Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

CURRICULUM STRUCTURE

Sem-I.

Code	Course Title	Hours per week			Credits
		L	T	P	
MITAI-101	Program Core I- Mathematics for Computer Science	3	0	0	3
MITAI -102	Program Core II- Advanced Data Structures and Algorithms	3	0	0	3
MITAI – 103	Program Core III- Pattern Recognition	3	0	0	3
MITAI - 104	Program Core IV- Artificial Intelligence	3	0	0	3
MITAI -105	Research Methodology and IPR	2	0	0	2
MITAI - 106A/106B/106C	Elective I (Cloud Computing / Machine Learning / / Big Data Analytics)	3	0	0	3
MITAI -192	Laboratory 1 (Advanced Data Structures and Algorithms)	0	0	4	2
MITAI - 194	Laboratory 2 (Pattern Recognition)	0	0	4	2
MITAI- 196A/196B/196C	Laboratory 3 (Based on Elective I)	0	0	4	2
Total Credits: 23					

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Sem- II

Code	Course Title	Hours per week			Credits
		L	T	P	
MITAI -201	Program Core V Artificial Neural Network	3	0	0	3
MITAI -202	Program Core VI – Image Processing	3	0	0	3
MITAI – 203	Program Core VII – Natural Language Processing	3	0	0	3
MITAI - 204A/204B/204C	Program Elective II- Soft Computing / Advanced Data Mining/Information Retrieval	3	0	0	3
MITAI - 205A/B/C	Audit Course-2	2	0	0	0
MITAI-291	Laboratory 1 (Artificial Neural Network)	0	0	4	2
MITAI -292	Laboratory 2(Image Processing)	0	0	4	2
MITAI – 293	Laboratory 3(Natural Language Processing)	0	0	4	2
MITAI -294	Term Paper with Seminar	0	0	4	2
Total Credits: 20					

***Students be encouraged to go to Industrial Training/Internship for at least 2-3 months during semester break.**

Sem* III

Code	Course Title	Hours per week			Credits
		L	T	P	
MITAI – 301A/B/C/D	Program Elective III – Computer Vision & Robotics/Deep Learning/Distributed System/IOT/	3	0	0	03

MITAI -302	**Open Elective** A. Business Analytics B. Project Management & Entrepreneurship C. Industrial Safety D. Operations Research E. Cost Management of Engineering Projects F. Composite Materials G. Waste to Energy	3	0	0	03
MITAI -381	Dissertation-I /Industrial Project	0	0	20	10
Total Credits: 16					

***Students going for Industrial Project/Thesis will complete these courses through MOOCs.**

Sem-IV

	Course Title	**Hours per week**			**Credits**
		L	T	P	
MITAI - 481	Dissertation II	0	0	32	16
Total Credits: 16					

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Name of the Course: M.Sc in Artificial Intelligence **Subject:** Mathematics of Computer Science	
Course Code: MITAI-101	**Semester: I**
Duration: 36 Hours	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory:**3**	End Semester Exam:**70**
Tutorial:**0**	Attendance: **5**
Practical:**0**	Continuous Assessment:**25**
Credit: **3**	Practical Sessional internal continuous evaluation:**NA**
	Practical Sessional external examination:**NA**

Aim:	
Sl. No.	
1	To determine multiplicative inverses, modulo n and use to solve linear congruencesgraph theory.
2	To solve different engineering problems using counting techniques.

Objective:	
Sl. No.	
1	To express a given logic sentence in terms of predicates, quantifiers, and logical connectives and derive the solution for a given a problem using deductive logic andprove the solution based on logical inference.
2	To classify the algebraic structure for a given mathematical problem and evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.
3	To accrue basic knowledge in probability and statistics
4	

Pre-Requisite:	
Sl. No.	
1	Knowledge of basic mathematics.

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Theory of Numbers: Principles of Mathematical Induction, Well Ordering Principle, Divisibility theory and properties of divisibility; Fundamental theorem of Arithmetic; Euclidean Algorithm for finding G.C.D and some basic properties of G.C.D with simple examples; Congruence, Residue classes of integer modulo n (Zn) and its examples, Chinese Remainder Theorem.	**4**	**10**

02	Counting Techniques: Pigeon- hole Principle, Principles of inclusion and exclusions; Recurrence relations: Formulation & Modelling of different counting problems in terms of recurrencerelations, Solution of linear recurrence relations with constant coefficients (upto second order) by (i) The iterative method (ii)Characteristic roots method (iii) Generating functions method.	**4**	**10**
03	Propositional Logic: Syntax, Semantics, Validity and Satisfiability,Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use ofQuantifiers. Proof Techniques: Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.	**4**	**10**
04	**Probability**: Random experiment, outcome, trial and event, Exhaustive events, favourable events, Independent events, sample space, definition of probability, addition theorem of probability, conditional probability, independent events, Mutually and pair wise independent events, multiplication theorem of probability for	**6**	**10**

	independent events, Baye's theorem.		
05	**Random Variable (Univariate):** Random Variable, Distribution function, discrete random variable, Probability mass function, Distribution function of discrete random variable, Continuous random variable, Probability density function. Distribution function of continuous random variable. Two dimensional probability mass function, Marginal probability function, conditional probability function, Two dimensional distribution function, marginal distribution function, Joint density function, marginal density function.	**6**	**10**
06	Basic understanding of Moments: Raw and central moments. Relation between moments: raw moments & central moments, Effect of change of origin and scale on moments, Pearsonian coefficients Measures of skewness, kurtosis. Standard Distribution: Binomial, Poisson, Negative Binomial Distribution, Normal Distribution and their properties. Correlation & Regression: Explain the meaning of correlation and regression, measure the coefficients of correlation and regression, and define and measure coefficient of determination. Index Numbers: Learn about the need of index numbers, explain the different methods of constructing index numbers, evaluate the tests for judging the soundness of an index number.	**6**	**10**
07	**Sampling Theory:** Sampling Theory, Random Samples and random Numbers, Sampling with and without replacement, sampling distributions, sampling distribution of means, sampling distribution of properties, sampling distribution of differences and sum, standard errors, software demonstration of elementary sampling Theory.	**6**	**10**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
C L Liu and D P Mohapatra	Elements of Discrete Mathematics A Computer Oriented Approach		3rd Edition by, Tata McGraw – Hill.
N. Chandrasekaran and M. Umaparvathi	Discrete Mathematics, PHI.		
J S Milton and J C Arnold.K. Sharma	Introduction to Probability and Statistics		
Vijay K Rohatgi and A K Md Ehsanes Saleh	An Introduction to Probability and Statistics		

Reference Books

Kenneth H. Rosen	Discrete Mathematics and its Applications		Tata McGraw – Hill
Susanna S. Epp	Discrete Mathematics with Applications		4th edition, Wadsworth Publishing Co. Inc.
Douglas Brent West	Introduction to Graph Theory		Prentice Hall
Clark John, Holton Derek Allan	A First Look at Graph Theory		World Scientific
P.K.Maji et. al. – Compu.	Soft Set Theory		Math. Appl. 45(2003) 555-562

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to	Total	No of question to	To answer	Marks per	Total

		be set	Marks	be set		question	Marks
A	**1,2,3,4,5,6**	**10**	**10**				
B	**1,2,3,4,5,6**			**5**	**3**	**5**	**60**
C	**1,2,3,4,5,6**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Name of the Course: M.Sc in Artificial Intelligence

Subject: Advanced Data Structures and Algorithms

Course Code: MITAI-102& MITAI-192	**Semester: I**
Duration: 36 Hours	**Maximum Marks: 100+100**
Teaching Scheme	**Examination Scheme**
Theory:**3**	End Semester Exam:**70**
Tutorial:**0**	Attendance: **5**
Practical:**4**	Continuous Assessment:**25**
Credit: **3+2**	Practical Sessional internal continuous evaluation:**40**

	Practical Sessional external examination:**60**		
Aim:			
Sl. No.			
1	To understand the data structures, their advantages and drawbacks, how to implement them in programming language, how their drawbacks can be overcome and what the applications are and where they can be used.		
Objective:			
Sl. No.			
1	To learn about the data structures/ methods/algorithms mentioned in the course with a comparative perspective .		
2	To make use of the most appropriate data structure/ method/algorithm in a program		
3	To enhance the efficiency (i.e. reduce the run-time) or for better memory utilization		
4	To understand at least the efficiency aspects of the graph and sorting algorithms covered in this course.		
5	To convert an inefficient program into an efficient one using the knowledge gathered from this course.		
Pre-Requisite:			
Sl. No.			
1	Basic Computation and Principles of C		
2	Mathematics		
3	basics of set theory		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Module -I. [8L] Linear Data Structure Introduction (2L): Why we need data structure? Concepts of data structures: a) Data and data structure b) Abstract Data Type and Data Type. Algorithms and programs, basic idea of pseudo-code. Algorithm efficiency and analysis, time and space analysis of algorithms – order notations. Array (2L): Different representations – row major, column major. Sparse matrix - its implementation and usage. Array representation of polynomials. Linked List (4L): Singly linked list, circular linked list, doubly linked list, linked list representation of polynomial and	**8**	**5**

