from sections A and B. Section C is a compulsory section consisting of 15 short answer type questions of 2 marks each.

COURSE OBJECTIVE: On completion of the subject, students will have the opportunity to develop the skills of intellect decision making. It also provides an extension of their communication skills to articulate the evidence based acquaintance and clinical knowledge for assessment and diagnosis of patients. It is a prospect to the students for the application of the research and professional information to novel situations.

COURSE OUTCOME: On completion of this subject students should have the opportunity to:

1. Strengthen the basic fundamental basis of assessment and diagnosis and postulate this knowledge in clinical practice.
2. Analyses critical evaluate the patient conditions and formulation of accurate diagnosis.
3. Acquire a thorough understanding of pediatric conditions which can be applied in clinical practice.

COURSE DESCRIPTION

SECTION I

I. Normal Developmental Milestone
II. Pediatric assessment triangle
III. Child developmental stages
IV. Physical Therapy Assessment Procedures Used in Pediatric Conditions

1. Pediatric assessment, evaluation and correlation of findings with pediatric dysfunction
2. Higher cerebral function examination
3. Cognitive and perceptual assessment,
4. Cranial nerves examination
5. Assessment of Motor system–(Tone, voluntary movement control & abnormal involuntary movement)
6. Assessment of reflex integrity
7. Assessment of gait (kinetic & kinematic)
8. Assessment of Sensory system

V. Balance and Coordination: Assessment, Evaluation of Following and Correlation of Findings with Neurological Dysfunction

1 Balance, Equilibrium and Coordination Assessment.
2 Assessment of Autonomic nervous system function
3 Vestibular Examination

SECTION -II

I. Pediatric Assessment Scales and Measurement Tools

II. Screening Test

1. Bayley Infant Neurodevelopmental Screener (BINS)
2. Harris Infant Neuromotor test (HINT)
3. Infant Neurological International Battery (INFANIB)

III. Test of Motor Function

1. Test of Infant Motor Performance (TIMP),
2. Alberta Infant Motor Scale (AIMS),
3. Gross Motor Function Measure (GMFM),
4. Peabody Development Motor Scales (PDMS),
5. Bruininks- Oseretsky Test of Motor Proficiency (BOTMP),
6. Bayley Scales of Infant and Toddler Development (BSID),
7. Battelle Development Inventory (BDI),
8. Brief Ataxia Rating Scale (BARS)

IV. Balance and Coordination Assessment Test

1. Functional reach test,
2. Timed up and go test,
3. Get up and go test,
4. Pediatric balance Scale (PBS)
5. Scale to assess cognition

V. Functional Assessment Scales

1. Pediatric Evaluation of Disability Inventory (PEDI),
2. PEDI-Computer Adaptive Test (PEDI-CAT),
3. WeeFIM,
4. Rehabilitation Outcome measure scales: Quality of life Measures, Scales used in Assessment of children.

SECTION- III

Advanced Pediatric Assessment Procedure:

I. Disease Specific Measurements scales and tools: Scales used or the assessment of

1. Cerebral palsy
2. Down's syndrome
3. Spinal cord injury
4. Infantile hemiplegia
5. Muscular dystrophy
6. Sensory disorders and other disorders
7. Traumatic brain injury

II. Laboratory Examination related to Pediatric Disorders:

1. EMG
2. NCV
3. EEG (Basic Interpretation)
4. Lumbar puncture & CSF Analysis

Recommended books

1 Motor Assessment of Developing Infant - Piper &Darrah - W.E. Saunders.

2 Pediatric Physical Therapy -Jane S Tecklin. 5th ed. Lippincott Wiliams and Wilkins, 2014

3 Treatment of Cerebral Palsy and Motor Delay-Sophie Levitt

4 Physical therapy for children – Campbell Suzann K, 4th ed. W.B Saunders, Philadelphia, 2012

5 Therapeutic exercise in developmental disabilities – Barbara H and Patricia C, 3rd ed. SLACK Inc., 2005

6 Physical management of Multiple Handicapped – Freser, William & Wilkins, Baltimore.

7 Elements of Pediatric physiotherapy- Eckerley P, Churchill Liningstone, Edingburgh, 1993

8 Physiotherapy in pediatrics – Shepherd R. 3rd edition, Butterworth-Heinmann, London, 1995

9 The Growth chart – WHO, Geneva, 1986

10 Examination in Neurology examination- Dejong.

11 Differential Diagnosis-John PatternNeurology in Clinical Practice – Bradley&Daroff

12 Neurological Rehabilitation - Darcy Umphred

.

Master of Physiotherapy- Orthopedics
Semester – I
Paper Code- MM 104

Musculoskeletal Disorders I: Assessment and Evaluation

External Assessment-70 | Internal Assessment- 30
Total Marks-100 | Pass Marks-50
Time- 3 hrs

INSTRUCTION FOR THE PAPER SETTER: The question paper will consist of three sections i.e. A, B, and C. Section A will have four long answer type questions, out of which students have to attempt two questions of 10 marks each and will carry 20 marks in all. Section B will have four long answer type questions, out of which students have to attempt two questions of 10 marks each and will carry 20 marks in all. Section C will consist of 15 short answer type questions of 2 marks each and will carry 30 marks in all. All the sections will cover the entire syllabus uniformly.

INSTRUCTIONS FOR THE CANDIDATES: Candidates are required to attempt two questions each from sections A and B. Section C is a compulsory section consisting of 15 short answer type questions of 2 marks each.

COURSE OBJECTIVE: On completion of the subject, students will have the opportunity to develop the skills of intellect decision making. It also provides an extension of their communication skills to articulate the evidence based acquaintance and clinical knowledge for assessment and diagnosis of patients. It is a prospect to the students for the application of the research and professional information to novel situations.

COURSE OUTCOME: On completion of this subject students should have the opportunity to:

1. Strengthen the basic fundamental basis of assessment and diagnosis and postulate this knowledge in clinical practice.
2. Analyses critical evaluate the patient conditions and formulation of accurate diagnosis.
3. Acquire a thorough understanding of musculoskeletal conditions which can be applied in clinical practice.

Section I

Introduction to Assessment Techniques

I. Physiotherapy assessment, evaluation and clinical reasoning.
II. Introduction to various schools of manual therapy.
   a) Mulligan
   b) Kaltenborne
   c) Neural Mobilization (Butler & Shacklock)

d) Mckenzie
e) Maitland
f) James Cyriax
g) Myofascial Release
h) Muscle Energy Technique (MET)
i) Combined Movement

III. Overview of various investigatory procedures (Hematology and Serology, imaging techniques, arthroscopy, BMD)

Section II

I. Examination of Peripheral joints

A. Upper Limb
a) Shoulder Complex
b) Elbow & Forearm Complex
c) Wrist and Hand Complex

B. Lower Limb
a) Hip Complex
b) Knee Complex
c) Ankle & Foot Complex

II. Assessment & Evaluation of Temporo-mandibular Joint

Section III

I. Assessment of Amputee

II. Assessment of geriatric patient

III. Functional Assessment Scales

A. Shoulder Outcome Scales

1. American Shoulder and elbow Surgeons Standardized Shoulder Assessment Form (ASES)

2. Shoulder Pain and disability Index (SPADI)

3. Disabilities of Arm, Shoulder and Hand (DASH)

4. Rotator cuff quality of life (RCQOL)

5. The Western Ontario rotator cuff Index (WORC)

6. The Western Ontario shoulder Instability (WOSI) Index"

B. Elbow

1. ASES
2. Patient Rated elbow evaluation (PREE)
3. Quick DASH"

C. Hand and wrist Outcome measures

1. Boston Carpal tunnel Questionnaire (BCTR)
2. Patient- rated wrist and hand evaluation questionnaire
3. Quick DASH

D. Hip Outcome measures

1. Hip Disability and Osteoarthritis Outcome Score (HOOS)
2. Harris Hip score (HHS)
3. American Academy of Orthopaedic Surgeon (AAOS) Hip and knee questionnaire
4. Hip Outcome score (HOS)

E. Knee Outcome Measures

1. Knee Injury and Osteoarthritis Outcome Score (KOOS)
2. Westerner Ontario and McMaster University Osteoarthritis Index (WOMAC)
3. The Cincinnati knee Rating Scale
4. Victorian Institute of Sport Assessment (VISA) Questionnaire

