Syllabus for M. Tech. in Artificial Intelligence & Data Science (AI & DS)

Semester -III

Name of the Course: M. Tech. in Artificial Intelligence and Data Science **Subject: Computer Vision & Computer Vision Lab**	
Course Code: PGCS (AI &DS) 301A, PGCS(AI & DS) 391A	**Semester: III**
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.	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.	To develop small applications and detect the objects in various applications

Pre-Requisite:	
Sl. No.	
1.	Should have knowledge of Mathematic and Programming Concept

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Image Formation Models** • 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	Feature Extraction • 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.	6	14

03	Shape Representation and Segmentation • 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	Motion Detection and Estimation • Regularization theory • Optical computation • Stereo Vision • Motion estimation, Background Subtraction and Modeling, Optical Flow, KLT, Spatio- Temporal Analysis, Dynamic Stereo; Motion parameter estimation • Structure from motion, Motion Tracking in Video	6	14
05	Object recognition • Hough transforms and other simple object recognition methods • Shape correspondence and shape matching • Principal component analysis • Shape priors for recognition	6	10
06	Applications of Computer Vision 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:
Based on theory lectures.

List of Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
D. Forsyth and J. Ponce	Computer Vision	Second	Pearson

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer and MATLAB/ Python software

Syllabus for M. Tech. in Artificial Intelligence & Data Science (AI & DS)

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	
C	ALL			5	3	15	70

- 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 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**

Syllabus for M. Tech. in Artificial Intelligence & Data Science (AI & DS)

Name of the Course: M. Tech. in Artificial Intelligence and Data Science **Subject: Digital Image Processing**	
Course Code: PGCS (AI &DS) 301B, PGCS (AI & DS) 391B	**Semester: III**
Duration: 36 Hrs.	**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.	Able to understand the concept of image enhancement, image restoration, image segmentation etc. for engineering applications

Objective:	
Sl. No.	
1.	To make students familiar with the most important concepts of image processing.
2.	To make students aware about various applications of digital image processing.

Pre-Requisite:	
Sl. No.	
1.	**Mathematics, Programming Concept**

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	14
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: Neighbor 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	6	16

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 Filtering, Derivative Filtering, Homomorphic Filtering; Enhancement in the frequency domain - Low pass filtering, High pass filtering.	6	12
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.	6	8
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	10
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:
Skills to be developed:

Listof Practical:

Based on theory lectures.

List of Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Gonzalves	Digital Image Processing	4th Edition	Pearson
Jahne	Digital Image Processing	6th Edition	Springer India
Chanda & Majumder	Digital Image Processing & Analysis	2nd Edition	PHI
Jain	Fundamentals of Digital Image Processing	ISBN: 9788120309296	PHI

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer, MATLAB/ Python software

Syllabus for M. Tech. in Artificial Intelligence & Data Science (AI & DS)

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	
C	ALL			5	3	15	70

- 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 objectivequestions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to beset**	**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**

Syllabus for M. Tech. in Artificial Intelligence & Data Science (AI & DS)

Name of the Course: M. Tech. in Artificial Intelligence and Data Science **Subject: Neural Network and Deep Learning & Neural Network and Deep Learning Lab**			
Course Code: PGCS (AI & DS) 301C, PGCS (AI & DS) 391C		**Semester: III**	
Duration: 36 Hrs.		**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 provide exposure to these advances and facilitate in depth discussions on chosen topics		
Objective:			
Sl. No.			
1.	Apply Neural Network and Deep Learning approach to solve real life complex problem.		
Pre-Requisite:			
Sl. No.			
1.	Artificial Intelligence		
2.	Probability and Statistics		
3.	Linear Algebra		
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	3	10
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	8	15
03	Radial basis function networks: RBF networks for function approximation, RBF networks for pattern classification, Support vector 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 and its real-life applications	8	15
04	Introduction to deep neural networks, Deep Feed Forward network, training deep models, dropouts, Convolutional Neural Networks Architectures, convolution / pooling layers, Recurrent Neural Networks, Deep Belief Network	8	10
05	Autoencoders (standard, sparse, denoising, contractive, etc), Variational Autoencoders, Adversarial Generative Networks, Autoencoder and DBM Attention and memory models, Dynamic memory networks	5	10
06	Applications of Neural Network and Deep Learning: Object recognition, Natural Language Processing, Medical Image Analysis	4	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:

