NOIDA INSTITUTE OF ENGG. & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
(AN AUTONOMOUS INSTITUTE)

Affiliated to

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY UTTAR PRADESH, LUCKNOW

Evaluation Scheme & Syllabus

For

Master of Integrated Technology

Computer Science and Engineering

Fourth Year

(Effective from the Session: 2025-26)

NOIDA INSTITUTE OF ENGG. & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
(AN AUTONOMOUS INSTITUTE)

Master Of Integrated Technology
Computer Science and Engineering
EVALUATION SCHEME
SEMESTER VII

S. No.	Subject Codes	Subject Name	Type of Subject	Periods			Evaluation Schemes				End Semester		Total	Credit
				L	T	P	CT	TA	TOTAL	PS	TE	PE		
1	AMICSE0703	Software Project Management	Mandatory	3	0	0	30	20	50		100		150	3
2	AMICSE0702	Software Engineering and Design	Mandatory	3	0	0	30	20	50		100		150	3
3	AMICSML0701	Machine Learning	Mandatory	3	0	0	30	20	50		100		150	3
4		Departmental Elective-V	Departmental Elective	3	0	0	30	20	50		100		150	3
5		Open Elective-II	Open Elective	3	0	0	30	20	50		100		150	3
6	AMICSE0752	Software Engineering and Design Lab	Mandatory	0	0	2				25		25	50	1
7	AMICSML0751	Machine Learning Lab	Mandatory	0	0	2				25		25	50	1
8	AMICSE0759	Internship Assessment-III	Mandatory	0	0	2				50			50	1
9	ANC0701/ ANC0702	Foundations of Entrepreneurship/ CRM Fundamentals	Compulsory Audit	2	0	0	30	20	50		50		100	NA
		*Massive Open Online Courses (For B.Tech. Hons. Degree)	*MOOCs											
		TOTAL											**900**	**18**

Abbreviation Used:

L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam., PE: Practical End Semester Exam, CE: Core Elective,OE:Open Elective, DE: Departmental Elective, CA: Compulsory Audit, MOOCs: Massive Open Online Courses.

*** List of Recommended MOOCs (Massive Open Online Courses) for Final Year Master of Integrated Students (Semester-VII)**

S.No.	Subject Code	Course Name	University / Industry Partner Name	No of Hours	Credits
1	AMC0312	Continuous Integration and Delivery - DevOps	Infosys Wingspan (Infosys Springboard)	46h 41m	3.5
2	AMC0242	Data Analysis with Pandas and Python	Infosys Wingspan (Infosys Springboard)	19h 49m	1.5
3	AMC0227	Deep Learning for Developers	Infosys Wingspan (Infosys Springboard)	34h 51m	2.5
4	AMC0299	Scrum In Practice	Infosys Wingspan (Infosys Springboard)	26h 30m	2
5	AMC0279	Spring Boot and Angular-React Stack -DevOps Tools and Capstone Project	Infosys Wingspan (Infosys Springboard)	107h 50m	4

PLEASE NOTE:-

- **Internship (3-4 weeks) shall be conducted during summer break after semester-VI and will be assessed during semester-VII**
- **Compulsory Audit Courses (Non Credit - ANC0701/ANC0702)**
  - All Compulsory Audit Courses (a qualifying exam) has no credit.
  - Total and obtained marks are not added in the Grand Total.

List of Departmental Electives

S. No.	Subject Codes	Subject Name	Type of Subject	Bucket Name	Branch	Semester
1	AMICSAI0713	Programming for Data Analytics	Departmental Elective-V	Cloud Computing	M.Tech Int.	7
2	AMICSE0712	RPA Implementation	Departmental Elective-V	CRM-RPA	M.Tech Int.	7
3	AMICSE0713	Web Development using MERN STACK with DevOps	Departmental Elective-V	Full Stack Development	M.Tech Int.	7

List of Open Electives for M.Tech Int.

S. No.	Subject Code	Name of open Elective Subjects	Type of Subject	Subject offered to Program	Semester
1	AOE0762	Biology for Engineers	Open Elective-II	All Programs except BT	7
2	AOE0765	Human Psychology and Organizational Behaviour	Open Elective-II	All Programs	7
3	AOE0766	Sensor Technologies	Open Elective-II	All Programs	7

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EVALUATION SCHEME
SEMESTER VIII

S. No.	Subject Codes	Subject Name	Type of Subject	Periods			Evaluation Schemes				End Semester		Total	Credit
				L	T	P	CT	TA	TOTAL	PS	TE	PE		
1	AMICSE0801	Computer Vision	Mandatory	3	0	0	30	20	50		100		150	3
2		Open Elective-III	Open Elective	3	0	0	30	20	50		100		150	3
3	AMICSE0851	Computer Vision Lab	Mandatory	0	0	2				25		25	50	1
4	AMICSE0859/ AMICSE0858	Capstone Project/Industrial Internship	Mandatory	0	0	18				100		300	400	8
5	ANC0802/ ANC0801	CRM Fundamentals/ Foundations of Entrepreneurship	Compulsory Audit	2	0	0	30	20	50		50		100	NA
		*Massive Open Online Courses (For B.Tech. Hons. Degree)	*MOOCs											
		TOTAL											**750**	**15**

Abbreviation Used:

L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam., PE: Practical End Semester Exam, CE: Core Elective,OE:Open Elective, DE: Departmental Elective, CA: Compulsory Audit, MOOCs: Massive Open Online Courses.

*** List of Recommended MOOCs (Massive Open Online Courses) for Forth Year Master of Integrated Students (Semester-VIII)**

S.No.	Subject Code	Course Name	University/Industry Partner Name	No. of Hours	Credit
1	AMC0332	Angular	Infosys Wingspan (Infosys Springboard)	36h 43m	3
2	AMC0302	Azure Devops	Infosys Wingspan (Infosys Springboard)	14h 6m	1
3	AMC0303	Decision Trees using Python	Infosys Wingspan (Infosys Springboard)	10h 47m	0.5
4	AMC0300	Fundamentals of Routing	Infosys Wingspan (Infosys Springboard)	83h 30m	4
5	AMC0301	Mobile App Development using Flutter	Infosys Wingspan (Infosys Springboard)	44h 37m	3.5

PLEASE NOTE: -

- **Compulsory Audit Courses (Non Credit -ANC0801/ANC0802)**
  - All Compulsory Audit Courses (a qualifying exam) has no credit.
  - Total and obtained marks are not added in the Grand Total.

List of Open Electives for M.Tech Int.

S. No.	Subject Code	Name of open Elective Subjects	Type of Subject	Subject offered to Program	Semester
1	AOE0871	Nano Technology	Open Elective-III	All Programs except BT	8
2	AOE0872	Wireless communication	Open Elective-III	All Programs except EC,ME,BT, IOT	8
3	AOE0867	Industry 4.0	Open Elective-III	All Programs except ME	8

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AICTE Guidelines in Model Curriculum:

A student will be eligible to get Under Graduate degree with Honours only, if he/she completes the additional MOOCs courses such as Coursera certifications, or any other online courses recommended by the Institute (Equivalent to 20 credits). During Complete B.Tech. Program Guidelines for credit calculations are as follows.

1. For 6 to 12 Hours =0.5 Credit
2. For 13 to18 =1 Credit
3. For 19 to 24 =1.5 Credit
4. For 25 to 30 =2 Credit
5. For 31 to 35 =2.5 Credit
6. For 36 to 41 =3 Credit
7. For 42 to 47 =3.5 Credit
8. For 48 and above =4 Credit

For registration to MOOCs Courses, the students shall follow Coursera registration details as per the assigned login and password by the Institute these courses may be cleared during the B. Tech degree program (as per the list provided). After successful completion of these MOOCs courses, the students shall provide their successful completion status/certificates to the Controller of Examination (COE) of the Institute through their coordinators/Mentors only.

The students shall be awarded Honours Degree as per following criterion.

i. If he / she secures 7.50 as above CGPA.
ii. Passed each subject of that degree program in the single attempt without any grace.
iii. Successful completion of MOOCs based 20 credits.