F. Ankle and Foot Outcome Measure

1. Foot and Ankle Ability Measure (FAAM) - reliability - 0.87
2. Foot Function Index (FFI)
3. Foot and Ankle Disability Index (FADI)
4. Foot and Ankle Outcome Score (FAOS)
5. American Orthopaedic Foot and Ankle Society (AOFAS)
6. The Oxford Ankle Foot Questionnaire

Master of Physiotherapy- Orthopedics- Part II

SEMESTER III

Paper Code: MM303

Physiotherapy Management in Traumatic Musculoskeletal conditions

External Assessment-70 Internal Assessment-30
Total Marks-100 Pass Marks-50
Time- 3 hrs

INSTRUCTION FOR THE PAPER SETTER: The question paper will consist of three sections i.e. A, B, and C. Section A will have four long answer type questions, out of which students have to attempt two questions of 10 marks each and will carry 20 marks in all. Section B will have four long answer type questions, out of which students have to attempt two questions of 10 marks each and will carry 20 marks in all. Section C will consist of 15 short answer type questions of 2 marks each and will carry 30 marks in all. All the sections will cover the entire syllabus uniformly.

INSTRUCTIONS FOR THE CANDIDATES: Candidates are required to attempt two questions each from sections A and B. Section C is a compulsory section consisting of 15 short answer type questions of 2 marks each.

COURSE OBJECTIVE: On completion of the subject, students will have the opportunity to develop the skills of intellect decision making. It also provides an extension of their communication skills to articulate the evidence based acquaintance and clinical knowledge for assessment and diagnosis of patients. It is a prospect to the students for the application of the research and professional information to novel situations.

COURSE OUTCOME: On completion of this subject students should have the opportunity to:

1. Strengthen the basic fundamental basis of assessment and diagnosis and postulate this knowledge in clinical practice.
2. Analyses critical evaluate the patient conditions and formulation of accurate diagnosis.
3. Acquire a thorough understanding of surgical musculoskeletal conditions and physiotherapy management which can be applied in clinical practice.

COURSE DESCRIPTION:

SECTION I

I. General Fractures

II. Fracture and Dislocations of Peripheral Joints

A. Upper Limb

a) Shoulder and arm
b) Elbow and forearm
c) Wrist and hand

B. Lower Limb

a) Pelvis
b) Hip and thigh
c) Knee and leg
d) Ankle and foot

SECTION II

I. Introduction & Role of Rehabilitation in common Orthopaedic surgeries.
   a) Menisectomy
   b) Patellectomy
   c) Arthoplasties :-Shoulder, Elbow, Hip, Knee Arthoplasty.
   d) Arthrodesis :- triple arthrodesis, Hip, Knee, Shoulder Elbow arthrodesis, Spinal Fusion
   e) Osteotomies
   f) Bone grafting, Bone Lengthening
   g) Tendon transfers
   h) Soft Tissue release (Fasciotomy)
   i) Nerve Repair and grafting etc.

SECTION III

I. Introduction & Role of Rehabilitation in Burn Management
II. Amputation
   a) Types, Levels & procedures
   b) Pre and post-operative rehabilitation.
   c) Prosthesis and stump care.
   d) Limb transplantation Surgery

Books suggested

1. Turek's Orthopedics: Principles and their Application , Weinstein SL and Buckwalter JA, Lippincott
2. Apley's System of Orthopedics and Fractures , Louis Solomon , Arnold publishers.
3. Textbook of Orthopedics for Fractures, Adams: Churchill Livingstone
4. Clinical Orthopedic Rehabilitation, Brent Brotzman.
5. Orthopedic Physiotherapy, Robert A Donatelli, Churchill Livingstone.
6. Tidy's Physiotherapy, Ann Thomasons ,Varghese publishing House.
7. Physical Rehabilitation Assessment and Treatment, Susan Sullivan, Japee brothers
8. Textbook of Orthopedics, John Ebnezar, Japee Brothers.
9. Treatment and Rehabilitation of fractures,S Hoppenfield, Vasantha LM;Lippincott William and Wilkins.
10. Hand practice , Principle and Practice, Mauren Salter, Butterworth Heinemann.

Master of Physiotherapy- Orthopedics - Part II

Semester IV

Paper Code: MM402

Advance Concepts of Physiotherapy in Musculoskeletal Disorders

External Assessment-70 Internal Assessment- 30

Total Marks-100 Pass Marks-50

Time- 3 hrs

INSTRUCTION FOR THE PAPER SETTER: The question paper will consist of three sections i.e. A, B, and C. Section A will have four long answer type questions, out of which students have to attempt two questions of 10 marks each and will carry 20 marks in all. Section B will have four long answer type questions, out of which students have to attempt two questions of 10 marks each and will carry 20 marks in all. Section C will consist of 15 short answer type questions of 2 marks each and will carry 30 marks in all. All the sections will cover the entire syllabus uniformly.

INSTRUCTIONS FOR THE CANDIDATES: Candidates are required to attempt two questions each from sections A and B. Section C is a compulsory section consisting of 15 short answer type questions of 2 marks each.

COURSE OBJECTIVE: On completion of the subject, students will have the opportunity to develop the skills of intellect decision making. It also provides an extension of their communication skills to articulate the evidence based acquaintance and clinical knowledge for assessment and diagnosis of patients. It is a prospect to the students for the application of the research and professional information to novel situations.

COURSE OUTCOME: On completion of this subject students should have the opportunity to:

1. Strengthen the basic fundamental basis of assessment and diagnosis and postulate this knowledge in clinical practice.
2. Analyses critical evaluate the patient conditions and formulation of accurate diagnosis.
3. Acquire a thorough understanding of advance concepts of Physiotherapy including Manual therapy and electrotherapy which can be applied in clinical practice.

Section- I

I. Practical application of various manual therapy concepts

a) Mulligan
b) Kaltenborne
c) Neural Mobilization (Butler & Shacklock)
d) Mckenzie

e) Maitland
f) James Cyriax
g) Myofascial Release
h) Muscle Energy Technique (MET)
i) Combined Movement

II Introduction to the concepts and techniques in PRT

III Orientation to Proprioceptive Neuromuscular Facilitation concepts and technique

IV Brief introduction to the Musculoskeletal and neural concepts of Dry Needling

V Massage and Sports Massage.

Section II

1. Introduction to the Advanced Electrotherapeutic and Physiological Modalities:
   a) Functional Electrical stimulation.
   b) Class IV laser Therapy.
   c) Ultraviolet Radiation.
   d) Extracorporeal shock wave Therapy.
   e) Hydrotherapy.

Section-III

1. Introduction to Electrodiagnosis
   a) Electromyography
   b) Nerve Conduction Study
   c) Biofeedback.
   d) ECG and Its relevance.
   e) SD Curve

Books suggested

1. Sinha A.G.: Principle and Practices of Therapeutic Massage – Jaypee Brothers,New Delhi
2. Gardiner M. Dena: The Principles of Exercise Therapy - CBS Publishers, Delhi.
3. Kisner and Colby: Therapeutic Exercises – Foundations and Techniques, F.A Davis.
4. Basmajian John V.: Therapeutic Exercise, Williams & Wilkins.
5. Thomson et al - Tidy's Physiotherapy: Butterworth – Heinmann.
6. Wood & Baker: Beard's Massage, W.B. Saunders.
7. Kendall: Muscles – Testing and Function - Williams & Wilkins
8. Daniels and Worthinghams: Muscle Testing – Techniques of Manual Examination, W.B. Saunders.
9. First Aid to Injured: St. John's Ambulance Association.
10. William E. Prentice: Rehabilitation Techniques - Mosby.

11. Werner Kuprian: Physical Therapy for Sports, W.B. Saunders.
12. Norkin& White: Measurement of Joint Motion – A Guide to Goniometry - F.A. Davis.
13. Andrea Bates and Norm Hanson: Aquatic Exercise Therapy, W.B. Saunders.
14. Dvir: Isokinetics: Muscle Testing, Interpretation and Clinical Applications, W.B Saunders.
16. Kennedy: Mosby's Sports Therapy Taping Guide.
17. Malone: Orthopeadic and Sports Physical Therapy, C.V. Mosby.
18. Albert: Eccentric Muscle Training in Sports and Orthopeadics, W.B. Saunders.
11. Werner Kuprian: Physical Therapy for Sports, W.B. Saunders.
12. Norkin& White: Measurement of Joint Motion – A Guide to Goniometry - F.A. Davis.