	applications.		
02	Module -II: [7L] Linear Data Structure [Stack and Queue (5L): Stack and its implementations (using array, using linked list), applications. Queue, circular queue, dequeue. Implementation of queue- both linear and circular (using array, using linked list), applications. Recursion (2L): Principles of recursion – use of stack, differences between recursion and iteration, tail recursion. Applications - The Tower of Hanoi, Eight Queens Puzzle.	**7**	**20**
03	Module -III. [11L] Nonlinear Data structures Trees (7L): Basic terminologies, forest, tree representation (using array, using linked list). Binary trees - binary tree traversal (pre-, in-, post- order), threaded binary tree (left, right, full) - non-recursive traversal algorithms using threaded binary tree, expression tree. Binary search tree- operations (creation, insertion, deletion, searching). Height balanced binary tree – AVL tree (insertion, deletion with examples only). B- Trees – operations (insertion, deletion with examples only). Graphs (4L): Graph definitions and concepts (directed/undirected graph, weighted/un-weighted edges, sub-graph, degree, cutvertex/articulation point, pendant node, clique, complete graph, connected components – strongly connected component, weakly connected component, path, shortest path, isomorphism). Graph representations/storage implementations – adjacency matrix, adjacency list, adjacency multi-list. Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) – concepts of edges used in DFS and BFS (tree-edge, back-edge, cross-edge, forward-edge), applications. Minimal spanning tree – Prim's algorithm (basic idea of greedy methods).	**11**	**25**
04	Module - IV. Searching, Sorting (10L): Sorting Algorithms (5L): Bubble sort and its optimizations, insertion sort, shell sort, selection sort, merge sort, quick sort, heap sort (concept of max heap, application – priority queue), radix sort. Searching (2L): Sequential search, binary search, interpolation search. Hashing (3L): Hashing functions, collision resolution techniques.	**10**	**20**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:

List of Practical:

- Implementation of array operations:
- Stacks and Queues: adding, deleting elements Circular Queue: Adding & deleting elements Merging Problem :
- Evaluation of expressions operations on Multiple stacks & queues :
- Implementation of linked lists: inserting, deleting, inverting a linked list. Implementation of stacks & queues using linked lists:
- Polynomial addition, Polynomial multiplication
- Sparse Matrices : Multiplication, addition.
- Recursive and Nonrecursive traversal of Trees
- Threaded binary tree traversal. AVL tree implementation
- Application of Trees. Application of sorting and searching algorithms
- Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.

List of Books

Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
2/E by Robert L. Kruse, Bruce P. Leung.	"Data Structures And Program Design In C"		
Ellis Horowitz, Sartaj Sahni, Susan Anderson-freed.	"Fundamentals of Data Structures of C"		
Aaron M. Tenenbaum.	"Data Structures in C"		
Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein.	"Introduction to Algorithms"		
Reference Books			
S. Lipschutz.	"Data Structures"		
Reema Thareja	"Data Structures Using C"		
2/e by A.K. Rath, A. K. Jagadev	"Data Structure Using C"		
List of equipment/apparatus for laboratory experiments:			

Sl. No.	
1.	Computer

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1,2,3,4**	**10**	**10**				
B	**1,2,3,4**			**5**	**3**	**5**	**60**
C	**1,2,3,4**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-			
Signed Lab Note Book		**10**	
On Spot Experiment(one for each group consisting 5 students)		**40**	
Viva voce		**10**	**60**

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Name of the Course: M.Sc. in Information Technology (Artificial Intelligence) **Subject:** Pattern Recognition and Pattern Recognition Lab			
Course Code: MITAI – 103, MITAI – 193			
Duration:36 Hrs.		**Semester:1st**	
Teaching Scheme		**Maximum Marks:200**	
Theory:3		**Examination Scheme**	
Tutorial:0		End Semester Exam:70	
Practical:4		Attendance : 5	
Credit:3+2		Continuous Assessment: 25	
		Practical Sessional internal continuous evaluation:40	
		Practical Sessional external examination:60	
Aim:			
Sl. No.			
1.	Ability to Understand and apply both supervised and unsupervised classification methods to detect and characterize patterns in real-world data		
Objective:			
Sl. No.			
1.	Understand the concept of a pattern and the basic approach to the development of pattern recognition and machine intelligence algorithms		
2.	Understand the basic methods of feature extraction, feature evaluation, and data mining.		
Pre-Requisite:			
Sl. No.			
1.	Fundamentals of Programming		
2.	**Mathematics**		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Unit 1:** Introduction to pattern recognition : Basic concepts- Definitions, data sets for Pattern Recognition, Structure of a typical pattern recognition system. Different Paradigms of Pattern Recognition. Representations of Patterns and Classes. Metric and non-metric proximity measures.	6	14
02	Unit 2: Features selection Feature vectors - Feature spaces - Different approaches to Feature Selection-Branch and Bound Schemes. Sequential Feature Selection.	6	14
03	Unit 3: Features extraction Principal Component Analysis (PCA), Kernel PCA	6	14
04	Unit 4: Pattern classification Pattern classification using Statistical classifiers - Bayes' classifier - Classification performance measures – Risk and error probabilities. Linear Discriminant Function, Mahalanobis Distance, K-NN Classifier, Fisher's LDA, Single Layer Perceptron, Multi-layer Perceptron, Training	12	14

	set, test set; standardization and normalization		
04	Unit 5: Clustering Basics of Clustering; similarity / dissimilarity measures; clustering criteria. Different distance functions and similarity measures. K-means algorithm, K-medoids, DBSCAN	6	14
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:
Assignments (based on theory classes):
List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Sheldon M Ross	Introduction to Probability and Statistics for Engineers and Scientists		Elsevier Academic Press
B. Lubanovic	Introducing Python		O'Reilly
Reference Books:			
Murray R. Spiegel, Larry J. Stephens	Schaum's Outlines on Statistics		McGraw-Hill
Eric Matthes	Python Crash Course		No Starch Press
Ivan Idris	Numpy Beginner's Guide		Packt Publishing

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	**70**
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Examination Scheme for Practical Sessional examination:			
Practical Internal Sessional Continuous Evaluation			
Internal Examination:			
Continuous evaluation			**40**
External Examination: Examiner-			
Signed Lab Assignments		**10**	
On Spot Experiment		**40**	
Viva voce		**10**	**60**

Name of the Course: M.Sc in Information Technology (AI) **Subject: Artificial Intelligence**			
Course Code: MITAI - 104		**Semester: 1st**	
Duration:36 Hrs.			
Teaching Scheme		**Maximum Marks:100**	
Theory:3		**Examination Scheme**	
Tutorial:0		**End Semester Exam**:70	
Practical:4		Attendance : 5	
Credit:3+2		Continuous Assessment: 25	
Aim:			
Sl. No.			
1.	In-depth understanding of Python for Data Science.		
2.	Ability to read, understand and write code in Jupyter Notebook		
3.	Skill to write program code in Python to solve real world problems.		
Objective:			
Sl. No.			
1.	Programmatically download and analyze data		
2.	Gain insight into the 'Roles' played by a Data Analyst and Data Scientist		
3.	Using jupyter notebooks, master the art of writing code in python		
4.	Understand the intuition behind Artificial Neural Networks		
Pre-Requisite:			
Sl. No.			
1.	High school mathematics level		
2.	Some knowledge of programming will be plus		

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Introduction : Overview of Artificial intelligence- Problems of AI, AI technique, Tic - Tac - Toe problem.	5	4
02	Intelligent Agents : Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents. Problems, Problem Space & search: Defining the problem as	8	12

	state space search, production system, problem characteristics, issues in the design of search programs		
03	Search techniques [5] Solving problems by searching :problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search comparing uniform search strategies. Greedy best-first search, A* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search, genetic algorithms; constraint satisfaction problems, local search for constraint satisfaction problems. Games optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.,	7	20
04	Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledge representation. Representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction.	7	14
05	Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Fuzzy sets & fuzzy logics Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques. Introduction, Syntactic processing, semantic analysis, discourse & pragmatic processing. Forms of learning, inductive learning, learning decision trees, explanation based learning, learning using relevance information, neural net learning & genetic learning. Representing and using domain knowledge, expert system shells, knowledge acquisition.	9	20
	Sub Total:	36	70
	Internal Assessment Examination & Preparation of Semester Examination	4	30
	Total:	40	100

Practical:

Skills to be developed:

- Fundamental concepts of Artificial Intelligence
- Be able to identify the positive and the negative impact that AI will create
- Clearly define what is AI, Machine Learning and Deep Learning
- Learn how to code in Jupiter Notebooks and install packages in python
- Start coding in python and learn how to use it for Data analysis
- Understand the intuition behind Artificial Neural Networks

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Ritch & Knight	Artificial Intelligence		TMH
Stuart Russel Peter Norvig	Artificial Intelligence A Modern Approach,		Pearson
Reference Books:			
List of equipment/apparatus for laboratory experiments:			
Sl. No.			
1.	Computer		
2.	Software: Python		
3.			
4.			
5.			

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	15	
C	ALL			5	3	45	70

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Name of the Course: M.Sc. in Information Technology (Artificial Intelligence)
Subject:Research Methodology and IPR

Course Code: MITAI -105	**Semester: 1st**
Duration: 36 hours	**Maximum Marks:100**
Teaching Scheme	**Examination Scheme**
Theory:2	End Semester Exam:70
Tutorial:0	End Semester Exam:70
Practical:0	Attendance : 5
Credit: 2	Continuous Assessment: 25

Aim:

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Sl. No.	
1.	Understand research problem formulation.
2.	Analyze research related information
3.	Follow research ethics

Objective:	
Sl. No.	
1.	Understand research problem formulation.
2.	Analyze research related information
3.	Follow research ethics
4.	Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
5.	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasise the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
6.	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

Pre-Requisite:	
Sl. No.	
3.	
4.	