1. Based on theory lectures.

List of 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
Rajiv Chopra	Deep learning	2nd Edition	Khanna Publishing House
Satish Kumar	Neural Networks : A Classroom Approach	ISBN: 0070482926	Tata McGraw-Hill 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	
C	ALL			5	3	5	70

- 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 objectivequestions 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/ Sessional Internal Continuous Evaluation

Internal Examination:

Continuous evaluation	**40**

External Examination: Examiner-

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

Syllabus for M. Tech. in Artificial Intelligence & Data Science (AI & DS)

Name of the Course: M. Tech. in Artificial Intelligence and Data Science **Subject: Business Analytics**			
Course Code: PGCS(AI & DS)302A		**Semester: III**	
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			
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 prescriptivemodeling to support business decision-making.		
4.	Students will demonstrate the ability to translate data into clear, actionable insights.		
Pre-Requisite:			
Sl. No.			
1.	**Basic Programming,**		
2.	**Mathematics**		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organization, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modeling, sampling and estimation methods overview.	6	14
02	Trendiness and Regression Analysis: Modeling 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 Modeling, 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 Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.	6	14
05	Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, 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**

List of Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
James Evans	Business Analytics	2nd Edition	Pearson Education.
Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey,	Business analytics Principles, Concepts, and Applications	ISBN: 9780133552256	Pearson

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	
C	ALL			5	3	15	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 ontop 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**

Syllabus for M. Tech. in Artificial Intelligence & Data Science (AI & DS)

Name of the Course: M. Tech. in Artificial Intelligence and Data Science **Subject: Project Management and Entrepreneurship**	
Course Code: PGCS (AI & DS) 302B	**Semester: III**
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	

Aim:	
Sl. No.	
1.	Understand the role of Project management within an organization.
2.	Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.

Objective:	
Sl. No.	
1.	Students will aware about entrepreneurship and project management.
2.	Students will understand steps of project management and exact role of Entrepreneur

Pre-Requisite:	
Sl. No.	
1.	**Principle of Management**

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	What "Project Management" Means. About The Context of Modern Project Management. How to Manage Projects Throughout The Five Major Process Groups. How The Triple Constraint Affects the Project Manager. How to Develop an Effective Project Plan. How to Gain Commitment to The Project Plan. How to Efficiently Execute The Project Plan. How to Minimize Or Eliminate Scope Creep. How to Organize And Develop Successful Project Teams. How To Develop An Effective Project Control System. How To Develop Realistic Project Schedules. How To Efficiently Close Out A Project.	12	23
02	Entrepreneurship Is An Intensive Course Involving The Study Of Journals Articles, Analysis Of Cases, To Evolve Perspective On Entrepreneurship As An Academic Discipline	12	23
03	Entrepreneurship: An Introduction, New Venture Creation, Financing Entrepreneurial Ventures And The Business Plan, Family Business Management, Managing A Growing Business, Venture Growth Strategies, Entrepreneurial Skills And Strategies, Entrepreneurial Skills And Strategies, Intrapreneurship: Entrepreneurial Ventures In A Corporate Setting, Entrepreneur As Change Agent, Sustainable Innovation And Entrepreneurship, Social Entrepreneurship	12	24
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

List of Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
C. B. Gupta & N. P. Srinivasan	Entrepreneurial Development	ISBN:9788180549793	Sultan Chand And Sons
S. Choudhury	Project Management	ISBN:9780074600689	McGraw-Hill

Syllabus for M. Tech. in Artificial Intelligence & Data Science (AI & DS)

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	
C	ALL			5	3	15	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 ontop of the question paper.

Examination Scheme for end semester examination:

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

Syllabus for M. Tech. in Artificial Intelligence & Data Science (AI & DS)

Name of the Course: M. Tech. in Artificial Intelligence and Data Science **Subject: Industrial Safety**	
Course Code: PGCS(AI & DS) 302C	**Semester: III**
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	

Aim:	
Sl. No.	
1.	Understand the role of Industrial Safety in an organization.
2.	Analyze Industrial Safety in various aspects.
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 Safetydata.
Pre-Requisite:	
Sl. No.	
1.	**Basic Electrical Knowledge**

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, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.	6	14
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.	8	14
05	Periodic and preventive maintenance: Periodic inspection-concept andneed, 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	10	14
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of SemesterExamination	**4**	**30**
	Total:	**40**	**100**

Assignments: Based on theory

List of Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Higgins & Morrow,	Maintenance Engineering Handbook,		Da Information Services
H. P. Garg,	Maintenance Engineering,		S. Chand and Company
Audels	Pump-hydraulic Compressors		Mc. Graw Hill Publication
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 correctanswer)		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	
C	ALL			5	3	5	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 topof the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of eachquestion	Question to beset	Question to beanswered
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Syllabus for M. Tech. in Artificial Intelligence & Data Science (AI & DS)

Name of the Course: M. Tech. in Artificial Intelligence and Data Science **Subject: Cost Management of Engineering Projects**	
Course Code: PGCS (AI & DS) 302D	**Semester: III**
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	

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.