Master of Physiotherapy- Orthopedics - Part II

Semester IV
Paper Code: MM403
Physiotherapy Management in Spinal Conditions

External Assessment-70 | Internal Assessment- 30
Total Marks-100 | Pass Marks-50
Time- 3 hrs

INSTRUCTION FOR THE PAPER SETTER: The question paper will consist of three sections i.e. A, B, and C. Section A will have four long answer type questions, out of which students have to attempt two questions of 10 marks each and will carry 20 marks in all. Section B will have four long answer type questions, out of which students have to attempt two questions of 10 marks each and will carry 20 marks in all. Section C will consist of 15 short answer type questions of 2 marks each and will carry 30 marks in all. All the sections will cover the entire syllabus uniformly.

INSTRUCTIONS FOR THE CANDIDATES: Candidates are required to attempt two questions each from sections A and B. Section C is a compulsory section consisting of 15 short answer type questions of 2 marks each.

COURSE OBJECTIVE: On completion of the subject, students will have the opportunity to develop the skills of intellect decision making. It also provides an extension of their communication skills to articulate the evidence based acquaintance and clinical knowledge for assessment and diagnosis of patients. It is a prospect to the students for the application of the research and professional information to novel situations.

COURSE OUTCOME: On completion of this subject students should have the opportunity to:

a) Strengthen the basic fundamental basis of assessment and diagnosis and postulate this knowledge in clinical practice.
b) Analyses critical evaluate the patient conditions and formulation of accurate diagnosis.
c) Acquire a thorough understanding of congenital and spinal musculoskeletal disorders which can be applied in clinical practice situations.

COURSE DESCRIPTION

SECTION I

1. Review of anatomy and pathomechanics of vertebral column
2. Application of advance techniques like Maitland, Mckenzie, Mulligan
3. Principles of management

SECTION II

1. Congenital disorders of vertebral column
2. Congenital and Acquired deformities
3. Ergonomics
4. Non traumatic disorders of vertebral column
    a) Degenerative
    b) Infections
    c) Inflammatory
    d) Spinal instabilities

SECTION III

1. Traumatic injuries of vertebral column: General & regional injuries.
2. Soft tissue injuries, tightness, structural changes.
3. Bone injuries (fractures & dislocations of spine)
4. Pre and post-operative management of spinal surgeries.
5. Spinal cord injuries
    a) Types, Classifications
    b) Pathology
    c) Level
    d) Examination
    e) Management & rehabilitation
    f) Orthopedic surgeries
    g) Bio engineering appliances & support devices
    h) Pre &post-operative rehabilitation.

Books suggested

1. Turek's Orthopaedics: Principles and their Application, Weinstein SL and Buckwalter JA, Lippincott
2. Apley's System of Orthopaedics and Fractures, Louis Solomon, Arnold publishers.
3. Textbook of Orthopaedics, Adams: Churchill Livingstone
4. Clinical Orthopaedic Rehabilitation, Brent Brotzman.
5. Orthopaedic Physiotherapy, Robert A Donatelli, Churchill Livingstone.
6. Tidy's Physiotherapy, Ann Thomasons, Varghese publishing House.
7. Physical Rehabilitation Assessment and Treatment, Susan Sullivan, Japee brothers
8. Textbook of Orthopaedics, John Ebnezar, Japee Brothers.
9. Pain Series Rene Calliet., Japee Brothers.
10. Essentials of Orthopaedics and Applied Physiotherapy, Jayant Joshi,prakash Kotwal; Churchill Livingstone

Master of Physiotherapy- Neurology
Semester – I
Paper Code- MN104: Neurological Disorders 1: Assessment and Evaluation

External Assessment-70 Internal Assessment- 30
Total Marks-100 Pass Marks-50
Time- 3 hrs

INSTRUCTION FOR THE PAPER SETTER: The question paper will consist of three sections i.e. A, B, and C. Section A will have four long answer type questions, out of which students have to attempt two questions of 10 marks each and will carry 20 marks in all. Section B will have four long answer type questions, out of which students have to attempt two questions of 10 marks each and will carry 20 marks in all. Section C will consist of 15 short answer type questions of 2 marks each and will carry 30 marks in all. All the sections will cover the entire syllabus uniformly.

INSTRUCTIONS FOR THE CANDIDATES: Candidates are required to attempt two questions each from sections A and B. Section C is a compulsory section consisting of 15 short answer type questions of 2 marks each.

COURSE OBJECTIVE

On completion of the subject, students will have the opportunity to develop the skills of intellect decision making. It also provides an extension of their communication skills to articulate the evidence based acquaintance and clinical knowledge for assessment and diagnosis of patients. It is a prospect to the students for the application of the research and professional information to novel situations.

COURSE OUTCOME

On completion of this subject students should have the opportunity to:
1. Strengthen the basic fundamental basis of assessment and diagnosis and postulate this knowledge in clinical practice.
2. Analyses critical evaluate the patient conditions and formulation of accurate diagnosis.
3. Acquire a thorough understanding of neurological conditions which can be applied in clinical practice.

COURSE OBJECTIVE: On completion of the subject, students will have the opportunity to develop the skills of intellect decision making. It also provides an extension of their communication skills to articulate the evidence based acquaintance and clinical knowledge for assessment and diagnosis of patients. It is a prospect to the students for the application of the research and professional information to novel situations.

COURSE OUTCOME: On completion of this subject students should have the opportunity to:

a) Strengthen the basic fundamental basis of assessment and diagnosis and postulate this knowledge in clinical practice.
b) Analyses critical evaluate the patient conditions and formulation of accurate diagnosis.
c) Acquire a thorough understanding of factors influencing learning including the learner and the environment, and how these factors can be applied in clinical practice.

COURSE DESCRIPTION:

SECTION I

1. Revision of Neuro-anatomy and neurophysiology
2. Neurological assessment, evaluation and correlation of findings with neurological dysfunction
   a) History taking and examination of neurologically ill patient
   b) Higher cerebral function examination,
   c) Cognitive and perceptual assessment,
   d) Cranial nerves examination
   e) Motor System Assessment - Tone, voluntary movement control & abnormal involuntary movement,
   f) Assessment of reflex integrity
   g) Assessment of gait (kinetic & kinematic)
   h) Sensory system assessment and examination
   i) Balance, equilibrium and Coordination assessment.
   j) Assessment of Autonomic nervous system function.
   k) Vestibular Examination
   l) Assessment of unconscious patient.

SECTION II

1. Functional Assessment scales: Barthel index, Katz Index of ADL, FIM Scale, Sickness Impact Profile, Outcome & Assessment Information Set (OASIS).IADL.
2. Functional balance and coordination scales: functional reach test, Timed up and go test, Get up and go test, Berg balance Scale, CTSIB, Scales used in ataxia
3. Rehabilitation Outcome measure scales: Quality of life Measures, Scales used in Assessment of elderly.