Contents		Hrs./week	
Chapter	Name of the Topic	Hours	Marks
01	Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.	6	14
02	Effective literature studies approaches, analysis Plagiarism, Research ethics	6	10
03	Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.	6	14
04	Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.	6	14
05	Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical	6	14

	Indications.		
06	**New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.**	**6**	**4**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:
Skills to be developed:
List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)
Based on theory
Assignments: Based on theory

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:

1. StuartMelvilleandWayneGoddard,	**"Researchmethodology: an introduction for science & engineering students'"**		
WayneGoddardandStuartMelville,	**"ResearchMethodology: An Introduction"**		
Ranjit Kumar,	**"Research Methodology: A Step by Step Guide for beginners"**	**2nd Edition,**	
T. Ramappa, S. Chand,	**"Intellectual Property Rights Under WTO",**	**2008**	
Robert P. Merges, Peter S. Menell, Mark A. Lemley,	**" Intellectual Property in New Technological Age",**	**2016.**	
Asimov,	**"Introduction to Design", Prentice Hall,**	**1962.**	
Mayall,	**"Industrial Design",**		**McGraw Hill, 1992.**
Halbert,	**"Resisting Intellectual Property",**		**Taylor & Francis Ltd ,2007.**
Niebel,	**"Product Design",**		**McGraw Hill, 1974.**

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1	
2	
3	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions**	**Subjective Questions**

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

		(MCQ only with the correct answer)					
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**All**	**10**	**10**	**5**	**3**	**15**	**70**
B	**All**			**5**	**3**	**45**	
C	**All**						

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Name of the Course: M.Sc. in Information Technology (Artificial Intelligence) **Subject: Cloud Computing and Cloud Computing Lab**	
Course Code: MITAI - 106A**,** MITAI - 196A	**Semester: 1st**
Duration: 36 Hours	**Maximum Marks:200**
Teaching Scheme	**Examination Scheme**
Theory:03	**End Semester Exam**:70
Tutorial:0	Attendance : 5
Practical:4	Continuous Assessment: 25
Credit: 3+2	Practical Sessional internal continuous evaluation:40
	Practical Sessional external examination:60

Aim:	
Sl. No.	
1.	**Identify security aspects of each cloud model**
2.	**Develop a risk-management strategy for moving to the Cloud**
3.	**Implement a public cloud instance using a public cloud service provider**
4.	**Apply trust-based security model to different layer**
Objective:	
Sl. No.	
1.	**The student will also learn how to apply trust-based security model to real-world security problems.**
2.	**An overview of the concepts, processes, and best practices needed to successfully secure information within Cloud infrastructures.**
3.	**Students will learn the basic Cloud types and delivery models and develop an understanding of the risk and compliance responsibilities and Challenges for each Cloud type and service delivery model.**
Pre-Requisite:	
Sl. No.	
1.	**Networking**
2.	**Distributed Computing**

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction to Cloud Computing** **Online Social Networks and Applications, Cloud introduction and overview, Different clouds, Risks, Novel applications of cloud computing**	**4**	**10**
02	**Cloud Computing Architecture** **Requirements, Introduction Cloud computing architecture, On Demand Computing Virtualization at the infrastructure level, Security in Cloud computing environments, CPU Virtualization, A discussion on Hypervisors Storage Virtualization Cloud Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software Model, The Cloud Services Delivery Model** **Cloud Deployment Models** **Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to Cloud Computing Adoption in the Enterprise**	**11**	**14**
03	**Security Issues in Cloud Computing** **Infrastructure Security, Infrastructure Security: The Network Level, The Host Level, The Application Level, Data Security and Storage, Aspects of Data Security, Data Security Mitigation Provider Data and Its Security** **Identity and Access Management** **Trust Boundaries and IAM, IAM Challenges, Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management**	**4**	**14**
04	**Security Management in the Cloud** **Security Management Standards, Security Management in the Cloud, Availability Management: SaaS, PaaS, IaaS** **Privacy Issues** **Privacy Issues, Data Life Cycle, Key Privacy Concerns in the Cloud, Protecting Privacy, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, U.S. Laws and Regulations, International Laws and Regulations**	**8**	**14**
05	**Audit and Compliance** **Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Regulatory/External Compliance, Cloud Security Alliance, Auditing the Cloud for Compliance, Security-as-a-Cloud**	**5**	**14**
06	**ADVANCED TOPICS** **Recent developments in hybrid cloud and cloud security.**	**4**	**4**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:
Skills to be developed:
List of Practical:
Based on theory

Assignments: Based on theory

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

List of Books **Text Books:**			
Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Reference Books:			
1. John Rhoton,	**Cloud Computing Explained: Implementation Handbook for Enterprises,**	**Publication Date: November 2, 2009**	
2. Tim Mather,	**Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance (Theory in Practice),**	**ISBN-10: 0596802765,September 2009**	**O'Reilly Media,**

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
1.	**Computer**
2.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**ALL**	**10**	**10**		**3**		**70**
B	**ALL**			**5**		**15**	
C	**ALL**			**5**	**3**	**45**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:
Practical Internal Sessional Continuous Evaluation
Internal Examination:

Continuous evaluation			**40**
External Examination: Examiner-			
Signed Lab Assignments		**10**	
On Spot Experiment		**40**	
Viva voce		**10**	**60**

Name of the Course: M.Sc. in Information Technology (Artificial Intelligence) **Subject: Machine learning and Machine learning Lab**			
Course Code: MITAI – 106B, MITAI – 196B		**Semester: 1st**	
Duration:36 hours		**Maximum Marks:200**	
Teaching Scheme		**Examination Scheme**	
Theory:3		End Semester Exam:70	
Tutorial:0		End Semester Exam:70	
Practical:4		Attendance : 5	
Credit:3+2		Continuous Assessment: 25	
		Practical Sessional internal continuous evaluation:40	
		Practical Sessional external examination:60	
Aim:			
Sl. No.			
1.	**Extract features that can be used for a particular machine learning approach in various AI applications.**		
2.	**To compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.**		
3.	**To mathematically analyse various machine learning approaches and paradigms.**		
Objective:			
Sl. No.			
1.	**To learn the concept of how to learn patterns and concepts from data without being explicitly programmed in various nodes.**		
2.	**To design and analyse various machine learning algorithms and techniques with a modern outlook focusing on recent advances.**		
3.	**Explore supervised and unsupervised learning paradigms of machine learning.**		
4.	**To explore Deep learning technique and various feature extraction strategies.**		
Pre-Requisite:			
Sl. No.			
1.	**Algorithm and Data Structure**		
2.			
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Unit 1:** **Supervised Learning (Regression/Classification)** ● **Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Nave Bayes** ● **Linear models: Linear Regression, Logistic Regression,**	**9**	**10**

	Generalized Linear Models ● **Support Vector Machines, Nonlinearity and Kernel Methods** ● **Beyond Binary Classification: Multi-class/Structured Outputs, Ranking**		
02	**Unsupervised Learning** ● **Clustering: K-means/Kernel K-means** ● **Dimensionality Reduction: PCA and kernel PCA** ● **Matrix Factorization and Matrix Completion** ● **Generative Models (mixture models and latent factor models)**	**8**	**14**
03	**Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)**	**6**	**14**
04	**Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning**	**4**	**10**
05	**Scalable Machine Learning (Online and Distributed Learning) A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference**	**4**	**14**
06	**Recent trends classification applications.in various methods for learning techniques applications of machine learning.**	**5**	**8**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:
Skills to be developed:
Intellectual skills:

List of Practical

Based on Theory

Assignments: Based on Theory

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Reference Books:			
1. Kevin Murphy	**Machine Learning: A Probabilistic Perspective**		**MIT Press, 2012**
2. Trevor Hastie,	**The Elements of**		**Springer 2009 (freely**

Robert Tibshirani, Jerome Friedman,	**Statistical Learning,**		**available online)**
3.Christopher Bishop,	**Pattern Recognition and Machine Learning,**		**Springer, 2007.**

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	**Computer**
2.	
3.	
4.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**ALL**	**10**	**10**	**5**	**3**	**15**	**70**
B	**ALL**						
C				**5**	**3**	**45**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:			
Practical Internal Sessional Continuous Evaluation			
Internal Examination:			
Continuous evaluation			**40**
External Examination:Examiner-			
Signed Lab Assignments		**10**	
On Spot		**40**	
Viva voce		**10**	**60**

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Name of the Course: M.Sc. in Information Technology (Artificial Intelligence) **subject:** Big Data Analytics and Lab	
Course Code: MITAI – 106C**,** MITAI – 196C	**Semester:** 2 nd
Duration: 36 Hrs.	**Maximum Marks:** 200
teaching Scheme	**Examination Scheme**
Theory: 3	**End Semester Exam:** 70
Tutorial: 0	**Attendance :** 5
Practical: 4	**Continuous Assessment:** 25
Credit: 3 + 2	**Practical Sessional internal continuous evaluation:** 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1.	Ability to Understand big data for business intelligence. Learn business case studies for big data analytics. Understand nosql big data management. Perform map-reduce analytics using Hadoop and related tool.
Objective:	
Sl. No.	
1.	Understand big data for business intelligence. Learn business case studies for big data analytics. Understand nosql big data management. Perform map-reduce analytics using Hadoop and related tool.
Pre-Requisite:	
Sl. No.	
1.	Data Structure, Computer Architecture and Organization

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, bigdata and marketing, fraud and big data, risk and big data, credit riskmanagement, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics	**6**	**14**
02	Introduction to NoSQL, aggregate data models, aggregates, key-valueand document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peerpeer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reducecalculations	**6**	**14**

03	Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structureesonance architectures, Advances in Neural networks	**6**	**14**
04	MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output format	**6**	**14**
05	Hbase, data model and implementations, Hbase clients, Hbase examples, praxis.Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration	**6**	**10**
06	Pig, Grunt, pig data model, Pig Latin, developing and testing Pig Latin scripts. Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries.	**6**	**4**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

List of Practical:

1.Based on theory lectures.