M.TECH (INT) FOURTH YEAR		
Subject Code: AMICSE0703		**L T P** **3 0 0**
Subject Name: Software Project Management		**Credits** **3**
Course Objective: This course provides an in-depth understanding of the principles, practices, and techniques involved in managing software development projects. Students will learn how to plan, organize, and control software projects, including topics such as project initiation, scope management, scheduling, resource allocation, risk management, and quality assurance.		
Pre- requisites:		
Course Contents/Syllabus		
Unit 1	**Introduction** Overview of software project management Project life cycle models Introduction to project management software tools Identifying project stakeholders and gathering requirements Defining project scope and objectives Role and responsibilities of a software project manager	**8 Hours**
Unit 2	**Project Planning & Resource Management** Work breakdown structure (WBS) and task estimation techniques Developing a project schedule using Gantt charts or project management software Introduction to resource management Resource identification and allocation strategies Managing dependencies and constraints	**8 Hours**
Unit 3	**Project Risk Management** Introduction to Project Risk Management Identifying and assessing project risks Risk Handling and Control Types of Risk Risk Conditions and Decision-Making Content Developing risk mitigation strategies The Concept of Risk Management Risk, Contracts and Procurement	**8 Hours**
Unit 4	**Project Management Organisational Structures and Standards** The Concept of the Organizational Breakdown Structure Organizational Theory and Structures Examples of Organizational Structures Project Management Standards The Concept of Project Time Planning and Control Resource Scheduling & Project Replanning Trade-off Analysis, Probability Analysis	**8 Hours**

	Budgeting and control Introduction to Agile Project Management Scrum Mangement Six Sigma Principles	
Unit 5	**Software Quality & Case Study** Project Termination The place of software quality in project planning The importance of software quality Defining software quality ISO 9126 Practical software quality measures Case Studies	**8 Hours**

Course Outcomes –

CO1	Understand the key concepts and principles of software project management.	K2
CO2	Apply project management frameworks and methodologies to software development projects.	K3
CO3	Analyze & identify the important risks facing in a new project.	K4
CO4	Apply project management tools and techniques.	K3
CO5	Apply appropriate quality testing approaches.	K3

Text Books:

1. Hughes B., Cotterell M., Mall Rajib, "Software Project Management", McGraw Hill, 5th, 2015
2. Walker R., "Software Project Management", Pearson, 2003
3. "What Is Project Management?" [Online] Available from: www.apm.org.uk/WhatIsPM [Accessed 30 May 2013]. PMI (2013).

Reference Books:

1. Thayer R. H.,"Software Engineering Project Management", IEEE CS Press, 2nd edition, 1988
2. Pressman R., "Software Engineering: A Practitioner's Approach", McGraw Hill, 7th, edition, 2010
3. Thayer Richard H., "Software Engineering Project Management", John Wiley & Sons, 2nd edition, 2001

M. TECH (INT) FOURTH YEAR		
Subject Code: AMICSE0702		**L T P** **3 0 0**
Subject Name: Software Engineering and Design		**Credits** **3**
Course Objective: Students will be able to apply the principles of analysis, design, development, test, and maintenance in systematic way to create and build cost effective software solutions and become a successful professional with good fundamental knowledge of software engineering.		
Pre- requisites:		
Course Contents/Syllabus		
Unit 1	**Introduction** Evolving role of software, Software Characteristics, Software crisis, silver bullet, Software myths, Software Engineering Phases, Team Software Process (TSP), emergence of software engineering, Software process, project and product. **Development models** Software Process Models: Waterfall Model, Prototype Model, Spiral Model, Iterative Model, Incremental Model, Agile Methodology: Scrum Artifacts, Scrum Roles and Scrum Events, Kanban framework.	**8 Hours**
Unit 2	**Software Requirement Specifications (SRS):** Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Use Case Diagram, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. **Quality Assurance (SQA):** Quality concepts, SQA activities, Formal approaches to SQA; Statistical software quality assurance; CMM, The ISO standard.	**8 Hours**
Unit 3	**Software Design** Design principles, the design process, Design concepts: refinement, modularity, Cohesion, Coupling, Effective modular design: Functional independence, Design Heuristics for effective modularity. Software architecture: Function Oriented Design, Object Oriented Design, OOPs concepts-Abstraction, object, classification, inheritance, encapsulation, UML Diagrams-Class Diagram, Interaction diagram, Activity Diagram, Control hierarchy: Top-Down and Bottom-Up Design. structural partitioning, software procedure.	**8 Hours**
Unit 4	**Software Testing** Testing Objectives, 7 Principles of Testing, Levels of Testing: Unit Testing, System Testing, Integration Testing, User Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top Down and Bottom-Up, Testing Strategies: Test Drivers and Test Stubs, Accessibility Testing, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Functional Testing (DAO, BO). Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection. Compliance with Design and Coding Standards, Test Management, Test Planning and Estimation, Test Monitoring and Control, Configuration Management, Risks and Testing, Defect Management, Tool Support for Testing, Effective Use of Tools.	**8 Hours**
Unit 5	**Project Maintenance and Management Concepts** Project management concepts, Planning the software project, Estimation: Software Measurement and Metrics, Various Size Oriented Measures-LOC based, FP based, Halestead's Software Science, Cyclomatic Complexity Measures: Control Flow Graphs, Use-case based, empirical estimation COCOMO- A Heuristic estimation techniques, staffing level estimation, team structures, risk analysis and management. Configuration Management, Software reengineering reverse engineering, restructuring forward engineering, Clean Room software engineering. Case Tools, Software Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Need of Maintenance.	**8 Hours**

Course Outcomes –		
CO1	Understand various software characteristics and analyze different software Development Models	K2
CO2	Demonstrate the contents of an SRS and ensure that analysis, design and development meet applicable standards.	K2
CO3	Compare and contrast various methods for software design and create various object-oriented diagrams.	K4
CO4	Apply testing strategies for software systems, apply various testing techniques such as unit testing, test driven development and functional testing.	K3
CO5	Apply the project management concepts and calculate various metrics related to software project	K3

Text Books:

1. Aggarwal K.K. and Singh Yogesh, "Software Engineering", New Age International Publishers, 3rd edition, 2008
2. Pressman RS, "Software Engineering: A Practitioners Approach", McGraw Hill, 7th edition, 2022
3. Mall Rajib, "Fundamentals of Software Engineering", PHI Publication, 4th edition, 2014

Reference Books:

4. Pankaj Jalote, "An Integrated Approach to Software Engineering", Springer , 3rd edition, 2010
5. Ghezzi, M. Jarayeri, D. Manodrioli, "Fundamentals of Software Engineering", PHI Publication, 2nd edition, 2007
6. Kassem Saleh, "Software Engineering", Cengage Learning, 2009
7. Summerville Ian, "Software Engineering", Addison Wesley, 9th edition, 2017

Links: NPTEL/You Tube/Web Link

https://www.mlsu.ac.in/econtents/16_EBOOK-7th_ed_software_engineering_a_practitioners_approach_by_roger_s._pressman_.pdf

https://davcollegetitilagarh.org/wp-content/uploads/2020/09/fundamentals-of-software-engineering-fourth-edition-rajib-mall.pdf

https://handoutset.com/wp-content/uploads/2022/05/An-Integrated-Approach-to-Software-Engineering-Pankaj-Jalote.pdf

https://nptel.ac.in/courses/106105182

https://nptel.ac.in/courses/106101163

M.TECH (INT) FOURTH YEAR		
Course code	**AMICSML0701**	**L T P 3 0 0**
Course title	**Machine Learning**	**Credits 3**

Course objective: To introduction to the fundamental concepts in machine learning and popular machine learning algorithms. To understand the standard and most popular supervised learning algorithm.

Pre-requisites: Basic Knowledge of Machine learning.