SECTION III

1. Advanced Neurological Assessment Procedures:
    A. Electro diagnosis
        - Principles underlying electrical stimulation test.
        - SD curve
        - FG test
        - Rheobase, Chronaxie.
    B. Electromyography
        - Instrumentation.
        - Technique
        - Surface EMG
        - Single fiber EMG
        - Qualitative and quantitative analysis of the responses (includes practical)
    C. Nerve conduction studies
        - Instrumentation
        - Techniques
        - Interpretation (includes practical)
    D. Electrical study of reflexes
        - Silent period.
        - F- response
        - H- reflex
        - Axon reflex
        - Blink reflex
        - Jaw jerk
        - Tonic vibration reflex
    E. Evoked potentials
        - Somato sensory evoked potential
        - Motor evoked potential
        - Brainstem evoked potential
        - Visual evoked potential
2. Disease Specific Measurements scales and tools: Clinical Stroke scales, Scales used in spinal cord injury, Scales for the assessment of movement disorders, Multiple sclerosis, Scales for assessment of Brain injury And Cognitive scales.
3. Laboratory Examination related to Neurological Disorders: Lumbar puncture & CSF Analysis.
4. Radiograph and myelogram, CT scan and MRI of brain and spinal cord

Master of Physiotherapy- Neurology
SEMESTER II

Paper Code: MN 204

Physiotherapy Management in Neurological Disorders II

External Assessment-70 Internal Assessment- 30
Total Marks-100 Pass Marks-50
Time- 3 hrs

INSTRUCTION FOR THE PAPER SETTER: The question paper will consist of three sections i.e. A, B, and C. Section A will have four long answer type questions, out of which students have to attempt two questions of 10 marks each and will carry 20 marks in all. Section B will have four long answer type questions, out of which students have to attempt two questions of 10 marks each and will carry 20 marks in all. Section C will consist of 15 short answer type questions of 2 marks each and will carry 30 marks in all. All the sections will cover the entire syllabus uniformly.

INSTRUCTIONS FOR THE CANDIDATES: Candidates are required to attempt two questions each from sections A and B. Section C is a compulsory section consisting of 15 short answer type questions of 2 marks each.

COURSE OBJECTIVE: On completion of the subject, students will have the opportunity to develop the skills of intellect decision making. It also provides an extension of their communication skills to articulate the evidence based acquaintance and clinical knowledge for assessment and diagnosis of patients. It is a prospect to the students for the application of the research and professional information to novel situations.

COURSE OUTCOME: On completion of this subject students should have the opportunity to:

a) Strengthen the basic fundamental basis of assessment and diagnosis and postulate this knowledge in clinical practice.
b) Analyses critical evaluate the patient conditions and formulation of accurate diagnosis.
c) Acquire a thorough understanding neurological disorders related to Central Nervous system can be applied in clinical practice situations.

COURSE DESCRIPTION

SECTION – I

1. Cerebral Trauma (Head and Brain Injury)

- Epidemiology, Pathophysiologies, Symptoms, Signs, Investigation, Management, Pre and Post Operative Physiotherapy, Complications.
- Closed skull Fractures.

- Haematomas: Epidural, Sub Dural, Intracerebral
- Open cranio-cerebral injuries
- Neurosurgical management in head injuries

2. Stupor and Coma

- The Neural basis of consciousness.
- Lesions responsible for Stupor and Coma
- The assessment and Investigation of the unconscious patient.
- The Management of the Unconscious patient.

3. Disorders of the Cerebral Circulation - Stroke
   - Epidemiology of the stroke and TIA
   - Causes,types and pathophysiology
   - Clinical features & investigations
   - Treatment of different type of stroke
   - Recovery & rehabilitation
   - Stroke prevention

SECTION II

1. Cerebrovascular Diseases
   - Intracranial Aneurysm
   - Spontaneous Subdural
   - Extradural Haemorrhage
   - intracerebral Haemorrhage
   - Subarachnoid haemorrhage
   - AV Malformations

2. Neoplastic lesion
   - Intracranial Tumors
   - Cerebral Hemisphere
   - Tumors from related structures, Meninges, Cranial Nerves.
   - Cerebellar Tumors

3. Vestibular disorders and management
   - Role of vestibular system in postural control
   - Postural abnormalities in vestibular disorder
   - Vestibular functions tests and clinical examinations
   - Central and peripheral vestibular disorders
   - Vestibular hypo function
   - Vestibular dysfunction

SECTION III

1. Infections of central nervous systems.
    - Meningitis
    - Encephalitis
    - Brain abscess
    - Neuro Syphilis
    - Herpes Simplex
    - Tuberculosis
    - AIDS
2. Demyelinating Diseases of the Nervous system
    - Classification of Demyelinating Diseases
    - Multiple Sclerosis.
    - Diffuse Sclerosis
3. Movement disorders
    - Akinetic-rigidity Syndromes, Parkinson disorder and other extra Pyramidal Syndromes
    - Dyskinetic disorders, Chorea.
4. Diseases of cranial nerves.

Books suggested

1. Neurological Physiotherapy - A problem solving approach - Susan Edwards - Churchill Livingstone.
2. Neurological Rehabilitation - Umpherd - Mosby.
3. Motor Assessment of Developing Infant - Piper & Darrah - W.E. Saunders.
4. Paediatric Physical Therapy - Teckling - Lippmcott
5. Treatment of Cerebral Palsy and Motor Delay-Sophie Levitt
6. Brain's Disease of the Nervous System - Nalton - ELBS.
7. Guided to clinical Neurology - Mohn & Gaectier - Churchill Livingstone.
8. Principles of Neurology - Victor - McGraw Hill lnternational edition.
9. Examination in Neurology examination- Dejong.
10. Differential Diagnosis-John PatternNeurology in Clinical Practice – Bradley&Daroff
11. Neurological Assessment-Blicker staff.
12. Clinical Evaluation of Muscle Function-Lacote- Churchill Living Stone
13. Hutchinson's Clinical Methods – Swash – Bailliere Tindall.

Master of Physiotherapy- Neurology- Part II

SEMESTER III

Paper Code: MN303

Physiotherapy Management in Neurological Disorders III

External Assessment-70 Internal Assessment-30
Total Marks-100 Pass Marks-50
Time- 3 hrs

INSTRUCTION FOR THE PAPER SETTER: The question paper will consist of three sections i.e. A, B, and C. Section A will have four long answer type questions, out of which students have to attempt two questions of 10 marks each and will carry 20 marks in all. Section B will have four long answer type questions, out of which students have to attempt two questions of 10 marks each and will carry 20 marks in all. Section C will consist of 15 short answer type questions of 2 marks each and will carry 30 marks in all. All the sections will cover the entire syllabus uniformly.

INSTRUCTIONS FOR THE CANDIDATES: Candidates are required to attempt two questions each from sections A and B. Section C is a compulsory section consisting of 15 short answer type questions of 2 marks each.

COURSE OBJECTIVE: On completion of the subject, students will have the opportunity to develop the skills of intellect decision making. It also provides an extension of their communication skills to articulate the evidence based acquaintance and clinical knowledge for assessment and diagnosis of patients. It is a prospect to the students for the application of the research and professional information to novel situations.

COURSE OUTCOME: On completion of this subject students should have the opportunity to:

a) Strengthen the basic fundamental about neurological disorders and postulate this knowledge in clinical practice.
b) Analyses critical evaluate the patient conditions and formulation of accurate diagnosis.
c) Acquire a thorough understanding of the neonatal and peripheral nervous system neurological disorders in different domains of the physiotherapy and application in clinical practice situations.

COURSE DESCRIPTION:

SECTION –I

1. Pre & post-natal Development sequence of normal child.
2. Developmental milestones, Neonatal reflexes, various periods of growth,
3. General assessment of child

4. Early identification and intervention Important Screening Tests.
    A. Developmental Screening Tests.
    B. Tests of motor function.

5. Nutrition and Immunization: Normal nutritional requirements of a child, Prevention of some nutritional disorders, Nutritional deficiency diseases, Immunization.
6. High risk infants, Risk factors, Neonatal Assessment, Developmental intervention, ICU, NICU Care.
7. Cerebral Palsy: Types, Aetiology, Clinical Features, Management and Rehabilitation of various types of cerebral palsies various approaches used in C.P.
8. Physiotherapy in Neurological affection of childhood: poliomyelitis, spina bifida, hydrocephalus, meningitis, encephalitis, inflammatory disorders of brain and spinal cord, birth injuries of brachial plexus

SECTION-II

1. Physiotherapy in Muscular Disorders
    A. Myopathies of childhood.
    B. Types of muscular dystrophies.
    C. Floppy muscular dystrophy.

2. Role of Physiotherapy in Genetic Disorders
    A. Down syndrome.
    B. Fragile X Syndrome.
    C. Rett's Syndrome.
    D. Spinal Muscular Atrophy.

SECTION-III

1. Diseases of the muscles.
    - Classifications, myopathies, muscle dystrophies and neuromuscular junction disorders.
2. Spasticity
    - Neuropathology
    - Assessment
    - Medical and surgical management
    - Rehabilitation measures.
3. Diseases of the peripheral nervous system
    - All type of level of Peripheral Neuropathy and Brachial Plexus.
    - Causalgia.
    - Reflex Sympathetic Dystrophy.