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Hadzic F., Tan H. & Dillon T. S	Mining data with Complex Structures"		Springer
Yates R. B. and Neto B. R.	Modern Information Retrieval		Pearson Education
Tan P. N., Steinbach M & Kumar V	Introduction to Data Mining		Pearson Education

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	**Total Marks**	**No of question to be set**	**To answer**	**Marks per question**	**Total Marks**
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-

Signed Lab Assignments	**10**	
On Spot Experiment	**40**	

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Name of the Course M.Sc. in Information Technology (Artificial Intelligence) Subject: Artificial Neural Networks and Lab	
Course Code: MITAI 201, MITAI 291	**Semester: 2 nd**
Duration: 36Hrs.	**Maximum Mark**s: 100
Teaching Scheme	**Examination Scheme**
Theory: 3	End Semester Exam: 70
Tutorial: 0	Teacher's Assessment: 5
Practical: 4	Internal Assessment: 25
Credit: 3+2	**Practical Sessional internal continuous evaluation: 40**
	Practical Sessional external examination: 60

Aim:

Sl. No.	
1	In-depth understanding of various concepts of artificial neural network (ANN), Deep Neural Network (DNN) and Convolutional Neural Network (CNN).
2	Ability to understand computational complexity of a neural network.
3	Ability to understand the techniques of hyper parameter tuning.
4.	Ability to utilize ANN, DNN and CNN in solving real-time Artificial Inteligence (AI) led decision making problems.

Objective:

Sl. No.	
1	To study a computational model of the human neural system and its applications
2	To explore Deep learning technique and various feature extraction strategies.
3	

Pre-Requisite:

Sl. No.	
1	Understanding basic concepts of linear algebra.
2	Understanding basic concepts of machine learning.

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Biological neuron, artificial neuron as a computational model of a neuron, activation functions, architectures for ANNs, linear neural networks, Hebbs learning law	6	18
02	Non-linear neural networks: Perceptron- learning law, convergence theorem; multilayer feed forward neural networks-structure, activation functions, error back propagation learning, delta learning law, generalized delta rule, learning factors, convergence criteria, momentum factor in learning, conjugate gradient method for learning, universal approximation theorem, cross validation method for selecting the architecture, bias-variance dilemma	15	30
03	Statistical learning theory, principle of empirical risk minimization, Radial basis function networks: RBF networks for function approximation, RBF networks for pattern classification, Support vetcor machines: SVM for linearly separable classes, SVM for linearly non-separable classes, SVM for nonlinearly separable classes using kernels, multi-class pattern classification using SVMs	4	18
04	Feedback neural networks: Problem of pattern storage and retrieval, discrete Hopfiled networks, dynamical systems, energy function of hopfield model, energy analysis of hopfiled model.	6	18

05	Introduction to deep neural networks, convolution neural networks, recurrent neural networks, Boltzman machine	5	16
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:

Skills to be developed:

1.Ability to implement solve any AI led problems using neural networks.
2.Ability to learn hyper parameters tuning strategies.
3.Ability to perform a comparative study of different neural networks for a given problem.

List of Practical:

1. Write a Python program to implement the basic unit (neuron) of a neural network.

2. Write definitions for different activation functions and their derivatives in python.

3. Write definitions for different loss (cost) functions and their derivatives in python.

4. Implement the back propagation algorithm from scratch.

5. Implement a simple neural network to solve the XOR problem from scratch.

6. Write a program in KERAS to implement an ANN that predicts insurance cost for a customer (Dataset will be provided).

7. Develop a machine learning (ML) model that predicts houses rent in different cities in a given country (Dataset will be provided).

8. Implement a supervised ANN model to correctly predict the flower species from the measured Attributes.

9. Implement a supervised ANN model to correctly predict the flower species from the measured Attributes.

10. Implement a supervised model through convolutional neural network to classify hand-written Digits (Dataset: MNIST to be used).

Assignments:

1. Explain the working principle of the basic unit (neuron) of a neural network.

2. Explain how the learnable parameters of an ANN are updated through back propagation algorithm in details.

3. Write definitions of different activation and loss (cost) functions used in ANN. Also find their derivatives.

4. Discuss the strategies to prevent over-fitting and under-fitting problems often encounter in a deep neural network .

5. Discuss vanishing gradient problem often occurred during training of a deep neural network. Also, discuss how the problem can be overcome.

6. Discuss how a multi-class pattern classification can be implemented using Support Vector Machine (SVM).

7. Describe how a discrete Hopfiled network can be used as a feedback neural network.

8. Describe the process of convolution operation. How the convolutional operations can be used in deep neural network for pattern classification.

List of Books
Text Books:

Name of Author	**Title of the Book**	Edition/ISSN/ISBN	**Name of the Publisher**
Simon S. Haykin,	Neural Networks and Learning Machines	3rd Edition	Prentice Hall
Sathish Kumar	Neural Networks: A Classroom Approach	3rd Edition	Tata McGraw Hill
Reference Books:			
B. Yegnanarayana	Artificial Neural Networks	1st Edition	Prentice Hall India Learning Pvt. Ltd
Snehashish Chakraverty and Susmita Mall	Artificial neural networks for engineers and scientists: solving ordinary differential equations	ISBN 9781498781381	CRC Press
Tariq Rashid	Make Your Own Neural Network: A Gentle Journey Through the Mathematics of Neural Networks, and Making Your Own Using the Python Computer Language	ISBN 1530826608, 9781530826605	CreateSpace Independent Publishing Platform

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer

End Semester Examination Scheme. Maximum Marks-70. Time allotted- 3hrs.

Group	**Unit**	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70

C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-

Signed Lab Assignments	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Name of the Course: M.SC in Information Technology(AI) **Subject:** Image Processing and Lab	
Course Code: MITAI-202,292	**Semester:Second**
Duration:40	**Maximum Marks:200**
Teaching Scheme	Examination Scheme
Theory: 3	End Semester Exam: 70
Tutorial:0	Attendance : 5
Practical: 2	Continuous Assessment: 25
Credit:3+2=5	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1.	To be able to Review the fundamental concepts of a digital image processing system
2.	To be able to Analyze images in the frequency domain using various transforms
3.	To be able to Evaluate the techniques for image enhancement and image restoration.
4.	To be able to Categorize various compression techniques.
5.	To be able to Interpret image segmentation and representation techniques.

Objective:	
Sl. No.	
1.	To study the image fundamentals and mathematical transforms necessary for image processing
2.	To study the image enhancement techniques
3.	To study image restoration procedures
4.	To study the image compression procedures

Pre-Requisite:	
Sl. No.	
5.	Linear Algebra and Statistics
6.	

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction** Background, Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image Processing - Image Acquisition, Storage, Processing, Communication, Display.	**5**	**10**
02	**Digital Image Formation** A Simple Image Model, Geometric Model- Basic Transformation (Translation, Scaling, Rotation), Perspective Projection, Sampling & Quantization - Uniform & Non uniform.	**6**	**10**
03	**Mathematical Preliminaries** Neighbour of pixels, Connectivity, Relations, Equivalence & Transitive Closure; Distance Measures, Arithmetic/Logic Operations, Fourier Transformation, Properties of The Two Dimensional Fourier Transform, Discrete Fourier Transform, Discrete Cosine & Sine Transform.	**7**	**10**
04	**Image Enhancement** Spatial Domain Method, Frequency Domain Method, Contrast Enhancement -Linear & Nonlinear Stretching, Histogram Processing; Smoothing - Image Averaging, Mean Filter, Low-pass Filtering; Image Sharpening. High-pass Filtering, High-boost	**8**	**15**

	Filtering, Derivative Filtering, Homomorphic Filtering; Enhancement in the frequency domain - Low pass filtering, High pass filtering.		
05	**Image Restoration** Degradation Model, Discrete Formulation, Algebraic Approach to Restoration - Unconstrained & Constrained; Constrained Least Square Restoration, Restoration by Homomorphic Filtering, Geometric Transformation – Spatial Transformation, Gray Level Interpolation.	**7**	**10**
06	**Image Segmentation** Point Detection, Line Detection, Edge detection, Combined detection, Edge Linking & Boundary Detection – Local Processing, Global Processing via The Hough Transform; Thresholding - Foundation, Simple Global Thresholding, Optimal Thresholding; Region Oriented Segmentation - Basic Formulation, Region Growing by Pixel Aggregation, Region Splitting & Merging.	**7**	**15**
	Sub Total:	**40**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		
	Total:		

Practical:

Skills to be developed:

Intellectual skills:

1.
2.
3.
4.
5.

Motor Skills:

1.
2.
3.
4.
5.