Course Contents / Syllabus

Unit-I	**Introduction to Machine Learning** Introduction – Learning, Types of Learning, Well defined learning problems, Designing a Learning System, History of ML, Introduction to Machine Learning Approaches, Introduction to Model Building, Sensitivity Analysis, Underfitting and Overfitting, Bias and Variance, Concept Learning Task, Find – S Algorithms, Version Space and Candidate Elimination Algorithm, Inductive Bias, Issues in Machine Learning and Data Science Vs Machine Learning.	**8 Hours**
Unit-II	**Mining Association and Supervised Learning** Classification and Regression, Regression: Linear Regression, Multiple Linear Regression, Logistic Regression, Polynomial Regression, Decision Trees: ID3, C4.5, CART. **Apriori Algorithm:** Market basket analysis, Association Rules. **Neural Networks**: Introduction, Perceptron, Multilayer Perceptron, Support Vector Machine.	**8 Hours**
Unit-III	**Unsupervised Learning** Introduction to clustering, K-means clustering, K-Nearest Neighbor, Iterative distance-based clustering, Dealing with continuous, categorical values in K-Means, Hierarchical: AGNES, DIANA, Partitional: K-means clustering, K-Mode Clustering, density-based clustering, Expectation Maximization, Gaussian Mixture Models.	**8 Hours**
Unit-IV	**Probabilistic Learning & Ensemble** Bayesian Learning, Bayes Optimal Classifier, Naive Bayes Classifier, Bayesian Belief Networks. **Ensembles methods:** Bagging & boosting, C5.0 boosting, Random Forest, Gradient Boosting Machines and XGBoost.	**8 Hours**
Unit-V	**Reinforcement Learning & Case Studies** **Reinforcement Learning:** Introduction to Reinforcement Learning, Learning Task, Example of Reinforcement Learning in Practice, Learning Models for Reinforcement – (Markov Decision process, Q Learning – Q Learning function, QLearning Algorithm), Application of Reinforcement Learning. **Case Study:** Health Care, E-Commerce, Smart Cities.	**8 Hours**

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

CO1	Understanding utilization and implementation of proper machine learning algorithm.	K2
CO2	Understand the basic supervised machine learning algorithms.	K2

CO3	Understand the difference between supervised and unsupervised learning.	K2
CO4	Apply a comprehensive understanding of machine learning algorithms and the mathematical principles that underpin them for practical implementation.	K2
CO5	Apply an appreciation for what is involved in learning from data.	K3

Text books:

1) Marco Gori , Machine Learning: A Constraint-Based Approach, Morgan Kaufmann. 2017
2) Ethem Alpaydin, Machine Learning: The New AI, MIT Press-2016
3) Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, 1995
4) Tom M. Mitchell, "Machine Learning", McGraw-Hill, 2010

Reference Books:

1) Ryszard, S., Michalski, J. G. Carbonell and Tom M. Mitchell, Machine Learning: An Artificial Intelligence Approach, Volume 1, Elsevier. 2014
2) Stephen Marsland, Taylor & Francis 2009. Machine Learning: An Algorithmic Perspective.
3) Ethem Alpaydin, (2004) "Introduction to Machine Learning (Adaptive Computation and Machine Learning)", The MIT Press.
4) Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies 1st Edition by John D. Kelleher

Links:

https://www.youtube.com/watch?v=fC7V8QsPBec&list=PL1xHD4vteKYVpaIiy295pg6_SY5qznc77&index=2

https://www.youtube.com/watch?v=OTAR0kT1swg&list=PL1xHD4vteKYVpaIiy295pg6_SY5qznc77&index=3
https://www.youtube.com/watch?v=OCwZyYH14uw
https://www.youtube.com/watch?v=9_LY0LiFqRQ
https://www.youtube.com/watch?v=EYeF2e2IKEo
https://www.youtube.com/watch?v=_PwhiWxHK8o
https://www.youtube.com/watch?v=wTF6vzS9fy4
https://www.youtube.com/watch?v=lt65K-REdHw

https://www.youtube.com/watch?v=HTSCbxSxsg&list=PL1xHD4vteKYVpaIiy295pg6_SY5qznc77&index=4
https://www.youtube.com/watch?v=NnlS2BzXvyM
https://www.youtube.com/watch?v=7enWesSofhg

https://youtu.be/rthuFS5LSOo
https://youtu.be/kho6oANGu_A

https://www.youtube.com/watch?v=9vMpHk44XXo&list=PL1xHD4vteKYVpaIiy295pg6_SY5qznc77&index=5
Reinforcement Learning Tutorial | Reinforcement Learning Example Using Python | Edureka - YouTube Association Rule Mining – Solved Numerical Question on Apriori Algorithm(Hindi) - YouTube
Q Learning Explained | Reinforcement Learning Using Python | Q Learning in AI | Edureka - YouTube

M.TECH (INT) FOURTH YEAR

Subject Code-AMICSE0752	**L T P** **0 0 2**
Subject Name- Software Engineering and Design Lab	**Credits** **1**

Course Objective- With the help of modern CASE tools, students will learn how to go through the entire process of software development, from identifying a problem to creating a finished and high-quality product.

Course Outcomes:

CO1	Identify ambiguities, inconsistencies, and incompleteness from a requirements specification and state functional and non-functional requirement	K2
CO2	Graphically represent various UML diagrams and associations among them.	K2
CO3	Able to use modern engineering tools for specification, design, implementation and testing	K3

List of Practicals

Lab No.	**Unit**	**Topic**	**Program Logic Building**	**CO Mapping**
1	2	Requirement Gathering	Find the real-world problem and create the requirement statements.	CO1
2	2	Requirement Engineering	Draw the use case diagram for assigned project.	CO2
3	2	Requirement analysis	Draw the Data Flow Diagram (DFD): All levels.	CO2
4	2	Requirement analysis	Design an ER diagram for with multiplicity.	CO2
5	2	Requirement analysis	Prepare SRS document in line with the IEEE recommended standards.	CO2
6	3	Design	Create Flowchart diagram for the assigned project	CO2
7	3	Object oriented design	Create Object diagram for the assigned project	CO2
8	3	Object oriented design	Create Class diagram for the assigned project.	CO2
9	3	Software design	Create State chart diagram assigned project.	CO2
10	3	Software design	Create Interaction diagram: sequence diagram.	CO2
11	3	Software design	Create Interaction diagram: collaboration diagram.	CO2
12	3	Software design	Create Activity diagram for the assigned project.	CO2

13		Software design	Create Timing diagram for the assigned project	CO2
14	3	Software design	Create Component diagram for the assigned project.	CO2
15	3	Software design	Create Deployment diagram for the assigned project.	CO2
16	4	Software testing	Estimation of Test Coverage Metrics and Structural Complexity.	CO3
17	4	Test cases	Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on boundary-value analysis, execute the test cases, and discuss the results.	CO3
18	4	Black box Testing	Design, develop, code, and run the program in any suitable language to solve the commission problem. Analyz it from the perspective of boundary value testing, derive different test cases, execute these test cases, and discuss the test results.	CO3
19	4	equivalence class partitioning	Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on equivalence class partitioning, execute the test cases, and discuss the results.	CO3
20	4	decision-table based testing	Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Derive test cases for your program based on decision-table approach, execute the test cases, and discuss the results.	CO3
21	4	Path testing	Create test cases for a program which determine whether an integer is prime or not by using path testing.	CO3
22	4	White box testing	Create test cases for a program which determine whether an integer is prime or not by using Cyclomatic complexity.	CO3

23	4	DC path testing	Consider a program to input two numbers and print them in ascending order. Find all du paths and identify those du-paths that are not feasible. Also find all dc paths and generate the test cases for all paths (dc paths and non dc paths).	CO3
24	4	White box testing	Consider the code to arrange the nos. in ascending order. Generate the test cases for loop coverage and path testing. Check the adequacy of the test cases through mutation testing and compute the mutation score for each.	CO3
25	4	Test case preparation	Write Test cases for any Known Application (e.g., Banking Application)	CO3
26	4	Test Plan	Create a test plan document for any application (e.g., Library Management System)	CO3
27	4	Testing Tools	Study of any testing tool (e.g., Win Runner)	CO3
28	4	Testing Tools	Study of any bug tracking tool (e.g., Bugzilla, Bug bit)	CO3
29	4	Testing Tools	Study of any test management tool (e.g., Test Director)	CO3
30	4	Testing Tools	Study of any open source-Testing tool (e.g., Test link, Test Rail)	CO3
31	4	Testing Tools	Study of any web testing tool (e.g., Selenium)	CO3
32	5	Mini Project	Mini Project with CASE tools.	CO3
33	5	Case study	Case Study Provided by Industry.	CO3