- Peripheral Nerve Tumors and Irradiation Neuropathy.
- Traumatic, Compressive and Ischemic Neuropathy.
- Penal Radiculitis and Radiculopathy.
- Hereditary Motor and Sensory Neuropathy (HMSN) (Type I,II,IV and V)
- Acute Idiopathic Polyneuritis
- Neuropathy due to infections.
- Vasculomotor Neuropathy.
- Neuropathy due to systemic medical disorders.
- Drug – induced neuropathy.
- Metal – poisoning chemical neuropathies
- GBS

BOOKS RCOMONDED:

1. Neurological Physiotherapy - A problem solving approach - Susan Edwards - Churchill Livingstone.
2. Neurological Rehabilitation - Umpherd - Mosby.
3. Motor Assessment of Developing Infant - Piper & Darrah - W.E. Saunders.
4. Paediatric Physical Therapy - Teckling - Lippmcott
5. Treatment of Cerebral Palsy and Motor Delay-Sophie Levitt
6. Brain's Disease of the Nervous System - Nalton - ELBS.
7. Guided to clinical Neurology - Mohn & Gaectier - Churchill Livingstone.
8. Principles of Neurology - Victor - McGraw Hill lnternational edition.
9. Examination in Neurology examination- Dejong.
10. Differential Diagnosis-John PatternNeurology in Clinical Practice – Bradley&Daroff
11. Neurological Assessment-Blicker staff.
12. Clinical Evaluation of Muscle Function-Lacote- Churchill Living Stone
13. Hutchinson's Clinical Methods – Swash – Bailliere Tindall.

Master of Physiotherapy- Neurology- Part II
SEMESTER IV
Paper Code: MN 402

Advance Concepts of Physiotherapy in Neurological Disorders

External Assessment-70 Internal Assessment- 30
Total Marks-100 Pass Marks-50
Time- 3 hrs

INSTRUCTION FOR THE PAPER SETTER: The question paper will consist of three sections i.e. A, B, and C. Section A will have four long answer type questions, out of which students have to attempt two questions of 10 marks each and will carry 20 marks in all. Section B will have four long answer type questions, out of which students have to attempt two questions of 10 marks each and will carry 20 marks in all. Section C will consist of 15 short answer type questions of 2 marks each and will carry 30 marks in all. All the sections will cover the entire syllabus uniformly.

INSTRUCTIONS FOR THE CANDIDATES: Candidates are required to attempt two questions each from sections A and B. Section C is a compulsory section consisting of 15 short answer type questions of 2 marks each.

COURSE OBJECTIVE: On completion of the subject, students will have the opportunity to develop the skills of intellect decision making. It also provides an extension of their communication skills to articulate the evidence based acquaintance and clinical knowledge for assessment and diagnosis of patients. It is a prospect to the students for the application of the research and professional information to novel situations.

COURSE OUTCOME: On completion of this subject students should have the opportunity to:

a) Strengthen the basic fundamental basis of assessment and diagnosis and postulate this knowledge in clinical practice.
b) Analyses critical evaluate the patient conditions and formulation of accurate diagnosis.
c) Acquire a thorough understanding of advance concepts of Physiotherapy including Manual therapy and electrotherapy which can be applied in clinical practice.

COURSE DESCRIPTION:

SECTION-I

I. Neuro Rehabilitation- Treatment Planning Process:
   1. Classification of Treatment Techniques Based on Current Concepts & Approaches.
   2. All Types of Strengthening Techniques
   3. Overview of Neurological Impairments and their Treatment, with emphasis on Recording and Documentation

SECTION-II

I. Neuromuscular Training- Methods For Optimizing Neuromuscular & Postural Control: Proprioception Training and Kinesthetic Training (Sensory Integration)

- Problem Solving Approach
- Motor Control
- Clinical Decision Making And Clinical Reasoning
- Evidence Based Practice

SECTION-III

I. Advanced Neuro-Therapeutic Techniques:

- Functional Electrical stimulation.
- Transcranial Direct Current Stimulation (tDCS)
- Cranial Stimulation
- Electromyography and Biofeedback.
- Nerve Conduction Velocity and Evoked Potentials.
- Motor learning Theories
- Management of pain and Spasticity and paralysis in neurological disorders
- Modified CIMT
- Biofeedback
- Basic Principle and Concepts of: Brunnstrom, Bobath,NDT, Roods, MRP.
- Concepts, Principles and techniques of Neurodyanamics
- Transcranial Magnetic stimulation (rTMS)
- Cognitive Behavioral Therapy (CBT)

RECOMMENDED BOOKS:

1. Sinha A.G.: Principle and Practices of Therapeutic Massage – Jaypee Brothers,New Delhi
2. Gardiner M. Dena: The Principles of Exercise Therapy - CBS Publishers, Delhi.
3. Kisner and Colby: Therapeutic Exercises – Foundations and Techniques, F.A.Davis.
4. Basmajian John V.: Therapeutic Exercise, Williams & Wilkins.
5. Thomson et al - Tidy's Physiotherapy: Butterworth – Heinmann.
6. Wood & Baker: Beard's Massage, W.B. Saunders.
7. Kendall: Muscles – Testing and Function - Williams & Wilkin
8. Daniels and Worthinghams: Muscle Testing – Techniques of Manual Examination, W.B. Saunders
9. First Aid to Injured: St. John's Ambulance Association.
10. William E. Prentice: Rehabilitation Techniques - Mosby.
11. Werner Kuprian: Physical Therapy for Sports, W.B. Saunders.
12. Norkin& White: Measurement of Joint Motion – A Guide to Goniometry - F.A.Davis.
13. Andrea Bates and Norm Hanson: Aquatic Exercise Therapy, W.B. Saunders.

Master of Physiotherapy- Neurology- Part II
SEMESTER IV
Paper Code: MN403:

Physiotherapy Management in Neurological Disorders IV

External Assessment-70 Internal Assessment- 30
Total Marks-100 Pass Marks-50
Time- 3 hrs

INSTRUCTION FOR THE PAPER SETTER: The question paper will consist of three sections i.e. A, B, and C. Section A will have four long answer type questions, out of which students have to attempt two questions of 10 marks each and will carry 20 marks in all. Section B will have four long answer type questions, out of which students have to attempt two questions of 10 marks each and will carry 20 marks in all. Section C will consist of 15 short answer type questions of 2 marks each and will carry 30 marks in all. All the sections will cover the entire syllabus uniformly.

INSTRUCTIONS FOR THE CANDIDATES: Candidates are required to attempt two questions each from sections A and B. Section C is a compulsory section consisting of 15 short answer type questions of 2 marks each.

COURSE OBJECTIVE: On completion of the subject, students will have the opportunity to develop the skills of intellect decision making. It also provides an extension of their communication skills to articulate the evidence based acquaintance and clinical knowledge for assessment and diagnosis of patients. It is a prospect to the students for the application of the research and professional information to novel situations.

COURSE OUTCOME: On completion of this subject students should have the opportunity to:

a) Strengthen the basic fundamental basis of assessment and diagnosis and postulate this knowledge in clinical practice.
b) Analyses critical evaluate the patient conditions and formulation of accurate diagnosis.
c) Acquire a thorough understanding of neurological physiotherapy techniques in various conditions which can be applied in clinical practice.

COURSE DESCRIPTION:

SECTION-I

I. Diseases of the Spinal cord
   a) Motor Neuron Disease
   b) Cauda equina Syndrome
   c) Spinal Muscular Atrophy
   d) Spino-cerebellar Degeneration (Friedreich's Ataxia)
   e) Transverse Myelitis

II. Disorders / Rehabilitation of the spinal cord

a) Acute Traumatic injuries of the spinal cord
b) Slow progressive compression of the spinal cord
c) Syringomyelia
d) Tumors of Spinal Cord

SECTION-II

I. Medical, Surgical, and Physiotherapy Management in Disturbances of CSF and its circulation.

II. Compressive myelopathies.

a) Classification
b) Surgical Management Laminectomy)
a) Spinal Stability after surgery
b) Postoperative Rehabilitation regime

III. Neuropsychological Problems and Rehabilitation

a) Various aspects of Behavior- Confusion, Delirium, Amnesia, Schizophrenia.
b) Disturbances of Memory, Emotion, Mood and Social Behavior
c) General Intellectual functions, Memory Functions, Attention, Language, Visual Perception, Spatial Processing, Executive Functions, Emotional Distress and Behavioral Problems.