List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)

1. Assignments will be based on theory subject
2.
3.
4.

Assignments:

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Gonzalves	Digital Image Processing		Pearson
Jain	Fundamentals of Digital Image Processing		PHI

Jahne	Digital Image Processing		Springer India
Chanda & Majumder	Digital Image Processing & Analysis		PHI
Sonka	Image Processing, Analysis & Machine Vision		VIKAS

Reference Books:

List of equipment/apparatus for laboratory experiments:

Sl. No.	
6.	Matlab
7.	Python
8.	Digital Camera
9.	
10.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**All**	**10**	**10**				**70**
B	**All**			**5**	**3**	**5**	
C	**All**			**4**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			

External Examination: Examiner- **40**

Signed Lab Note Book(for five experiments)	**10**	
On Spot Experiment(one for each group consisting 5 students)	**10**	
Viva voce	**20**	

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Name of the Course: M.Sc. in Information Technology (Artificial Intelligence) **subject:** Natural Language Processing	
Course Code: MITAI-203, MITAI-293	**Semester: III**
Duration: 36 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 3	**End Semester Exam: 70**
Tutorial: 0	**Attendance : 5**
Practical: 4	**Continuous Assessment: 25**
Credit: 3 + 2	**Practical Sessional internal continuous evaluation: 40**
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1.	After completion of course, students would be able to:
2.	Understand the semantic for language processing.
3.	Apply NLP for language processing.

Objective:	
Sl. No.	
1.	Gain an in-depth understanding of the computational properties of natural languages.
2.	Understanding semantics and pragmatics of English language for processing
3.	How key concepts from NLP are used to describe and analyze language
4	POS tagging and context free grammar for English language.
5	Gain an in-depth understanding of the computational properties of natural languages.

Pre-Requisite:	
Sl. No.	
1.	UG level course in Algorithm Design and Analysis

Contents		**Hrs./week**	
Chapter	Name of the Topic	**Hours**	**Marks**
01	Introduction- Human languages, models, ambiguity, processing paradigms; Phases in natural language processing, applications. Text representation in computers, encoding schemes.	**6**	**10**
02	Linguistics resources- Introduction to corpus, elements in balanced corpus, TreeBank, PropBank, WordNet, VerbNet etc. Resource management with XML, Management of linguistic data with the help of GATE, NLTK. Regular expressions, Finite State Automata, word recognition, lexicon.	**6**	**12**
03	Morphology, acquisition models, Finite State Transducer. N-grams, smoothing, entropy, HMM, ME, SVM, CRF. Part of Speech tagging- Stochastic POS tagging, HMM.	**6**	**10**
04	Handling of unknown words, named entities, multi word expressions. A survey on natural language grammars, lexeme, phonemes, phrases and	**6**	**20**

	idioms, word order, agreement, tense, aspect and mood and agreement, Context Free Grammar, spoken language syntax. Parsing-Unification, probabilistic parsing, TreeBank.		
05	Semantics- Meaning representation, semantic analysis, lexical semantics, WordNet Word Sense Disambiguation- Selectional restriction, machine learning approaches, dictionary based approaches. Discourse- Reference resolution, constraints on co-reference, algorithm for pronoun resolution, text coherence, discourse structure.	**6**	**15**
06	Applications of NLP- Spell-checking, Summarization Information Retrieval- Vector space model, term weighting, homonymy, polysemy, synonymy, improving user queries. Machine Translation– Overview.	**6**	**3**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:

Skills to be developed:

1. Understanding NLP problem.
2. Familiar with different ML/AI model used for NLP.
3. Uses of NLTK

Practical & projects:

1. Build your own segmentation model for text to sentence and sentence to word.
2. Introduce NLTK library for natural language processing.
3. Build a spell checker using edit distance algorithm for a limited vocabulary.
4. Spam and Ham identification using Naïve based algorithm.
5. Build a Parts of speech tagger from look-up-table.
6. Build a Parts of speech tagger from using N-gram model.
7. Build a Parts of speech tagger using HMM model.
8. Sentiment analysis using Naïve based algorithm.
9. Context identification using SVM.
10. Introduce RNN in Sentiment analysis.

Assignments:

1. Explain different prepressing steps need for NLP.
2. State Naïve based assumption. Explain Naïve based algorithm.

3. What is parts of speech? Explain pos tagger using Veterbi algorithm.
4. Explain edit distance algorithm. Give its application.

List of Books

Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
5. Daniel Jurafsky 6. James H. Martin	7. An Introduction to Natural Language Processing, 8. Computational Linguistics, and Speech Recognition	9. Third Edition draft	10. Tata McGraw-Hill
11. Gary J. Bronson	12. A First Book of ANSI C	13. 4th Edition	14. ACM

Reference Books:

James A	Natural language Understanding 2e		Pearson Education, 1994
Bharati A., Sangal R., Chaitanya V.	Natural language processing: a Paninian perspective		PHI, 2000
Siddiqui T., Tiwary U. S.	Natural language processing and Information retrieval		OUP, 2008

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	**Total Marks**	**No of question to be set**	**To answer**	**Marks per question**	**Total Marks**
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**
Examination Scheme for Practical Sessional examination:				
Practical Internal Sessional Continuous Evaluation				
Internal Examination:				
Continuous evaluation				**40**
External Examination: Examiner-				
Signed Lab Assignments			**10**	
On Spot Experiment			**40**	
Viva voce			**10**	**60**

Name of the Course: M.Sc. in Information Technology (Artificial Intelligence) **Subject:** Soft Computing			
Course Code: MITAI – 204A		**Semester:** 2nd	
Duration: 36 Hrs.		**Maximum Marks:** 100	
Teaching Scheme		**Examination Scheme**	
Theory: 3		**End Semester Exam:** 70	
Tutorial: 0		**Attendance :** 5	
Practical: 0		**Continuous Assessment:** 25	
Credit: 3			
Aim:			
Sl. No.			
1.	Cover the concepts of Fuzzy logic (FL), Artificial Neural Networks (ANNs) and Genetic Algorithm (GA).		
2.	Ability to apply Soft Computing techniques to solve a number of real life problems.		
3.	Provide exposure to theory as well as practical systems and software used in soft computing.		
Objective:			
Sl. No.			
1.	To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario.		
2.	To implement soft computing based solutions for real-world problems.		
3.	To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.		
Pre-Requisite:			
Sl. No.			
1.	Understanding of basic mathematical logic.		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**

01	**INTRODUCTION TO SOFT COMPUTING:** Evolution of Computing, Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics	**7**	**10**
02	**FUZZY LOGIC:** Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.	**9**	**12**
03	**NEURAL NETWORKS:** Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks : Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks	**10**	**12**
04	**GENETIC ALGORITHMS:** Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning: Machine Learning Approach to Knowledge Acquisition.	**5**	**12**
05	Recent Trends in deep learning, various classifiers, neural networks and genetic algorithm. Implementation of recently proposed soft computing techniques.	**5**	**12**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

List of Practical:

1. Write a program in MATLAB to plot various membership functions.
2. Use Fuzzy toolbox to model tip value that is given after a dinner which can be-not good, satisfying, good and delightful and service which is poor, average or good and the tip value will range from Rs. 10 to 100.
3. Implement FIS Editor.
4. Generate AND, NOT function using McCulloch-Pitts neural net by MATLAB program.
5. Write a MATLAB program for Perceptron net for an AND function with bipolar inputs and targets.
6. Write a MATLAB program for Hebb Net to classify two dimensional input patterns in bipolar with their given targets.
7. Write a MATLAB Program on Back propagation neural network.
8. Write the algorithm of Genetic Algorithm

Assignments:

Based on theory Lecture.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Jyh:Shing Roger Jang, Chuen:Tsai Sun, EijiMizutani	Neuro-Fuzzy and Soft Computing		Prentice:Hall of India, 2003.
George J. Klir and Bo Yuan	Fuzzy Sets and Fuzzy Logic: Theory and		Prentice Hall, 1995.

	Applications		

List of equipment/apparatus for laboratory experiments:							
Sl. No.							
1.		Computer					
End Semester Examination Scheme.			**Maximum Marks-70.**			**Time allotted-3hrs.**	
Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	**Total Marks**	**No of question to be set**	**To answer**	**Marks per question**	**Total Marks**
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:				
Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Name of the Course: M.Sc. in Information Technology (Artificial Intelligence) **Subject: Advanced Data Mining**	
Course Code: MITAI 204B,	**Semester:** 2nd
Duration: 36 Hrs.	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory: 3	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4	Continuous Assessment: 25
Credit: 3 +2	

Aim:	
Sl. No.	
1.	Students should be able to understand different classes of problems concerning their computation difficulties
2.	Ability to introduce the students to recent developments in the area of algorithmic design.
Objective:	
Sl. No.	

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

1.	Introduce students to the advanced methods of designing and analyzing algorithms.
2.	The student should be able to choose appropriate algorithms and use it for a specific problem.
Pre-Requisite:	
Sl. No.	
1.	Understanding of basic logic and programming.