M.TECH (INT) FOURTH YEAR		
Course code	**AMICSML0751**	**L T P** **0 0 2**
Course title	**Machine Learning Lab**	**Credit** **1**

List of Experiments:

Sr. No.	Name of Experiment	CO
1	Write a program to perform various types of regression (Linear & Logistic).	CO2
2	Implement Apriori algorithm using sample data in Python.	CO1
3	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.	CO2
4	Write a program to implement k-Nearest Neighbour algorithm to classify the iris dataset. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.	CO1
5	Apply EM algorithm to cluster a set of data. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.	CO3
6	Implement Support Vector Machine using Scikit-learn.	CO1
7	Implement the non-parametric Locally Weighted Regression algorithm to fit data points. Select appropriate data set for your experiment and draw graphs.	CO1
8	Implement Gradient Boosting Machine Ensemble in Python.	CO1
9	Implement of ANN algorithm using a sample dataset.	CO2
10	Implement naïve Bayesian Classifier model. Write the program to calculate the accuracy, precision, and recall for your data set.	CO3

Lab Course Outcome:

CO1	Understand the implementation procedures for the machine learning algorithms.	K2
CO2	Identify and apply Machine Learning algorithms to solve real-world problems.	K3
CO 3	Examine the requirements on special databases.	K4

M.TECH (INT) FOURTH YEAR		
Subject Code : AMICSE0712		**L T P** **3 0 0**
Subject Name: RPA Implementation		**Credits** **3**
Course Objective: This course is designed to give a thorough understanding and practical skills in developing and deploying software robots for Robotic Process Automation (RPA).		
Pre- requisites: Basic Knowledge of C Programming		
Course Contents/Syllabus		
Unit 1	**Data Manipulation:** Introduction to Data Manipulation, Scalar variables, collections and Tables, Text Manipulation, Data Manipulation, Gathering and Assembling Data Recording and Advanced UI Interaction; Recording Introduction, Basic and Desktop Recording, Web Recording, Input/output Methods, Screen Scraping, Data Scraping, Scraping advanced techniques	**8 Ho urs**
Unit 2	**Selectors:** Selectors, Defining and Assessing Selectors, Customization, Debugging, Dynamic Selectors, Partial Selectors, RPA Challenge, Image, Text & Advanced Citrix Automation, Introduction to Image & Text Automation, Image-based automation, Keyboard based automation, Information Retrieval, Advanced Citrix Automation challenges, Best Practices using tab for Images Starting Apps	**8 Hours**
Unit 3	**Data Tables and Automation:** Excel Data Tables & PDF, Data Tables in RPA, Excel and Data Table Basics Data Manipulation in Excel, Extracting Data from PDF, extracting a single piece of data, Anchors, Using anchors in PDF Email Automation**:** Email Automation, Incoming Email automation, Sending Email automation	**8 Hours**
Unit 4	**Debugging and Exception Handling:** Debugging Tools, Strategies for solving issues, Catching errors. Orchestrator: Tenants, Authentication, Users, Roles, Robots, Environments, Queues & Transactions, Schedules	**8 Hours**
Unit 5	**Robotic Framework:** Re-Framework template, Re-Framework template works, Use Re-Framework to automate your own processes. .NET Classes and Objects	**8 Hours**
Course Outcomes:		
CO1	Apply the concepts and methods for data manipulation.	K3
CO2	Learn basic implementation of Selectors.	K2
CO3	Implement the knowledge of RPA tools, and functions in various industries	K4
CO4	Gain expertise in Desktop, Web & Citrix Automation and use RE-Framework to build a structured business automation process.	K2
CO5	Develop a real-world workflow automation project and will be able to debug a workflow.	K5
Textbooks:		
4. Jain Vaibhav, “Crisper Learning: For UiPath”, Latest Edition, Independently Published, 2018.		
5. Tripathi Alok Mani, “Learning Robotics Process Automation”, Latest Edition, Packt Publishing ltd, Birmingham. March 2018		

Reference Books/E-Books:
1. Wibbenmeyer Kelly, “The Simple Implementation Guide to Robotic Process Automation (RPA)”, Latest Edition, iUniverse Press, 2018.
2. https://www.uipath.com/hubfs/ebook-its-time-to-automate.pdf
Links: NPTEL/You Tube/Web Link
https://www.youtube.com/watch?v=6QoCG6YIPVo&list=PL41Y-9S9wmyJarNN2KnB4XudpT1yE1kVd
https://www.youtube.com/watch?v=YOHFgrOvPTM&list=PL41Y-9S9wmyLvF6Ou0oPhg6MrFWSw7sn4
https://www.youtube.com/watch?v=QMBuyLMjOhM&list=PL41Y-9S9wmyIYX6kciM8DboVYymsv2y6K
https://www.youtube.com/watch?v=KE9raKNTkfI&list=PL41Y-9S9wmyLeXL1DY9j-XepNb_vg9N8t
https://www.youtube.com/watch?v=2rjr8QhD9oc&list=PL41Y-9S9wmyJi2zmWY77yPZrdVI7ab3Ja

M.TECH (INT) FOURTH YEAR		
Subject Code: AMICSAI0713		**L T P 3 0 0**
Subject Name: Programming for Data Analytics		**Credits 3**
Course objective: This course aims to equip students with the knowledge of statistical data analysis techniques relevant to business decision-making, empowering them to apply Data Science principles in analyzing and resolving business problems. By the end of the course, students will be well-prepared to make informed decisions in a data-driven business landscape.		
Pre-requisites: Basic Knowledge of Python and R		
Course Contents / Syllabus		
Unit 1	**Basic Data Analysis Using Python/R** Pandas data structures – Series and Data Frame, Data wrangling using pandas, Statistics with Pandas, Mathematical Computing Using NumPy, Data visualization with Python Descriptive and Inferential Statistics, Introduction to Model Building, Probability and Hypothesis Testing, Sensitivity Analysis, Regular expression: RE packages.	**8 Hours**
Unit 2	**R Graphical User Interfaces** Built-in functions, Data Objects-Data Types & Data Structure, Structure of Data Items, Manipulating and Processing Data in R using Dplyr package & Stringr package, Building R Packages, Running and Manipulating Packages, data import and export, attribute and data types, descriptive statistics, exploratory data analysis, Flexdashboard, and R-shiny.	**8 Hours**
Unit 3	**Data Engineering Foundation** Connecting to a database (sqlite) using Python, Sending DML and DDL queries and processing the result from a Python Program, Handling error, NOSQL query using MongoDB, MongoDB Compass.	**8 Hours**
Unit 4	**Introduction to Tensor Flow And AI** Introduction, Using TensorFlow for AI Systems, Up and Running with TensorFlow, Understanding TensorFlow Basics, Convolutional Neural Networks, Working with Text and Sequences, and Tensor Board Visualization, Word Vectors, Advanced RNN, and Embedding Visualization. TensorFlow Abstractions and Simplifications, Queues, Threads, and Reading Data, Distributed TensorFlow, Exporting and Serving Models with TensorFlow.	**8 Hours**
Unit 5	**Deep Learning with Keras** Introducing Advanced Deep Learning with Keras, Deep Neural Networks, Autoencoders, Generative Adversarial Networks (GANs), Improved GANs, Disentangled Representation GANs, Cross-Domain GANs, Variational Autoencoders (VAEs), Deep Reinforcement Learning, Policy Gradient Methods.	**8 Hours**

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

CO1	Install, Code and Use Python & R Programming Language in R Studio IDE to perform basic tasks on Vectors, Matrices and Data frames.	K1
CO2	Implement the concept of the R packages.	K3
CO3	Understand the basic concept of the MongoDB.	K2
CO4	Understand and apply the concept of the RNN and tensorflow.	K4
CO5	Understand and evaluate the concept of the keras in deep learning.	K5

Textbooks:

1.Glenn J. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley Publishers, 2007.