SECTION-III

I. Disorder of Special senses

a) Papilloedema and Increased Intracranial Pressure
b) Abnormalities in Visual Fields, Supranuclear and Infraneuclear Disorders of Ocular Movements.
c) Olfactory Disorders.
d) Disorders of Speech & Language, Perception, Somatosensory and Cognitive Impairment
   - Aphasia
   - Anarthria
   - Dyslexia

BOOKS SUGGESTED:

1 Neurological Physiotherapy - A problem solving approach - Susan Edwards -Churchill Livingstone.
2 Neurological Rehabilitation - Umpherd - Mosby.
3 Motor Assessment of Developing Infant - Piper & Darrah - W.E. Saunders.
4 Paediatric Physical Therapy - Teckling - Lippincott
5 Treatment of Cerebral Palsy and Motor Delay-Sophie Levitt
6 Brain's Disease of the Nervous System - Nalton - ELBS.

Bachelor of Physiotherapy

Semester III

Title of the Course – EXERCISE THERAPY – I

Paper Code – B – 304	University Marks: 70
Course Description - Core Theory	Internal Marks: 30
Credit per Semester - 5 credits	Max. Marks: 100
Hours per Semester - 75 hours	Min. Marks: 50

Instructions for Paper Setter:

Paper Setter should follow the below mentioned question paper pattern for setting the question paper for three hours duration. The question paper will be strictly from the prescribed syllabus / scheme. It shall be ensured that no question should be asked out of the syllabus. The question paper must be fairly distributed over the whole course of study and not concentrated on any one or few portions. Every section of the question paper must contain the questions from all the units of the syllabus. Repetition of a question must be avoided.

S. No.	Section	Type of Questions	No. of Questions to be attempted	Marks per Question	Total Marks for that section
1.	**Section A**	Long Answer Type Questions	2 out of 3	15 x 2	30
2.	**Section B**	Short Answer Type Questions	4 out of 5	4 x 5	20
3.	**Section C**	Very Short Answer Type Questions	10 out of 12	2 x 10	20
Total Marks = 70					

Instructions for Candidate: Candidate is instructed to attempt the question paper in the above given pattern in three sections. Attempt all questions as indicated.

COURSE OBJECTIVES - In this course, the students will learn the principles and effects of exercise as a therapeutic modality and will learn the techniques in the restoration of physical functions.

Course Learning Outcomes: At the end of the course, the candidate will able to:

1. Define principle of exercise applications.
2. Describe methods of testing – goniometry, manual muscle testing
3. Anthropometric Measurements, Measurement of Limb Length and functional tests.
4. Classify and describe active movements and passive movements.
5. Define and describe free exercises and resisted exercises.
6. Describe relaxation techniques.
7. Define and describe therapeutic massage.

Topics to be covered:

1. **Introduction to Exercise Therapy –** 10 hours

   The aims of Exercise Therapy, The techniques of Exercise Therapy, Approach to patient's problems, Assessment of patient's condition – Measurements of Vital parameters.

   Starting Positions – Fundamental positions & derived Positions, Planning of Treatment

2. **Methods of Testing -** 15 hours

   a) Functional tests

   b) Measurement of Joint range: ROM- Definition, Normal ROM for all peripheral joints & spine, Goniometer-parts, types, principles, uses, Limitations of goniometry, Techniques for measurement of ROM for all peripheral joints

   c) Tests for neuromuscular efficiency

   d) Electrical tests

   e) Manual Muscle Testing: Introduction to MMT, Principles & Aims, Indications & Limitations, Techniques of MMT for group & individual: Techniques of MMT for upper limb / Techniques of MMT for lower limb / Techniques of MMT for spine.

   f) Anthropometric Measurements: Muscle girth – biceps, triceps, forearm, quadriceps, calf

   g) Static power Test

   h) Dynamic power Test

   i) Endurance test

   j) Speed test

k) Tests for Co-ordination

l) Tests for sensation

m) Pulmonary Function tests

n) Measurement of Limb Length: true limb length, apparent limb length, segmental limb length

o) Measurement of the angle of Pelvic Inclination

3. **Relaxation:** 8 hours

a) Definitions: Muscle Tone, Postural tone, Voluntary Movement, Degrees of relaxation, Pathological tension in muscle, Stress mechanics, types of stresses, Effects of stress on the body mechanism, Indications of relaxation, Methods & techniques of relaxation- Principles & uses: General, Local, Jacobson's, Mitchel's, additional methods.

4. **Passive Movements -** 10 hours

a) Causes of immobility, Classification of Passive movements, Specific definitions related to passive movements, Principles of giving passive movements, Indications, contraindications, effects of uses , Techniques of giving passive movements.

5. **Active Movements -** 22 hours

a) Definition of strength, power & work, endurance, muscleactions.

b) Physiology of muscle performance: structure of skeletal muscle, chemical & mechanical events during contraction & relaxation, muscle fiber type, motor unit, force gradation.

c) Causes of decreased muscleperformance

d) Physiologic adaptation to training: Strength & Power, Endurance.

e) Types of active movements

i. Free exercise: Classification, principles, techniques, indications, contraindications, effects and uses.

ii. Active Assisted Exercise: Principles, techniques, indications, contraindications, effects and uses.

iii. Assisted-Resisted Exercise: principles, techniques, indications, contraindications, effects and uses.

iv. Resisted Exercise: Definition, principles, indications, contraindications,

precautions & techniques, effects anduses.

- Types of resisted exercises, Manual and Mechanical resistance exercise, Isometric exercise, Dynamic exercise: Concentric and Eccentric, Dynamic exercise: Constant versus variable resistance, Isokinetic exercise, Open-Chain and Closed-Chainexercise.
- Specific exercise regimens -
  - Isotonic: de Lormes, Oxford, MacQueen, Circiut weight training
  - Isometric: BRIME (Brief Resisted Isometric Exercise), Multiple Angle Isometrics
  - Isokinetic regimens

6. **Massage:** 10 hours
   a. History and Classification of Massage Technique
   b. Principles, Indications and Contraindications
   c. Technique of Massage Manipulations
   d. Physiological and Therapeutic Uses of Specific Manipulations

SUGGESTED READINGS (TEXT BOOKS & REFERENCE BOOKS):

1. Practice exercise therapy- Hollis- Blackwell Scientific Publication
2. Therapeutic Exercises- Basmajjan- Williams and Wilkins.
3. Therapeutic Exercises Foundations and Techniques –Kisner and Colby –F.A. Davis.
4. Principle of exercise of therapy – Gardiner –C.B.S. Delhi
5. Beard's Massage –Wood- W.B. Saunders.
6. Muscle testing and functions – Kendall- Williams & Wiikins.
7. Deniels and Worthingham's- Muscle testing- Hislop & Montgomery –W.B. Saunders.
8. Measurement of joint motion: A guide to Goniometry- Norkins & White- F.A. Davis

Bachelor of Physiotherapy

Semester IV

Title of the Course – EXERCISE THERAPY - II

Paper Code – B – 401	University Marks: 70
Course Description - Core Theory	Internal Marks: 30
Credit per Semester - 4 credits	Max. Marks: 100
Hours per Semester - 90 hours	Min. Marks: 50

Instructions for Paper Setter:

Paper Setter should follow the below mentioned question paper pattern for setting the question paper for three hours duration. The question paper will be strictly from the prescribed syllabus / scheme. It shall be ensured that no question should be asked out of the syllabus. The question paper must be fairly distributed over the whole course of study and not concentrated on any one or few portions. Every section of the question paper must contain the questions from all the units of the syllabus. Repetition of a question must be avoided.