Objective:	
Sl. No.	
1.	To gain an understanding of how managers use business analytics to formulate and solvebusiness problems and to support Cost Management of Engineering Projects.
2.	To become familiar with processes needed to develop, report, and analyze CostManagement data.

Pre-Requisite:	
Sl. No.	
1.	**Basic Management knowledge**

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 centers, 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	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	17

07	Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.	4	10
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Assignments: Based on theory

List of Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
1.Charles T. Horngren, Srikant M Datar,Madhav Rajan	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	
C	ALL			5	3	15	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 ontop 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**

Syllabus for M. Tech. in Artificial Intelligence & Data Science (AI & DS)

Name of the Course: M. Tech. in Artificial Intelligence and Data Science **Subject: Composite Materials**	
Course Code: PGCS(AI & DS) 302E	**Semester: III**
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	

Aim:	
Sl. No.	
1.	Understand the role of Composite Materials
2.	Analyze various effects of Composite Materials.

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

Pre-Requisite:	
Sl. No.	
1.	**Basic chemistry**

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 overallcomposite 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 Molding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression molding – Reaction injection molding. Properties and applications.	8	14
05	Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygro thermal 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**

Syllabus for M. Tech. in Artificial Intelligence & Data Science (AI & DS)

Assignments: Based on theory
List of Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
R.W.Cahn	Material Science and Technology		VCH, West Germany
WD Callister, Jr., Adapted by R. Balasubramaniam,	Materials Science and Engineering, An introduction.	Indian edition	John Wiley & Sons, NY
Lubin.	Hand Book of Composite Materials	2nd Edition	Springer
K.K.Chawla.	Composite Materials	ISBN: 8181284909	Springer
Deborah D.L. Chung.	Composite Materials Science and Applications	2nd Edition	Springer
Danial Gay, Suong	Composite Materials	1st Edition, ISBN: 1587160846	CRC Press
V. Hoa, and Stephen W. Tasi.	Design and Applications	ISBN, 1420031686	CRC Press

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	
C	ALL			5	3	15	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 topof the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of eachquestion	Question to beset	Question to beanswered
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Syllabus for M. Tech. in Artificial Intelligence & Data Science (AI & DS)

Name of the Course: M. Tech. in Artificial Intelligence and Data Science **Subject: Waste to Energy**	
Course Code: PGCS (AI & DS) 302F	**Semester: III**
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	

Aim:	
Sl. No.	
1.	Understand the role of Waste to Energy.
2.	Analyze data how to convert Waste to Energy.

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.

Pre-Requisite:	
Sl. No.	
1.	**Basic Environmental science**

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 charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.	7	14
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 program in India.	8	14
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Syllabus for M. Tech. in Artificial Intelligence & Data Science (AI & DS)

Practical:
Assignments: Based on theory
List of Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Desai, Ashok V.,	Non-Conventional Energy	ISBN: 8122402070	Wiley Eastern Ltd.
Khandelwal, K. C.and Mahdi, S.S.,	Biogas Technology – A PracticalHand Book		Tata McGraw Hill Publishing Co. Ltd.
Challal, D. S.,	Food, Feed and Fuel from Biomass	ISBN: 8120404998	IBH Publishing Co.Pvt. Ltd.
C. Y. WereKo-Brobby and E. B. Hagan,	Biomass Conversion and Technology	ISBN: 0471962465	John Wiley & Sons

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

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

Examination Scheme for end semester examination:

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

Syllabus for M. Tech. in Artificial Intelligence & Data Science (AI & DS)

Name of the Course: M. Tech. in Artificial Intelligence and Data Science **Subject: Dissertation-I / Industrial Project**	
Course Code: PGCS (AI & DS) 381	**Semester: III**
Teaching Scheme	**Examination Scheme**
Duration:	**Maximum Marks:100**
Theory: 0	**End Semester Exam: 0**
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 toindustry 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 andVerification
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.