2.Learning TensorFlow by Tom Hope, Yehezkel S. Resheff, Itay Lieder O'Reilly Media, Inc.

3.Advanced Deep Learning with TensorFlow 2 and Keras: Apply DL, GANs, VAEs, deep RL, unsupervised learning, object detection and segmentation, and more, 2nd Edition.

4.Glenn J. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley Publishers, 2007.

Reference Books:

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", 1 st Edition, Wrox, 2013.
2. Chris Eaton, Dirk Deroos et. al., "Understanding Big data", Indian Edition, McGraw Hill, 2015.
3. Tom White, "HADOOP: The definitive Guide", 3 rd Edition, O Reilly, 2012

Links:

https://www.ibm.com/cloud/blog/python-vs-r

https://www.youtube.com/watch?v=C5R5SdYzQBI

https://hevodata.com/learn/data-engineering-and-data-engineers/

https://www.youtube.com/watch?v=IjEZmH7byZQ

https://www.youtube.com/watch?v=pWp3PhYI-OU

M.Tech (Int) IV Year VII Semester		
Subject Code: AMICSE0713		**L T P** **3 0 0**
Subject Name:Web Development using MERN Stack with DevOps		**Credits** **3**
Course Objective: This course focuses on how to design and build static as well as dynamic web pages and interactive web applications. Students can understand how to put them together to create a MERN stack application.		
Pre- requisites: Student should have the knowledge of HTML, CSS and ES6		
Course Contents/Syllabus		
Unit-1	**Introduction to React JS:** Overview of frameworks, NPM commands, React App, Project Directory Structure, React Component Basic, Understanding JSX, Props and State, Stateless and Stateful Components, Component life cycle, Hooks, react-router vs react-router-dom,	**8 Hours**
Unit-2	**Connecting React with mongodB:** Google Material UI, AppBar, Material UI's Toolbar, NavBar, Material UI Buttons, SQL and Complex Transactions, Dynamic Schema, create Index (), get Indexes () & drop Index (), Replication, Statement-based vs. Binary Replication, Auto-Sharding and Integrated Caching, Load balancing, Aggregation, scalability.	**8 Hours**
Unit-3	**Node js & Express Framework:** Introduction, Environment Setup, serving static resources, template engine with vash and jade, Connecting Node.js to Database, Mongoose Module, Creating Rest APIs, Express Framework, MVC Pattern, Routing, Cookies and Sessions, HTTP Interaction, User Authentication	**8 Hours**
Unit-4	**Evolution of DevOps:** DevOps Principles, DevOps Lifecycle, DevOps Tools, and Benefits of DevOps, SDLC (Software Development Life Cycle) models, Lean, ITIL and Agile Methodology, Agile vs DevOps, Process flow of Scrum Methodologies, Project planning, scrum testing, sprint Planning and Release management, Continuous Integration and Delivery pipeline.	**8 Hours**
Unit-5	**CI/CD concepts (GitHub, Jenkins, Sonar):** GitHub, Introduction to Git, Version control system, Jenkins Introduction, Creating Job in Jenkins, adding plugin in Jenkins, Creating Job with Maven & Git, Integration of Sonar, Dockers, Containers Image: Run, pull, push containers, Container lifecycle, Introduction to Kubernetes.	**8 Hours**
Course Outcomes –		
CO1	Apply the knowledge of ES6 that are vital to implement react application over the web.	K3
CO2	Implement and understand the impact of web designing by database connectivity with Mongodb .	K3
CO3	Explain, analyze and apply the role of server-side scripting language like Nodejs and Express js framework	K4
CO4	Identify the benefits of DevOps over other software development processes to Gain insights into the DevOps environment.	K2
CO5	Demonstrate popular open-source tools with features and associated terminology used to perform Continuous Integration and Continuous Delivery.	K3

Textbooks:

1. Kirupa Chinnathambi, “Learning React”, 2nd Edition 2016, Addison Wesley Publication.
2. Mohan Mehul, “Advanced Web Development with React”, 2nd Edition 2020, BPB Publications.
3. Dhruti Shah, “Comprehensive guide to learn Node.js”, 1st Edition, 2018 BPB Publications.
4. Jennifer Davis, Ryn Daniels, “Effective DevOps: Building, Collaboration, Affinity, and Tooling at Scale”,1st Edition, 2016, O'Reilly Media Publication.
5. John Edward Cooper Berg, “DevOps. Building CI/CD Pipelines with Jenkins, Docker Container, AWS (Amazon Web Services) ECS, JDK 11, Git and Maven 3, Sonar, Nexus”, Kindle Edition,2019, O'Reilly Media Edition.

Reference Books:

8. Anthony Accomazzo, Ari Lerner, and Nate Murray, “Fullstack React: The Complete Guide to ReactJS and Friends”, 4th edition, 2020 International Publishing.
9. David Cho, “Full-Stack React, Type Script, and Node: Build cloud-ready web applications using React 17 with Hooks and GraphQL”, 2nd edition, 2017 Packt Publishing Limited.
10. Richard Haltman & Shubham Vernekar, “Complete node.js: The fast guide: Learn complete backend development with node.js”5th edition, 2017 SMV publication.
11. Glenn Geenen, Sandro Pasquali, Kevin Faaborg, “Mastering Node.js: Build robust and scalable real-time server-side web applications efficiently” 2nd edition Packt,2017 Publishing Limited.
12. Greg Lim,” Beginning Node.js, Express & MongoDB Development, kindle edition,2019 international publishing.
13. Daniel Perkins, “ReactJS Master React.js with simple steps, guide and instructions” 3rd edition, 2015 SMV publication.
14. Peter Membrey, David Hows, Eelco Plugge, “MongoDB Basics”, 2nd edition ,2018 International Publication.

Links: NPTEL/You Tube/Web Link:

https://youtu.be/QFaFIcGhPoM?list=PLC3y8-rFHvwgg3vaYJgHGnModB54rxOk3
https://youtu.be/pKd0Rpw7O48
https://youtu.be/TlB_eWDSMt4
https://youtu.be/QFaFIcGhPoM

https://youtu.be/Kvb0cHWFkdc
https://youtu.be/pQcV5CMara8
https://youtu.be/c3Hz1qUUIyQ
https://youtu.be/Mfp94RjugWQ
https://youtu.be/SyEQLbbSTWg

https://youtu.be/BLl32FvcdVM
https://youtu.be/fCACk9ziarQ
https://youtu.be/YSyFSnisip0
https://youtu.be/7H_QH9nipNs
https://youtu.be/AX1AP83CuK4

https://youtu.be/2N-59wUIPVI
https://youtu.be/hQcFE0RD0cQ
https://youtu.be/UV16BbPcMQk
https://youtu.be/fqMOX6JJhGo

https://youtu.be/m0a2CzgLNsc
https://youtu.be/1ji_9scA2C4
https://youtu.be/tuIZok81iLk
https://youtu.be/IluhOk86prA
https://youtu.be/13FpCxCClLY