S. No.	Section	Type of Questions	No. of Questions to be attempted	Marks per Question	Total Marks for that section
1.	Section A	Long Answer Type Questions	2 out of 3	15 x 2	30
2.	Section B	Short Answer Type Questions	4 out of 5	4 x 5	20
3.	Section C	Very Short Answer Type Questions	10 out of 12	2 x 10	20
Total Marks = 70					

Instructions for Candidate: Candidate is instructed to attempt the question paper in the above given pattern in three sections. Attempt all questions as indicated.

COURSE OBJECTIVES- After the course on exercise therapy student will be able to understand the different types of exercise for the benefit of patient in different situations and conditions both in health and disease or disorder.

Course Learning Outcomes: At the end of the course, the candidate will able to:

1. Define principle of Proprioceptive Neuromuscular Facilitation (PNF) and describe patterns, techniques of PNF.
2. Classify types of suspension and Describe methods of applying it.
3. Describe functional reeducation.
4. Define and describe Aerobic exercises.
5. Describe stretching techniques and classify the types of stretching.
6. Define principle of hydrotherapy and describe its various applications.
7. Describe mobilization of peripheral joints.
8. Discuss balance& coordination exercises.
9. Describe different walking aids and its uses.

Topics to be covered:

1. **Proprioceptive NeuromuscularFacilitation** 8 hours

   a) Definitions & goals

   b) Basic neurophysiologic principles of PNF: Muscular activity, Diagonals patterns of movement: upper limb, lower limb

   c) Procedure: components of PNF

   d) Techniques of facilitation

   e) Mobility: Contract relax, Hold relax, Rhythmic initiation

   f) Strengthening: Slow reversals, repeated contractions, timing for emphasis, rhythmic stabilization Stability: Alternating isometric, rhythmic stabilization

   g) Skill: timing for emphasis, resisted progression

   h) Endurance: slow reversals, agonist reversal

2. **Suspension Therapy** 4 hours

   a) Definition, principles, equipments & accessories, Indications &contraindications,

   b) Benefits of suspension therapy

   c) Types of suspension therapy: axial, vertical, pendular Techniques of suspension therapy for upper limb Techniques of suspension therapy for lower limb

3. **Functional Re-education** 7 hours

   a) Lying to sitting: Activities on the Mat/Bed, Movement and stability at floor level; Sitting activities and gait; Lower limb and Upper limb activities.

4. **Aerobic Exercise** 5 hours

   a) Definition and key terms; Physiological response to aerobic exercise, Examination and evaluation of aerobic capacity – Exercise Testing, Determinants of an Exercise Program, The Exercise Program, Normal and abnormal response to acute aerobic exercise, Physiological changes that occur with training, Application of Principles of an Aerobic conditioning program for patients – types and phases of aerobic training.

5. **Stretching** 10 hours

a) Definition of terms related to stretching; Tissue response towards immobilization and elongation, Determinants of stretching exercise, Effects of stretching, Inhibition and relaxation procedures, Precautions and contraindications of stretching, Techniques of stretching.

6. **Manual Therapy & Peripheral Joint Mobilization** 10 hours

a) Schools of Manual Therapy, Principles, Grades, Indications and Contraindications,
b) Effects and Uses – Maitland, Kaltenborn, Mulligan
c) Biomechanical basis for mobilization, Effects of joint mobilization, Indications and contraindications, Grades of mobilization, Principles of mobilization, Techniques of mobilization for upper limb, lower limb,Precautions.

7. **Balance** 8 hours

a) Definition
b) Physiology of balance: contributions of sensory systems, processing sensory information, generating motoroutput
c) Components of balance (sensory, musculoskeletal, biomechanical)
d) Causes of impaired balance, Examination & evaluation of impaired balance, Activities for treating impaired balance: mode, posture, movement, Precautions & contraindications, Types of Balance retraining.

8. **Co-ordination Exercise** 8 hours

a) Anatomy & Physiology of cerebellum with its pathways
b) Definitions: Co-ordination, Inco-ordination, Causes for inco-ordination
c) Test for co-ordination: equilibrium test, non-equilibrium test Principles of co-ordination exercise.
d) Frenkel's Exercise: uses of Frenkel's exercise, technique of Frenkel's exercise, progression, home exercise.

9. **Posture** 6 hours

a) Definition, Active and Inactive Postures, Postural Mechanism, Patterns of Posture, Principles of re-education: corrective methods and techniques, Patient education.

10. **Walking Aids** 4 hours

a) Types: Crutches, Canes, Frames; Principles and training with walking aids

11. **Basics in Manual Therapy & Applications with Clinical reasoning** 12 hours

a) Examination of joint integrity
b) Contractile tissues
c) Non contractile tissues

d) Mobility - assessment of accessory movement & End feel
e) Assessment of articular & extra-articular soft tissue status
f) Myofascia lassessment
g) Acute & Chronic muscle hold
h) Tightness
i) Pain-original & referred
j) Basic principles, Indications & Contra-Indications of mobilization skills for joints & soft tissues.
k) Maitland
l) Mulligan
m) Mckenzie
n) Muscle Energy Technique
o) Myofascial stretching
p) Cyriax
q) Neuro Dynamic Testing

12. **Hydrotherapy** 4 hours

a) Definitions, Goals and Indications, Precautions and Contraindications, Properties of water, Use of special equipment, techniques, Effects and uses, merits and demerits

13. **Individual and Group Exercises** 4 hours

a) Advantages and Disadvantages, Organization of Group exercises, Recreational Activities and Sports

SUGGESTED READINGS (TEXT BOOKS & REFERENCE BOOKS):

1. Practice exercise therapy- Hollis- Blackwell Scientific Publication
2. Therapeutic Exercises- Basmajjan- Williams and Wilkins.
3. Therapeutic Exercises Foundations and Techniques –Kisner and Colby –F.A. Davis.
4. Proprioceptive Neuromuscular Facilitation –Voss et. al –Williams and Wilkins.
5. Principle of exercise of therapy – Gardiner –C.B.S. Delhi
6. Beard's Massage –Wood- W.B. Saunders.
7. Motor control theory and practical application Shumway –Cook & Wallcott. - Lippincott.
8. Hydrotherapy, principle and practice- Campion – Butterworth Heinmann.
9. Muscle testing and functions – Kendall- Williams & Wiikins.
10. Deniels and Worthingham's- Muscle testing- Hislop & Montgomery –W.B. Saunders.
11. Measurement of joint motion: A guide to Goniometry- Norkins & White- F.A. Davis.

Bachelor of Physiotherapy

Semester IV

Title of the Course – EXERCISE THERAPY PRACTICAL – II

Paper Code – B – 402	University Marks: 70
Course Description - Core Practical	Internal Marks: 30
Credit per Semester - 3 credits	Max. Marks: 100
Hours per Semester - 90 hours	Min. Marks: 50

COURSE OBJECTIVES- After the course on exercise therapy student will be able to understand the different types of exercise for the benefit of patient in different situations and conditions both in health and disease or disorder.

Course Learning Outcomes: At the end of this course candidate able to:

1. Demonstrate PNF techniques.
2. Demonstrate Suspension therapy
3. Demonstrate mobilization of peripheral joints.
4. Demonstrate balance and coordination exercises.
5. Demonstrate usage of walking aids.
6. Demonstrate various techniques of stretching.

Topics to be covered:

The students of exercise therapy are to be trained in Practical Laboratory work for all the topics discussed in theory. The student must be able to evaluate and apply judiciously the different methods of exercise therapy techniques on the patients. They must be able to-

a)	Demonstrate the PNF techniques	10 hours
b)	Demonstrate exercises for training co-ordination – Frenkel's exercise	10 hours
c)	Demonstrate techniques for functional re-education	10 hours
d)	Assess and train for using walking aids	8 hours
e)	Demonstrate mobilization of individual joint regions	10 hours
f)	Demonstrate to use the technique of suspension therapy for mobilizing and strengthening joints and muscles	8 hours
g)	Demonstrate the techniques for muscle stretching	8 hours
h)	Assess and evaluate posture andgait	8 hours
i)	Demonstrate techniques of strengthening muscles using resisted exercise	10 hours
j)	Demonstrate techniques for measuring limb length and body circumference.	8 hours

Bachelor of Physiotherapy

Semester VII

Title of the Course –Physiotherapy in Neurological Disorders

Theory paper Code – B – 701	University Marks: 70
Course Description - Core Theory	Internal Marks: 30
Credit per Semester - 4 credits	Max. Marks: 100
Hours per Semester - 75 hours	Min. Marks: 50

Instructions for Paper Setter:

Paper Setter should follow the below mentioned question paper pattern for setting the question paper for three hours duration. The question paper will be strictly from the prescribed syllabus / scheme. It shall be ensured that no question should be asked out of the syllabus. The question paper must be fairly distributed (as per the NOTE provided below) over the whole course of study and not concentrated on any one or few portions. Every section of the question paper must contain the questions from all the units of the syllabus. Repetition of a question must be avoided.