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Introduction, Incremental & Stream Data Mining · Incremental Algorithms for Data Mining · Characteristics of Streaming Data · Issues and Challenges · Streaming Data Mining Algorithms · Any time stream Mining	**6**	**10**
02	Distributed computing solutions for data mining · MapReduce/Hadoop and Spark · Cluster Computing	**6**	**14**
03	Mining Complex Structures · Algorithmic Development Issues · Mining trees o Tree Model Guided Framework o TMG framework for mining ordered & unordered subtrees o Tree Mining Applications · Mining Graphs o Approaches to graph mining	**6**	**14**
04	Sequence Mining · Characteristics of Sequence Data · Problem Modelling · Sequential Pattern Discovery · Timing Constraints · Applications in Bioinformatics	**6**	**14**
05	Text Mining · Text Classification · Vector Space Model · Flat and Hierarchical Clustering. Web Search · Crawling & Indexing · Hyperlink Analysis · Page Rank algorithm	**6**	**14**

	· Web Search and Information Retrieval · Case Study: Query Recommender System		
06	Multivariate Time Series (MVTS) Mining · Importance of MVTS data · Sources of MVTS data · Mining MVTS data o Sign Language Data o Agro-meteorological Data	**6**	**4**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

List of Practical:

1. Based on theory lectures.

Assignments:

Based on theory lectures.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Hadzic F., Tan H. & Dillon T. S	Mining data with Complex Structures		Springer.
Yates R. B. and Neto B. R	"Modern Information Retrieval" Pearson Education		

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	**Total Marks**	**No of question to be set**	**To answer**	**Marks per question**	**Total Marks**
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Examination Scheme for end semester examination:				
Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Name of the Course: M.Sc in Artificial Intelligence **Subject: Information Retrieval**	
Course Code: MITAI– 204C	**Semester:** III
Duration: 36 Hrs.	**Maximum Marks:** 100
Teaching Scheme	**Examination Scheme**
Theory: 3	**End Semester Exam:** 70
Tutorial: 0	**Attendance :** 5
Practical: 0	**Continuous Assessment:** 25
Credit: 3	

Aim:	
Sl. No.	
1.	To provide an overview of Information Retrieval. b.
	To introduce students about insights of the several topics of Information retrieval such as – Boolean retrieval model, Vector space model, Latent semantic indexing, XML and Image retrieval model.
Objective:	
Sl. No.	
1.	Students will get the understanding different Information retrieval model
	.Students will get to know about evaluation methods of the information retrieval model
Pre-Requisite:	
Sl. No.	
1.	

Contents		Hrs./week	
Chapter	Name of the Topic	Hours	Marks
01	Information retrieval process, Indexing, Information retrieval model, Boolean retieval model,Tokenization, Stop words, Stemming, Inverted index, Skip pointers, Phrase queries	7	14
02	Wild card queries, Permuterm index, Bigram index, Spelling correction, Edit distance, Jaccard coefficient, Soundex Wild card queries, Permuterm index, Bigram index, Spelling correction, Edit distance, Jaccard coefficient, Soundex	7	14
03	Precision, Recall, F-measure, E-measure, Normalized recall, Evaluation problems,Eigen vectors, Singular value decomposition, Lowrank approximation, Problems with Lexical Semantics	7	14
04	Relevance feedback, Rocchio algorithm, Probabilistic relevance	7	14

	feedback, Query Expansion and its types, Query drift Probabilistic relavance feedback, Probability ranking principle, Binary Independence Model, Bayesian network for text retrieval.		
05	Data vs. Text-centric XML, Text-Centric XML retrieval, Structural termsIntroduction to content Based Image retrieval, Challenges in Image retrieval, Image representation, Indexing and retrieving images, Relevance feedback	8	10
	Sub Total:	36	70
	Internal Assessment Examination & Preparation of Semester Examination	4	30
	Total:	40	100

Practical:
Skills to be developed:
List of Practical:

2. Based on theory lectures.

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Christopher D. Manning	Introduction to Information Retrieval		
Tanveer Siddiqui and U. S. Tiwar	Natural Language Processing And Information Retrieval		

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	**Total Marks**	**No of question to be set**	**To answer**	**Marks per question**	**Total Marks**
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type questions (MCQ) with one correct answer are to be set in theobjective part.
- Specific instruction to the students to maintain the order in answering objective questionsshould be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**

C	**ALL**	**15**	**5**	**3**
Examination Scheme for Practical Sessional examination:				

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Name of the Course: M.Sc. in Information Technology (Artificial Intelligence) **Subject :**Computer Vision & Robotics			
Course Code MITAI 301A		**Semester:** 3rd	
Duration: 36 Hrs.		**Maximum Marks:** 100	
Teaching Scheme		**Examination Scheme**	
Theory: 3		**End Semester Exam:** 70	
Tutorial: 0		**Attendance :** 5	
Practical: 0		**Continuous Assessment:** 25	
Credit: 3			
Aim:			
Sl. No.			
1.	To Study the image formation models and feature extraction for computer vision Identify the segmentation and motion detection and estimation techniques		
Objective:			
Sl. No.			
1.	ToDevelop small applications and detect the objects in various applications		
Pre-Requisite:			
Sl. No.			
1.	Should have knowledge of one Programming Language (Java preferably), Practice of SQL (queries and sub queries), exposure to Linux Environment		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**ImageFormationModels** • Monocular imaging system • Orthographic & Perspective Projection • Camera model and Camera calibration • Binocular imaging systems, Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration. Apparel, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration. Apparel, Stereo vision	**6**	**14**
02	FeatureExtraction	**6**	**14**

	• Image representations (continuous and discrete) • Edge detection, Edge linking, corner detection, texture, binary shape analysis, boundary pattern analysis, circle and ellipse detection, Light at Surfaces; Phong Model; Reflectance Map; Albedo estimation; Photometric Stereo; Use of Surface Smoothness Constraint; Shape from Texture, color, motion and edges.		
03	ShapeRepresentationandSegmentation • Deformable curves and surfaces • Snakes and active contours • Level set representations • Fourier and wavelet descriptors • Medial representations • Multi-resolution analysis, Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation	**6**	**14**
04	MotionDetectionandEstimation • Regularization theory • Optical computation • Stereo Vision • Motion estimation, Background Subtraction and Modelling, Optical Flow, KLT, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation • Structure from motion, Motion Tracking in Video	**6**	**14**
05	Objectrecognition • Hough transforms and other simple object recognition methods • Shape correspondence and shape matching • Principal component analysis • Shape priors for recognition	**6**	**10**
06	ApplicationsofComputerVision Automated Visual Inspection, Inspection of Cereal Grains, Surveillance, In-Vehicle Vision Systems, CBIR, CBVR, Activity Recognition, computational photography, Biometrics	**6**	**4**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:

List of Practical:

3. Based on theory lectures.

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

List of Books **Text Books:**			
Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
D. Forsyth and J. Ponce	Computer Vision		
List of equipment/apparatus for laboratory experiments:			
Sl. No.			
1.	Computer		

End Semester Examination Scheme.		**Maximum Marks-70.**		**Time allotted-3hrs.**			
Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	**Total Marks**	**No of question to be set**	**To answer**	**Marks per question**	**Total Marks**
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:				
Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Name of the Course: M.Sc in Artificial Intelligence Subject: Deep Learning	
Course Code: MITAI– 301B	**Semester:** III
Duration: 36 Hrs.	**Maximum Marks:** 100
Teaching Scheme	**Examination Scheme**
Theory: 3	**End Semester Exam:** 70
Tutorial: 0	**Attendance :** 5
Practical: 0	**Continuous Assessment:** 25
Credit: 3	

Aim:	
Sl. No.	
1.	

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Objective:			
Sl. No.			
1.	Apply deep learning approach to solve real life complex problem.		
Pre-Requisite:			
Sl. No.			
1.	Artificial Intelligence, Probability and Statistics, Linear Algebra		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Introduction Feedforward Neural networks. Gradient descent and the backpropagation algorithm. Unit saturation, aka the vanishing gradient problem, and ways to mitigate it. RelU Heuristics for avoiding bad local minima. Heuristics for faster training. Nestors accelerated gradient descent. Regularization. Dropout. Convolutional Neural Networks Architectures, convolution / pooling layers Recurrent Neural Networks LSTM, GRU, Encoder Decoder architectures Deep Unsupervised Learning	6	14
02	Autoencoders (standard, sparse, denoising, contractive, etc), VariationalAutoencoders, Adversarial Generative Networks, Autoencoder and DBM Attention and memory models, Dynamic memory networks	6	14
03	Applications of Deep Learning to NLP: Introduction to NLP and Vector Space Model of Semantics	6	14
04	Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-ofWords model (CBOW), Glove, Evaluations and Applications in word similarity, analogy reasoning	6	14
05	Dialogue Generation with LSTMs Applications of Dynamic Memory Networks in NLP	6	10
06	Recent Reseearch in NLP using Deep Learning: Factoid Question Asnwering, similar question detection, Dialogue topic tracking, Neural Summarization, Smart Reply	6	4

	Sub Total:	36	70
	Internal Assessment Examination & Preparation of Semester Examination	4	30
	Total:	40	100

Practical:
Skills to be developed:
List of Practical:

4. Based on theory lectures.

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville	Deep learning."		MIT Press book
Bengio, Yoshua.	Learning deep architectures for AI." Foundations and trends in Machine Learning		