M. TECH INTEGRATED FOURTH YEAR		
Subject Code: ANC0701		**L T P 2 0 0**
Subject Name: Foundations of Entrepreneurship		
Course Objective: The objective of this course is to make students understand and explore the dimensions of entrepreneurship; develop an understanding of intellectual property rights and be familiar with the financial support associated with new venture startups, Understand the various sources of idea generation and screening and to create awareness on the policy framework for promoting entrepreneurship and providing finance to entrepreneurs.		
Course Contents/Syllabus		
Unit- 1	**Introduction to Entrepreneurship** **About Entrepreneurship:** Concept of Entrepreneurship - Role of Entrepreneurship in Economic Development -Entrepreneurial decision process – Entrepreneurial traits, types, culture and structure, competing theories of Entrepreneurship About Entrepreneurs: — Qualities of a successful entrepreneur - Entrepreneurial motivation –Corporate Entrepreneurship and Intrapreneurship	**5 Hours**
Unit- 2	**Intellectual Property Rights** **About IPR:** Introduction to intellectual property rights (IPR), intellectual property and its protection, Forms of Protection depending on the product; Patent, copyright, trademark, design know-how, trade secrets, etc.	**6 Hours**
Unit -3	**Launching a New Venture** **Business Plan:** The business plan, Business Planning Process: elements of business planning, preparation of project plan, components of an ideal business plan – market plan, financial plan, operational plan **Feasibility Analysis:** Feasibility Analysis – aspects and methods: Economic, financial, and market analysis - and technological feasibility. Forms of ownership and understanding phases of Business unit: Various Forms of business ownership, Registration of business units; start-up to going IPO; revival, exit, and end to a venture.	**8 Hours**
Unit - 4	**Idea Generation and Screening** **Methods of Generating Ideas:** Linear techniques – Morphological Analysis, Attribute Listing, Scamper, Alternative Scenarios, Forced Association, Value Analysis **Product Planning and Development Process:** Establishing evaluation criteria, idea Stage, Concept Stage, Product Development Stage and Test marketing and commercialization.	**7 Hours**
Unit - 5	**Entrepreneurial Finance, Assistance and Entrepreneurial Development Agencies** **Sources of finance:** Banks and financial institutions – IFCI, ICICI, IDBI and SIDBI), financing of Small Business Role of central government and State Government in promoting entrepreneurship **Entrepreneurial Development Agencies:** Overview of MSME policy of government in India. Role of agencies assisting Entrepreneurship: DICs, SSIs, NSICs, Entrepreneurship Development Institute (EDI).	**4 Hours**

Course Outcomes:		
CO1	Develop an understanding of basic concepts of entrepreneurship.	K2
CO2	Develop an understanding on fundamentals of Intellectual Property Reghts.	K2
CO3	Evaluating and understanding a holistic approach of launching a new business venture.	K4
CO4	Understanding of converting an idea to an opportunity and various funding sources.	K2
CO5	Develop knowledge on Entrepreneurial Finance, Assistance and the role of Entrepreneurial Development Agencies.	K5

Textbooks:

1. Hisrich, R.D., Peters, M.P., & Shepherd, D. A., "Entrepreneurship", Mc.Graw- Hill, 2023

2. Bamford, C.E., & Burton, G. D.,"Entrepreneurship: the art, science, and process for success". Mcgraw-Hill, 2021

Reference Books/E-Books:

1. Rickman, C. D., "How to start your own business : ... and make it work". Dk Publishing, 2021

2. Barringer, B. R., & R Duane Ireland, "Entrepreneurship successfully launching new ventures" Harlow London New York, Ny Boston [U.A.] Pearson, 6th ed., 2019

Links: NPTEL/You Tube/Web Link

https://www.firstrepublic.com/insights-education/five-types-of-entrepreneurship-meaning-and-defining-characteristics

https://msme.gov.in/sites/default/files/MSME_Schemes_English_0.pdf

https://www.greyb.com/blog/morphological-analysis/#:~:text=Morphological%20analysis%20is%20all%20about,units%20to%20solve%20a%20problem

M.TECH (INT) FOURTHYEAR	
Subject Code: ANC0702	**L T P** **3 0 0**
Subject Name: CRM Fundamentals	

Course objective:

This course is designed to help in understanding the fundamentals of CRM. It will help in providing better services for Sales, Marketing and Customer Relations in an Enterprise. To make the students understand the organizational need, benefits and process of creating long-term value for individual customers. To disseminate knowledge regarding the concept of e-CRM and e-CRM technologies. To enable the students understand the technological and human issues relating to implementation of Customer Relationship Management in the organizations.

Pre-requisites: None

Course Contents / Syllabus

Unit-1	**Introduction** CRM- definition, history, goals. Sources of CRM value. Components of CRM: people, process, technology. Evolution of CRM: marketing and its principles, customer relations to CRM.Dynamics of Customer Supplier Relationships, Nature and context of CRM, Strategy and Organization of CRM: strategy, The relationship-oriented organization: Mission, Culture, Structure, People, Communication & Information Systems.	**8 Hours**
Unit-2	**CRM Strategy and Framework** Developing a CRM strategy. Customer oriented (C in CRM), Relationship driven, 360 degree view of customer. CRM system features- functions, application, benefits and solutions. Importance of loyalty- active, passive, split, shifting and switchers, customer profiling, customer segmentation model, Customer Experience, relationship marketing and journey, Case study.	**8 Hours**
Unit-3	**Solution Design and Architecture** CRM system solution- specifications, Data Analysis, Solution Requirements. Types of CRM- On-Premise, cloud based. Pros and Cons of each. Integration CRM with other enterprise applications. The Technology of CRM: Data warehouses and customer relationships, creating data mart model, components of operational data warehouse.	**8 Hours**
Unit-4	**CRM for Business** CRM in Sales, Service, Marketing, E-commerce. Social Customer Relationship Management. Analytical CRM: Predictive Analytics vs Operational Analytics. Channel Partner Relationship management, Collaborative CRM (using data pooling), Business Benefits of Cloud Based System, SLAs, Practical Challenges.	**8 Hours**
UNIT-5	**CRM implementation** Building CRM roadmaps: current processes, customers, strategic goals, technology issues, pilot and proof of concept projects. Preliminary Roadmap and its template, developing roadmap midstream. Design stage, custom development, integration, reporting, data migration, and implementation, testing, launching and application management. Introduction to following CRM tools:	**8 Hours**

	ZOHO, Pega, Microsoft Dynamics 365, Sales force.	
Course Outcome:	At the end of course, the student will be able	
CO 1	Understand the basic concepts of Customer relationship management.	K2
CO 2	To understand strategy and framework of Customer relationship management.	K2
CO 3	Learn basics of Cloud Based Customer relationship management.	K1
CO 4	Understand Customer relationship management in context with business use cases.	K3
CO 5	Understand implementation basics of CRM.	K3

Text books:

1. CRM Fundamentals by Scott Kostojohn Mathew Johnson Brian Paulen. Apress, 2011.
2. Customer Relationship Management- How to develop and execute a CRM strategy By Michael Pearce, Business Expert Press, 2021.

Reference Books:

1. The CRM Handbook-A Business Guide to Customer Relationship Management by Jill Dyché; Addison-Wesley (for case studies)
2. Customer Relationship Management Systems handbook by Duane E Sharp. Auerbach Publications by CRC Press Company

NPTEL/ YouTube/ Faculty Video Link:

https://onlinecourses.nptel.ac.in/noc20_mg57/preview
https://archive.nptel.ac.in/courses/110/105/110105145/

M. TECH (INT) FOURTH YEAR		
Subject Code: AMICSE0801		**L T P** **3 0 0**
Subject Name: Computer Vision		**Credits** **3**
Course Objective: To learn about key features of Computer Vision, design, implement and provide continuous improvement in the accuracy and outcomes of various datasets with more reliable and concise analysis results.		
Pre- requisites: Basic Knowledge of programming language Python/ Advanced Python features/ Libraries/		
Course Contents/Syllabus		
Unit -1	**Introduction to Computer Vision** Computer Vision, Research and Applications, (Self-Driving Cars, Facial Recognition, Augmented & Mixed Reality, Healthcare). Most popular examples Categorization of Images, Object Detection, Observation of Moving Objects, Retrieval of Images Based on Their Contents, Computer Vision Tasks classification, object detection, Instance segmentation. Convolutional Neural Networks, Evolution of CNN Architectures for Image, Recent CNN	**8 Hours**
Unit -2	**Architectures** Representation of a Three-Dimensional Moving Scene. Convolutional layers, pooling layers, and padding. Transfer learning and pre-trained models Architectures. Architectures Design: LeNet-5, AlexNet, VGGNet, GoogLeNet, ResNet, Efficient Net, Mobile Net, RNN Introduction.	**8 Hours**
Unit -3	**Segmentation** Popular Image Segmentation Architectures, FCN Architecture, Upsampling Methods, Pixel Transformations, Geometric Operations, Spatial Operations in Image Processing, Instance Segmentation, Localisation, Object detection and image segmentation using CNNs, LSTM and GRU's. Vision Models, Vision Languages, Quality Analysis, Visual Dialogue, Active Contours & Application, Split & Merge, Mean Shift & Mode Finding, Normalized Cuts.	**8 Hours**
Unit -4	**Object Detection** Object Detection and Sliding Windows, R-CNN, Fast R-CNN, Object Recognition, 3-D vision and Geometry, Digital Watermarking. Object Detection, face recognition instance Recognition, Category Recognition Objects, Scenes, Activities, Object classification.	**8 Hours**
Unit -5	**Visualization and Generative Models** Benefits of Interpretability, Fashion MNIST, Class Activation, Map code walkthrough, GradCAM,ZFNet. Introduction about Deep Generative Models, Generative Adversarial Networks Combination VAE and GAN's, other VAE and GAN's deep generative models. GAN Improvements, Deep Generative Models across multiple domains,Deep Generative Models image and video applications.	**8 Hours**
Course Outcomes –		