S. No.	Section	Type of Questions	No. of Questions to be attempted	Marks per Question	Total Marks for that section
1.	Section A	Long Answer Type Questions	2 out of 3	15 x 2	30
2.	Section B	Short Answer Type Questions	4 out of 5	4 x 5	20
3.	Section C	Very Short Answer Type Questions	10 out of 12	2 x 10	20
Total Marks = 70					

Instructions for Candidate: Candidate is instructed to attempt the question paper in the above given pattern in three sections. Attempt all questions as indicated.

COURSE OBJECTIVES: -The subject serves to integrate the knowledge gained by the students in neurology and neurosurgery with skills to apply these in clinical situations of dysfunction and neurological pathology. The objective of the course is that after the specified hours of lectures and demonstrations the student will be able to identify disabilities due to neurological dysfunction, plan and set treatment goals and

apply the skills gained in exercise therapy and electrotherapy in these clinical situations to restore neurological function

Course Learning Outcomes: The student will be able to

1. Describe the assessment and physiotherapy management for neurology and neurosurgery
2. To identify disabilities due to neurological dysfunction, plan and set treatment goals
3. To apply the skills gained in exercise therapy and electrotherapy in these clinical situations to restore neurological function
4. Identify & analyze Neuro-motor & psychosomatic dysfunction
5. Implement the Advice & parents education in Neuro-pediatric care
6. Be able to prescribe appropriate Orthosis/splints & will be able to fabricate temporary protective & functional splints

Topics to be covered:

1. **Neurological Assessment:** 15 Hours

Required materials for examination, Chief complaints, History taking – Present, Past, medical, familial, personal histories, Observation, Palpation, Higher mental function – Consciousness, Orientation, Wakefulness, memory, Speech, Reading, Language, Writing, Calculations, Perception, Left right confusion, Reasoning, and Judgment, Motor Examination – Muscle power, Muscle tone, Spasticity, Flaccidity, Reflexes – Developmental reflexes, deep tendon reflexes, Superficial reflexes, Sensory examination – Superficial, Deep and Cortical sensations, Special tests – Romberg's, Kernig's sign, Brudenzki sign, Tinels's sign, Slum test, Lehermitte's sign, Bells Phenomenon, Gower's sign, Sun set sign, Battle's sign, Glabellar tap sign, etc, Balance examination, coordination examination, Gait analysis – Kinetics & Kinematics (Quantitative & Qualitative analysis), Functional Analysis, Assessment tools & Scales – Modified Ashworth scale, Berg balance scale, Functional Independence measure (FIM), Barthel index, Glasgow coma scale, Mini mental state examination, Rancho Los Amigos Scale for Head injury, APGAR score, ASIA scale, Reflex Grading. Differential diagnosis

2. **Neuro physiological Techniques:** 10 Hours

Concepts, Principles, Techniques, Effects of following Neurophysiological techniques: Neuro Development Technique (NDT), Proprioceptive Neuromuscular facilitation (PNF), Vojta therapy, Rood's Sensory motor Approach, Sensory Integration Approach, Brunnstorm movement therapy, Motor relearning program, Contemporary task oriented approach, Muscle re-education approach and Constraint induced movement therapy

3. **Paediatric Neurology:** 9 Hours

Paediatric Examination, Developmental milestones, developmental reflexes, Neuro developmental screening tests. Evaluation & Management - History, Observation, Palpation, Milestone Examination, developmental reflex Examination, Higher mental function, Cranial nerve examination, Motor & Sensory examination, Reflex testing, differential Diagnosis, Balance & Coordination examination, Gait analysis, Functional analysis, List of Problems & Complications, short & Long Term goals, Management of systemic complications, Management of Mechanical Complications, Use of various Neurophysiological approaches & Modalities in Risk babies, Minimum brain damage, Developmental disorders, Cerebral palsy, Autism, Down's Syndrome, Hydrocephalus, Chorea, Spina bifida, and Syringomyelia

4. **Evaluation and Management of Brain and Spinal Cord Disorders:** 10 Hours

History, Observation, Palpation, Higher mental function, Cranial nerve examination, Motor & Sensory examination, Reflex testing, differential Diagnosis, Balance & Coordination examination, Gait analysis, Functional analysis, List of Problems & Complications, short & Long Term goals, Management of systemic complications, Management of Mechanical Complications, Use of various Neurophysiological approaches& Modalities in Cerebro vascular Accident, Meningitis, Encephalitis, Head Injury, Brain Tumors, Perceptual disorders, Amyotrophic lateral sclerosis, and Multiple sclerosis

5. **Evaluation and Management of Cerebellar, Spinal Cord and Muscle Disorders**: 9 Hours

History, Observation, Palpation, Motor & Sensory examination, Reflex testing, differential Diagnosis, Balance & Coordination examination, Gait analysis, Functional analysis, List of Problems & Complications, short & Long Term goals, Management of systemic complications, Management of Mechanical Complications, Use of various

Neurophysiological approaches& Modalities in Ataxia, Sensory Ataxia, Parkinson's disease, Duchhene Muscular dystrophy (DMD), Myasthenia Gravis, Eaton-Lambert Syndrome, Spinal tumors, Spinal cord injury, Transverse myelitis, Bladder & Bowel Dysfunction, Spinal muscular atrophies, Poliomyelitis, Post-Polio Syndrome

6. **Evaluation and Management of Peripheral Nerve Injuries and Disorders:** 9 Hours

History, Observation, Palpation, Motor & Sensory examination, Reflex testing, differential Diagnosis, Balance & Coordination examination, Gait analysis, Functional analysis, List of Problems & Complications, short & Long Term goals, Management of systemic complications, Management of Mechanical Complications, Use of various Neurophysiological approaches & Modalities in Hereditary motor sensory neuropathy, Guillain-Barre syndrome, Brachial plexus palsy, Thoracic outlet syndrome, Lumbosacral plexus lesions, Phrenic & intercostals nerve lesions, Median nerve palsy, Ulnar nerve palsy, Radial nerve palsy, Musculocutaneous nerve palsy, Anterior & Posterior interosseous nerve palsy, Axillary nerve palsy, Long thoracic nerve palsy, Suprascapular nerve palsy, sciatic nerve palsy, Tibial nerve palsy, Common peroneal nerve palsy, Femoral nerve palsy, Obturator nerve palsy, and Pudendal nerve palsy

7. **Assessment and management of Neurological gaits:** 5 Hours

Quantitative and Qualitative (Kinetic & Kinematics) analysis, List of Problems, short & Long Term goals, Management of following Neurological Gaits - Hemiplegic gait, Parkinson gait, High step gait, Hyperkinetic gait, Hypokinetic gait, Waddling gait, Scissoring gait, Spastic gait, Choreaform Gait, Diplegic Gait, and Myopathic Gait

8. **Pre and post-surgical assessment and treatment following conditions:** 8 Hours

Spinal disc herniation, Spinal stenosis, Spinal cord trauma, Head trauma, Brain tumors, Tumors of the spine, Spinal cord and peripheral nerves, Cerebral aneurysms, Subarachnoid hemorrhages, epilepsy, Parkinson's disease, Chorea, Hemiballism, Psychiatric disorders, Malformations of the nervous system, Carotid artery stenosis, Arteriovenous malformations, and Spina bifida

SUGGESTED READINGS (TEXT BOOKS & REFERENCE BOOKS):

1. Cash's textbook of neurology for physiotherapists – Downie – J.P. Brothers.
2. Adult Hemiplegia – Evaluation & treatment – Bobath – Oxford Butterworth Heinman
3. Neurological Rehabilitation – Carr & Shepherd – Butterworth Heinman