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	**Total Marks**	**No of question to be set**	**To answer**	**Marks per question**	**Total Marks**
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Name of the Course: M.Sc in Artificial Intelligence **Subject: Distributed System**			
Course Code: MITAI– 301D		**Semester:** III	
Duration: 36 Hrs.		**Maximum Marks:** 100	
Teaching Scheme		**Examination Scheme**	
Theory: 3		**End Semester Exam:** 70	
Tutorial: 0		**Attendance :** 5	
Practical: 0		**Continuous Assessment:** 25	
Credit: 3			
Aim:			
Sl. No.	To learn distributed mutual exclusion and deadlock detection algorithms		
1.	To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems.		
Objective:			
Sl. No.			
1.	To understand the foundations of distributed systems...		
	To learn issues related to clock Synchronization and the need for global state in distributed systems		
Pre-Requisite:			
Sl. No.			
1.			
Contents		Hrs./week	
Chapter	Name of the Topic	Hours	Marks
01	Introduction: Definition –Relation to computer system components –Motivation –Relation to parallel systems – Message-passing systems versus shared memory systems – Primitives for distributed communication –Synchronous versus asynchronous executions –Design issues and challenges. A model of distributed computations: A distributed program –A model of distributed executions –Models of communication networks –Global state – Cuts –Past and future cones of an event –Models of process communications. Logical Time: A framework for a system of logical clocks –Scalar time –Vector time – Physical clock synchronization: NTP.	7	14
02	Message ordering and group communication: Message ordering paradigms –Asynchronous execution with	7	14

	synchronous communication –Synchronous program order on an asynchronous system –Group communication – Causal order (CO) – Total order. Global state and snapshot recording algorithms: Introduction –System model and definitions – Snapshot algorithms for FIFO channel		
03	Distributed mutual exclusion algorithms: Introduction – Preliminaries – Lamport's algorithm –Ricart-Agrawala algorithm – Maekawa's algorithm – Suzuki–Kasami's broadcast algorithm. Deadlock detection in distributed systems: Introduction – System model – Preliminaries – Models of deadlocks – Knapp's classification –Algorithms for the single resource model, the AND model and the OR model.	7	14
04	Checkpointing and rollback recovery: Introduction – Background and definitions – Issues in failure recovery – Checkpoint-based recovery – Log-based rollback recovery – Coordinated checkpointing algorithm – Algorithm for asynchronous checkpointing and recovery. Consensus and agreement algorithms: Problem definition – Overview of results – Agreement in a failure –free system – Agreement in synchronous systems with failures.	7	14
05	Peer-to-peer computing and overlay graphs: Introduction – Data indexing and overlays – Chord – Content addressable networks – Tapestry. Distributed shared memory: Abstraction and advantages – Memory consistency models –Shared memory Mutual Exclusion.	8	10
	Sub Total:	36	70
	Internal Assessment Examination & Preparation of Semester Examination	4	30
	Total:	40	100

Practical:
Skills to be developed:
List of Practical:

5. Based on theory lectures.

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Brendan Burns	Designing Distributed Systems: Patterns and Paradigms for Scalable, Reliable Services		MIT Press book

List of equipment/apparatus for laboratory experiments:

Sl. No.	

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

1.		Computer					
End Semester Examination Scheme.				**Maximum Marks-70.**		**Time allotted-3hrs.**	
Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	**Total Marks**	**No of question to be set**	**To answer**	**Marks per question**	**Total Marks**
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Name of the Course: M.Sc in Artificial Intelligence **Subject: IOT**	
Course Code: MITAI– 301E	**Semester:** III
Duration: 36 Hrs.	**Maximum Marks:** 100
Teaching Scheme	**Examination Scheme**
Theory: 3	**End Semester Exam:** 70
Tutorial: 0	**Attendance :** 5
Practical: 0	**Continuous Assessment:** 25
Credit: 3	

Aim:	
Sl. No.	
1.	Understand the vision of IoT from a global context.
Objective:	
Sl. No.	
1.	Understand the application of IoT. ...
	Determine the Market perspective of IoT..

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Pre-Requisite:			
Sl. No.			
1.			
Contents		Hrs./week	
Chapter	Name of the Topic	Hours	Marks
01	IoT & Web Technology The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.	7	14
02	M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.	7	14
03	IoT Architecture -State of the Art – Introduction, State of the art, Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture-Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.	7	14
04	IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.	7	14
05	Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security	8	10
	Sub Total:	36	70
	Internal Assessment Examination & Preparation of Semester Examination	4	30
	Total:	40	100

Practical:
Skills to be developed:
List of Practical:

6. Based on theory lectures.

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Vijay Madisetti and	Internet of Things (A		VPT

Arshdeep Bahga	Hands-on-Approach)		
Francis daCosta	Rethinking the Internet of Things: A Scalable Approach to Connecting Everything		Apress Publications

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	**Total Marks**	**No of question to be set**	**To answer**	**Marks per question**	**Total Marks**
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Name of the Course: M.Sc. in Information Technology (Artificial Intelligence) **Subject: Business Analytics**	
Course Code: MITAI - 302A	**Semester: 3rd**
Duration: 36 Hours	**Maximum Marks:100**
Teaching Scheme	**Examination Scheme**
Theory:03	**End Semester Exam:** 70
Tutorial:0	**Attendance :** 5
Practical:0	**Continuous Assessment:** 25
Credit: 03	

Aim:

Sl. No.	
1.	**Understand the role of business analytics within an organization.**

2.	**Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.**
3.	**To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.**
4.	**To become familiar with processes needed to develop, report, and analyze business data.**
5.	**Use decision-making tools/Operations research techniques.**
6	**Mange business process using analytical and management tools.**
7.	**Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.**
Objective:	
Sl. No.	
1.	**Students will demonstrate knowledge of data analytics.**
2.	**Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.**
3.	**Students will demonstrate the ability to use technical skills in predicative and prescriptive modelling to support business decision-making.**
4.	**Students will demonstrate the ability to translate data into clear, actionable insights.**
Pre-Requisite:	
Sl. No.	
1.	
2.	

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Unit1:** **Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics.** **Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.**	**6**	**14**
02	**Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression.** **Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.**	**6**	**14**
03	**Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, measuring contribution of Business analytics, Managing Changes.** **Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.**	**6**	**14**
04	**Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.** **Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation**	**6**	**14**

	Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.		
05	**Decision Analysis: Formulating Decision Problems, Decision Strategies with the without OutcomeProbabilities,Decision Trees, The Value ofInformation, Utility and Decision Making.**	**6**	**10**
06	**Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.**	**6**	**4**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:
Assignments: Based on theory

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:

1.Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey,	**Business analytics Principles, Concepts, and Applications**		**Pearson FT Press.**
2.James Evans,	**Business Analytics**		**persons Education.**

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**

C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:			
Practical Internal Sessional Continuous Evaluation			
Internal Examination:			
Continuous evaluation			**40**
External Examination: Examiner-			
Signed Lab Assignments	**10**		
On Spot Experiment	**40**		
Viva voce	**10**		**60**

Name of the Course: M.Sc. in Information Technology (Artificial Intelligence) **Subject:Industrial Safety**			
Course Code: MITAI – 302C	**Semester: III**		
Duration: 36 Hours	**Maximum Marks:100**		
Teaching Scheme	**Examination Scheme**		
Theory:03	**End Semester Exam:** 70		
Tutorial:0	**Attendance :** 5		
Practical:0	**Continuous Assessment:** 25		
Credit: 03			
Aim:			
Sl. No.			
1	**Understand the role of Industrial Safety in an organization.**		
2	**Analyze Industrial Safety in various aspect.**		
3.			
Objective:			
Sl. No.			
1.	**Mange Industrial Safety using analytical and management tools.**		
2.	**To become familiar with processes needed to develop, report, and analyze Industrial Safety data.**		
3.			
Pre-Requisite:			
Sl. No.			
1.	**Basic Electrical Knowledge**		
2.			
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.**	**6**	**14**
02	**Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance,**	**6**	**14**

	Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.		
03	**Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.**	**6**	**14**
04	**Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault-finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.**	**6**	**14**
05	**Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance**	**6**	**14**
06			
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Assignments: Based on theory

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:

1.Higgins & Morrow,	**Maintenance Engineering Handbook,**		**Da Information Services.**
2.H. P. Garg,	**Maintenance Engineering,**		**S. Chand and Company.**
3.Audels,	**Pump-hydraulic Compressors,**		**Mcgrew Hill Publication.**

4.Winterkorn, Hans,	**Foundation Engineering Handbook,**		**Chapman & Hall London.**

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:		
Practical Internal Sessional Continuous Evaluation		
Internal Examination:		
Continuous evaluation		**40**
External Examination: Examiner-		
Signed Lab Assignments	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: M.Sc. in Information Technology (Artificial Intelligence) **Subject:Operations Research**	
Course Code: MITAI – 302D	**Semester: 3rd**
Duration: 36 Hours	**Maximum Marks:100**
Teaching Scheme	**Examination Scheme**
Theory:03	**End Semester Exam:** 70
Tutorial:0	**Attendance :** 5
Practical:0	**Continuous Assessment:** 25
Credit: 03	

Aim:

Sl. No.	
1.	**Ablility to apply the dynamic programming to solve problems of discreet and continuous variables.**
2.	**Students should able to apply the concept of non-linear programming**
3.	

Objective:

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Sl. No.	
1.	Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.
2.	Students should able to apply the concept of non-linear programming
3.	Students should able to carry out sensitivity analysis
4.	Student should able to model the real world problem and simulate it.
Pre-Requisite:	
Sl. No.	
1.	
2.	