CO1	Analyse knowledge of deep architectures used for solving various Vision and Pattern Association tasks.	K4
CO2	Develop appropriate learning rules for each of the architectures of perceptron and learn about different factors of back propagation.	K3
CO3	Deploy training algorithm for pattern association with the help of memory network.	K5
CO4	Design and deploy the models of deep learning with the help of use cases.	K5
CO5	Understand, Analyse different theories of deep learning using neural networks.	K4

Text Books:

1. "Introductory Techniques for 3D Computer Vision", edition 2009
2. Szelisk Richard, "Computer Vision: Algorithms and Applications", 2022, The University of Washington Edition, 2022
3. Forsyth D. and Ponce J., "Computer Vision - A Modern Approach", Prentice Hall,, Edition 2015
4. Trucco E. and Verri A., "Introductory Techniques for 3D Computer Vision", Prentice Hall.
5. Davies E. R., "Computer & Machine Vision", Academic Press 4th Edition 2012
6. Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press Edition, 2012

Reference Books:

1. Forsyth D. and Ponce J., "Computer Vision: A Modern Approach", Prentice Hall, 2nd edition, 2015
2. "Prince, Simon J.D. "Computer Vision: Models, Learning, And Inference". Cambridge University Press, 1st Edition, 2012.
3. Ballard D. H., Brown C. M., "Computer Vision", Prentice-Hall, 2008.
4. Craig Alan B., "Understanding Augmented Reality, Concepts and Applications", Morgan Kaufmann, Edition 2013
5. Richard Szeliski, "Computer Vision: Algorithms and Applications (CVAA)", Springer edition, 2022

Links: NPTEL/You Tube/Web Link

https://nptel.ac.in/courses/106/105/106105216/ 2023
https://onlinecourses.nptel.ac.in/noc23_ee78/preview/

https://nptel.ac.in/courses/106/106/106106224/2023
https://nptel.ac.in/courses/108103174

https://nptel.ac.in/courses/106/106/106106224/ 2023
https://onlinecourses.nptel.ac.in/

M.TECH (INT) FOURTH YEAR	
Subject Code: AMICSE0851	**L T P** **0 0 2**
Subject Name: Computer Vision Lab	**Credits** **1**
Course Objective: Through practical programming exercises, students will deepen their understanding CNN, Segmentation, Image Compression based models. They will be exposed to various practical considerations, using autoencoders. Study of various advanced topics which are crucial for making deep learning systems perform well in practice.	

Course outcome: After completion of this practical, students will be able to :

CO 1	Implement a various convolutional neural network and understand its architecture.	K3
CO 2	Apply image Modelling acquisition, Segmentation and develop a programming model to implement an Image morphological features.	K3
CO 3	Understand Visualization of various models and Deep GAN Networks .	K2

List of Practical

Lab No.	Program Logic Building	CO Mapping
1	Building a simple convolutional neural network for spam classification.	CO1
2	Building a simple convolutional neural network for image classification.	CO1
3	Implementing different types of pooling layers and comparing their effects on network performance.	CO2
4	Training a CNN model on a large-scale image classification dataset using cloud-based GPU acceleration.	CO1
5	Building a simple convolutional neural network for Cats-v-dogs classification	CO1
6	Fine-tuning a pre-trained CNN for a specific image recognition task.	CO1
7	Building a simple convolutional neural network for transfer learning using finetuning.	CO1
8	Building a simple convolutional neural network for transfer learning using feature extraction.	CO1
9	Building a CNN model for object detection using a pre-trained architecture like YOLO.	CO1
10	Exploring different activation functions and comparing their effects on network performance.	CO1
11	Write a program to Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.	CO1
12	Implement a program for basic image operations.	CO2

13	Implement a program for image enhancement	CO2
14	Implement a program for image compression	CO2
15	Implement a program for color image processing	CO2
16	Implement a program for image segmentation	CO2
17	Design a program for image morphology	CO2
18	Implementing De-noising auto encoder.	CO2
19	Implementing Deep auto encoder.	CO2
20	Implementing convolutional auto encoder.	CO2
21	Implementing feature extraction for classification using auto encoder.	CO3
22	Implementing feature extraction for regression using auto encoder.	CO3
23	Perform scaling, rotation and shifting operations on an image using OpenCV()	CO3
24	Perform image reflection on an image using OpenCV().	CO3
25	Implementing a basic Variational Autoencoder (VAE) for image generation	CO3
26	Training a Generative Adversarial Network (GAN) to generate synthetic images.	CO3
27	Implement and apply using Image Restoration	CO3
28	Implement and apply using Edge detection	CO3
29	Perform Image shearing on an image using OpenCV().	CO3
30	Write a function for all the geometric transformations and apply it to any image	CO3

Links:
https://nptel.ac.in/courses/106/105/106105216/ 2023 https://onlinecourses.nptel.ac.in/noc23_ee78/preview/
https://nptel.ac.in/courses/106/106/106106224/2023 https://nptel.ac.in/courses/108103174
https://nptel.ac.in/courses/106/106/106106224 https://onlinecourses.nptel.ac.in/noc21_cs93/preview

M. TECH (INT) FOURTH YEAR		
Subject Code: ANC0801		**L T P** **2 0 0**
Subject Name: Foundation of Entrepreneurship		
Course Objective: The objective of this course is to make students understand and explore the dimensions of entrepreneurship; develop an understanding of intellectual property rights and be familiar with the financial support associated with new venture startups, Understand the various sources of idea generation and screening and to create awareness on the policy framework for promoting entrepreneurship and providing finance to entrepreneurs.		
Course Contents/Syllabus		
Unit -1	**Introduction to Entrepreneurship** **About Entrepreneurship:** Concept of Entrepreneurship - Role of Entrepreneurship in Economic Development -Entrepreneurial decision process – Entrepreneurial traits, types, culture and structure, competing theories of Entrepreneurship About Entrepreneurs: — Qualities of a successful entrepreneur - Entrepreneurial motivation –Corporate Entrepreneurship and Intrapreneurship	**5 Hours**
Unit -2	**Intellectual Property Rights** **About IPR:** Introduction to intellectual property rights (IPR), intellectual property and its protection, Forms of Protection depending on the product; Patent, copyright, trademark, design know-how, trade secrets, etc.	**6 Hours**
Unit -3	**Launching a New Venture** **Business Plan:** The business plan, Business Planning Process: elements of business planning, preparation of project plan, components of an ideal business plan – market plan, financial plan, operational plan **Feasibility Analysis:** Feasibility Analysis – aspects and methods: Economic, financial, and market analysis - and technological feasibility. Forms of ownership and understanding phases of Business unit: Various Forms of business ownership, Registration of business units; start-up to going IPO; revival, exit, and end to a venture.	**8 Hours**
Unit -4	**Idea Generation and Screening** **Methods of Generating Ideas:** Linear techniques – Morphological Analysis, Attribute Listing, Scamper, Alternative Scenarios, Forced Association, Value Analysis **Product Planning and Development Process:** Establishing evaluation criteria, idea Stage, Concept Stage, Product Development Stage and Test marketing and commercialization.	**7 Hours**
Unit -5	**Entrepreneurial Finance, Assistance and Entrepreneurial Development Agencies** **Sources of finance:** Banks and financial institutions – IFCI, ICICI, IDBI and SIDBI), financing of Small Business Role of central government and State Government in promoting entrepreneurship	**4 Hours**