Contents		Hrs./week	
Chapter	Name of the Topic	Hours	Marks
01	Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models	7	14
02	Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming	8	14
03	Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT	7	14
04	Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.	7	14
05	Competitive Models,Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game TheorySimulation	7	14
	Sub Total:	36	70
	Internal Assessment Examination & Preparation of Semester Examination	4	30
	Total:	40	100

Practical:

Assignments: Based on theory

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher

Reference Books:

1.H.A. Taha,	Operations Research, An Introduction,		PHI, 2008
2.H.M. Wagner,	Principles of Operations Research,		PHI, Delhi, 1982.
3.J.C. Pant,	Introduction to Optimisation: Operations Research,		Jain Brothers, Delhi, 2008
4.Hitler	Libermann Operations Research		McGraw Hill Pub. 2009

5.Pannerselvam,	**Operations Research**		**Prentice Hall of India 2010**
6.Harvey M Wagner,	**Principles of Operations Research**		**Prentice Hall of India 2010**

List of equipment/apparatus for laboratory experiments:

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:		
Practical Internal Sessional Continuous Evaluation		
Internal Examination:		
Continuous evaluation		**40**
External Examination: Examiner-		
Signed Lab Assignments	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: M.Sc. in Information Technology (Artificial Intelligence) **Subject:Cost Management of Engineering Projects**	
Course Code: MITAI – 302E	**Semester: 3rd**
Duration: 36 Hours	**Maximum Marks:100**
Teaching Scheme	**Examination Scheme**
Theory:03	**End Semester Exam:** 70
Tutorial:0	**Attendance :** 5
Practical:0	**Continuous Assessment:** 25
Credit: 03	

Aim:

Sl. No.	
1.	**Understand the role of Cost Management of Engineering Projects.**
2.	**Analyze data using statistical and data mining techniques and understand relationships between the underlying Cost Management of Engineering Projects.**
3.	

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Objective:			
Sl. No.			
1.	**To gain an understanding of how managers use business analytics to formulate and solve business problems and to support Cost Management of Engineering Projects.**		
2.	**To become familiar with processes needed to develop, report, and analyze Cost Management data.**		
3.			
Pre-Requisite:			
Sl. No.			
1.	**Basic Management knowledge**		
2.			
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction and Overview of the Strategic Cost Management Process**	**4**	**4**
02	**Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.**	**6**	**6**
03	**Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non- technical activities.**	**6**	**10**
04	**Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process** **Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis.**	**8**	**20**
05	**Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis.**	**3**	
06	**Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.**	**5**	**20**
07	**Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.**	**2**	**10**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Assignments: Based on theory

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher

Reference Books:

1.	**Cost Accounting A Managerial Emphasis,**		**Prentice Hall of India, New Delhi**
2. Charles T. Horngren and George Foster,	**Advanced Management Accounting**		
3. Robert S Kaplan Anthony A. Alkinson,	**Management & Cost Accounting**		
4. Ashish K. Bhattacharya,	**Principles & Practices of Cost Accounting A. H.**		**Wheeler publisher**
5. N.D. Vohra,	**Quantitative Techniques in Management,**		**Tata McGraw Hill Book Co. Ltd.**

List of equipment/apparatus for laboratory experiments:

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:				
Practical Internal Sessional Continuous Evaluation				
Internal Examination:				
Continuous evaluation				**40**
External Examination: Examiner-				

Signed Lab Assignments	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: M.Sc. in Information Technology (Artificial Intelligence) **Subject: Composite Materials**			
Course Code: MITAI – 302F		**Semester: III**	
Duration: 36 Hours		**Maximum Marks:100**	
Teaching Scheme		**Examination Scheme**	
Theory:03		**End Semester Exam:** 70	
Tutorial:0		**Attendance :** 5	
Practical:0		**Continuous Assessment:** 25	
Credit: 03			
Aim:			
Sl. No.			
1.	**Understand the role of Composite Materials**		
2.	**Analyze various effect of Composite Materials.**		
3.			
Objective:			
Sl. No.			
1.	**To gain an understanding Composite Materials**		
2.	**To become familiar with processes needed to develop, report, and analyze Composite Materials data.**		
3.			
Pre-Requisite:			
Sl. No.			
1.	**Basic chemistry.**		
2.			
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.**	**7**	**14**
02	**REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.**	**7**	**14**
03	**Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.**	**7**	**14**

04	**Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.**	**8**	**14**
05	**Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.**	**7**	**14**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Assignments: Based on theory

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
1. R.W.Cahn	**Material Science and Technology**	**Vol 13**	**VCH, West Germany.**
2.WD Callister, Jr., Adapted by R. Balasubramaniam,	**Materials Science and Engineering, An introduction.**	**Indian edition, 2007.**	**John Wiley & Sons, NY,**

Reference Books:

1. Lubin.	**Hand Book of Composite Materials**		
2. K.K.Chawla.	**Composite Materials**		
3. Deborah D.L. Chung.	**Composite Materials Science and Applications**		
4.Danial Gay, Suong V. Hoa, and Stephen W. Tasi.	**Composite Materials Design and Applications**		

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Examination Scheme for end semester examination:				
Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:		
Practical Internal Sessional Continuous Evaluation		
Internal Examination:		
Continuous evaluation		**40**
External Examination: Examiner-		
Signed Lab Assignments	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: M.Sc. in Information Technology (Artificial Intelligence) **Subject:Waste to Energy**			
Course Code:MITAI 302**G**	**Semester: III**		
Duration: 36 Hours	**Maximum Marks:100**		
Teaching Scheme	**Examination Scheme**		
Theory:03	**End Semester Exam:** 70		
Tutorial:0	**Attendance :** 5		
Practical:0	**Continuous Assessment:** 25		
Credit: 03			
Aim:			
Sl. No.			
1.	**Understand the role of Waste to Energy.**		
2.	**Analyze data how to convert Waste to Energy.**		
3.			
Objective:			
Sl. No.			
1.	**To gain an understanding to solve environmental problems and to support Waste to Energy.**		
2.	**To become familiar with processes needed to develop, report, and analyze Waste to Energy.**		
3.			
Pre-Requisite:			
Sl. No.			
1.	**Basic Environmental studies**		
2.			
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors**	**7**	**14**
02	**Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of**	**7**	**14**

	charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.		
03	**Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.**	**7**	**14**
04	**Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.**	**7**	**14**
05	**Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.**	**8**	**14**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:
Assignments: Based on theory

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:

1.Desai, Ashok V.,	**Non-Conventional Energy,**		**Wiley Eastern Ltd., 1990.**
2.Khandelwal, K. C. and Mahdi, S. S.,	**Biogas Technology - A Practical Hand Book -**	**Vol. I & II,**	**Tata McGraw Hill Publishing Co. Ltd., 1983.**
3.Challal, D. S.,	**Food, Feed and Fuel from Biomass,**		**IBH Publishing Co. Pvt. Ltd., 1991.**
4.C. Y. WereKo-Brobby and E. B. Hagan,	**Biomass Conversion and Technology,**		**John Wiley & Sons, 1996.**

List of equipment/apparatus for laboratory experiments:

Sl. No.	
11.	
12.	
13.	
14.	
15.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Course Scheme for M.Sc. in InformationTechnology(Artificial Intelligence)

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:		
Practical Internal Sessional Continuous Evaluation		
Internal Examination:		
Continuous evaluation		**40**
External Examination: Examiner-		
Signed Lab Assignments	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: M.Sc.in Information Technology (Artificial Intelligence) **Subject: Dissertation-I /Industrial Project**	
Course Code: MITAI -393	**Semester: 3rd**
Teaching Scheme	**Examination Scheme100**
Theory:0	End Semester Exam:
Tutorial:0	Teacher's Assessment:0
Practical:20	Internal Assessment:0
Credit:10	Practical Sessional internal continuous evaluation:40
	Practical Sessional external examination:60

Content

The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following

Relevance to social needs of society
Relevance to value addition to existing facilities in the institute
Relevance to industry need
Problems of national importance
Research and development in various domain

The student should complete the following:

Literature survey Problem Definition
Motivation for study and Objectives

Preliminary design / feasibility / modular approaches
Implementation and Verification
Report and presentation

The dissertation stage II is based on a report prepared by the students on dissertation allotted to them. It may be based on:

Experimental verification / Proof of concept.
Design, fabrication, testing of Communication System.

The viva-voce examination will be based on the above report and work.

Name of the Course: M.Sc. in Information Technology (Artificial Intelligence) **Subject: Dissertation-II**	
Course Code: MITAI -491	**Semester: 4 th**
Teaching Scheme	**Examination Scheme100**
Theory:0	End Semester Exam:
Tutorial:0	Teacher's Assessment:0
Practical:32	Internal Assessment:0
Credit:16	Practical Sessional internal continuous evaluation:40
	Practical Sessional external examination:60

Guidelines for DissertationPhase–IandII

As per the AICTE directives, the dissertation is a yearlong activity, to be carried out an evaluated in two phases i.e. Phase – I: July to December and Phase – II: January to June.

The dissertation may be carried out preferably in-house i.e. department's laboratories and center OR in industry allotted through department's T & P coordinator.

After multiple interactions with guide and based on comprehensive literature survey the student shall identify the domain and define dissertation objectives. The referred

literature should preferably include IEEE/IET/IETE/Springer/Science Direct/ACM journals in the areas of Computing and Processing (Hardware and Software), Circuits-Devices and Systems, Communication-Networking and Security, Robotics and Control Systems, Signal Processing and Analysis and any other related domain. In case of Industry sponsored projects, the relevant application notes, while papers, product catalogues should be referred and reported.

Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and phase wise work distribution, and submit the proposal within a month from the date of registration.

Phase – I deliverables: A document report comprising of summary of literature survey, detailed objectives, project specifications, paper and/or computer aided design, proof of concept/functionality, part results, A record of continuous progress.

Phase – I evaluation: A committee comprising of guides of respective specialization shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend repeating the Phase-I work.

During phase – II, student is expected to exert on design, development and testing of the proposed work as per the schedule. Accomplished results/contributions/innovations should be published in terms of research papers in reputed journals and reviewed focused conferences OR IP/Patents.

Phase – II deliverables: A dissertation report as per the specified format, developed system in the form of hardware and/or software, A record of continuous progress.

Phase – II evaluation: Guide along with appointed external examiner shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend for extension or repeating the

work