	Entrepreneurial Development Agencies: Overview of MSME policy of government in India. Role of agencies assisting Entrepreneurship: DICs, SSIs, NSICs, Entrepreneurship Development Institute (EDI).	
Course Outcomes:		
CO1	Develop an understanding of basic concepts of entrepreneurship.	K2
CO2	Develop an understanding on fundamentals of Intellectual Property Reghts.	K2
CO3	Evaluating and understanding a holistic approach of launching a new business venture.	K4
CO4	Understanding of converting an idea to an opportunity and various funding sources.	K2
CO5	Develop knowledge on Entrepreneurial Finance, Assistance and the role of Entrepreneurial Development Agencies.	K5
Textbooks:		
1. Hisrich, R.D., Peters, M.P., & Shepherd, D. A., "Entrepreneurship", Mc.Graw- Hill, 2023		
2. Bamford, C.E., & Burton, G. D.,"Entrepreneurship: the art, science, and process for success". Mcgraw-Hill, 2021		
Reference Books/E-Books:		
1. Rickman, C. D., "How to start your own business : ... and make it work". Dk Publishing, 2021		
2. Barringer, B. R., & R Duane Ireland, "Entrepreneurship successfully launching new ventures" Harlow London New York, Ny Boston [U.A.] Pearson, 6th ed., 2019		
Links: NPTEL/You Tube/Web Link		
https://www.firstrepublic.com/insights-education/five-types-of-entrepreneurship-meaning-and-defining-characteristics		
https://msme.gov.in/sites/default/files/MSME_Schemes_English_0.pdf		
https://www.greyb.com/blog/morphological-analysis/#:~:text=Morphological%20analysis%20is%20all%20about,units%20to%20solve%20a%20problem		

M.TECH (INT) FOURTHYEAR	
Course Code: ANC0802	**L T P** **3 0 0**
Course Title: CRM Fundamentals	

Course objective:

This course is designed to help in understanding the fundamentals of CRM. It will help in providing better services for Sales, Marketing and Customer Relations in an Enterprise. To make the students understand the organizational need, benefits and process of creating long-term value for individual customers. To disseminate knowledge regarding the concept of e-CRM and e-CRM technologies. To enable the students understand the technological and human issues relating to implementation of Customer Relationship Management in the organizations.

Pre-requisites: None

Course Contents / Syllabus

Unit-1	**Introduction** CRM- definition, history, goals. Sources of CRM value. Components of CRM: people, process, technology. Evolution of CRM: marketing and its principles, customer relations to CRM.Dynamics of Customer Supplier Relationships, Nature and context of CRM, Strategy and Organization of CRM: strategy, The relationship-oriented organization: Mission, Culture, Structure, People, Communication & Information Systems.	**8 Hours**
Unit-2	**CRM Strategy and Framework** Developing a CRM strategy. Customer oriented (C in CRM), Relationship driven, 360 degree view of customer. CRM system features- functions, application, benefits and solutions. Importance of loyalty- active, passive, split, shifting and switchers, customer profiling, customer segmentation model, Customer Experience, relationship marketing and journey, Case study.	**8 Hours**
Unit-3	**Solution Design and Architecture** CRM system solution- specifications, Data Analysis, Solution Requirements. Types of CRM- On-Premise, cloud based. Pros and Cons of each. Integration CRM with other enterprise applications. The Technology of CRM: Data warehouses and customer relationships, creating data mart model, components of operational data warehouse.	**8 Hours**
Unit-4	**CRM for Business** CRM in Sales, Service, Marketing, E-commerce. Social Customer Relationship Management. Analytical CRM: Predictive Analytics vs Operational Analytics. Channel Partner Relationship management, Collaborative CRM (using data pooling), Business Benefits of Cloud Based System, SLAs, Practical Challenges.	**8 Hours**
UNIT-5	**CRM implementation** Building CRM roadmaps: current processes, customers, strategic goals, technology issues, pilot and proof of concept projects. Preliminary Roadmap and its template, developing roadmap midstream. Design stage, custom development, integration,	**8 Hours**

	reporting, data migration, and implementation, testing, launching and application management. Introduction to following CRM tools: ZOHO, Pega, Microsoft Dynamics 365, Sales force.	
Course Outcome: At the end of course, the student will be able		
CO 1	Understand the basic concepts of Customer relationship management.	K2
CO 2	To understand strategy and framework of Customer relationship management.	K2
CO 3	Learn basics of Cloud Based Customer relationship management.	K1
CO 4	Understand Customer relationship management in context with business use cases.	K3
CO 5	Understand implementation basics of CRM.	K3

Text books:

1. CRM Fundamentals by Scott Kostojohn Mathew Johnson Brian Paulen. Apress, 2011.
2. Customer Relationship Management- How to develop and execute a CRM strategy By Michael Pearce, Business Expert Press, 2021.

Reference Books:

1. The CRM Handbook-A Business Guide to Customer Relationship Management by Jill Dyché; Addison-Wesley (for case studies)
2. Customer Relationship Management Systems handbook by Duane E Sharp. Auerbach Publications by CRC Press Company

NPTEL/ YouTube/ Faculty Video Link:

https://onlinecourses.nptel.ac.in/noc20_mg57/preview
https://archive.nptel.ac.in/courses/110/105/110105145/

B.TECH FOURTH YEAR					
Course Code	**AOE0765**	**L**	**T**	**P**	**Credit**
Course Title	**Human Psychology and Organizational Behavior**	**3**	**0**	**0**	**3**
Course objective:		**Duration: 40 Hours**			
1	To understand the various dimensions of Human psychology.				
2	To familiarize students with the concept of Organizational Behavior.				
3	To enable students to describe how people behave under different conditions and understand why people behave as they do.				
4	To introduce students to the concepts of Team and Organization change.				

Prerequisites: Student must have basic understanding of General Management.

Course Contents / Syllabus

UNIT- I	**Introduction to Organizational Behavior**	**Hours- 8**

Introduction to OB , Definition, Nature and Scope – Environmental and organizational context – Impact of globalization, Diversity, Ethics, culture. Importance of OB in understanding Human Behavior. Cognitive Processes, I: Perception and Attribution: Nature and importance of Perception – Perceptual selectivity and organization , Social perception – Attribution Theories ,Locus of control –Attribution Errors.

UNIT-II	**Dimensions of Human Behavior and Psychology**	**Hours-8**

Cognitive Processes, II: Personality and Attitudes, Personality as a continuum - Meaning of personality , Johari Window and Transactional Analysis , Nature and Dimension of Attitudes -Job satisfaction and organizational commitment, Motivational needs and processes, Theories of Motivation

UNIT- III	**Conflict and Stress Management**	**Hours-8**

Stress and Conflict: Meaning and types of stress, Stress Management, Meaning and types of conflict, Effect of stress and intra individual conflict, Conflict management.

UNIT-IV	**Group Dynamics**	**Hours-8**

Groups Vs. Teams – Nature of groups – dynamics of informal groups – dysfunctions of groups and teams – teams in modern work place. Power and Politics: Meaning and types of power – empowerment

UNIT-V	**Leadership and Organizational Change.**	**Hours-8**

High performance work practices, Behavioral performance management: reinforcement and punishment as principles of Learning –Process of Behavioral modification, Leadership theories, Styles, Activities and skills of Great leaders. Organizational change , meaning, factors in Organizational change, process of planned Change, Resistance to change.

Course outcome: At the end of course, the student will be able to

CO 1	Understand the concept of Organization Behavior and human psychology in terms of the key factors that influence organizational behavior.	Knowledge (K2), Remembering (K1)
CO 2	Analyze and evaluate the behavior for enhancing individual and group performance.	Comprehending (K 3)
CO 3	Demonstrate the applicability of analyzing the complexities associated with management of individual behavior in the organization.	Knowledge (K2), Applying (K4)
CO 4	Analyze the complexities associated with management of the group behavior in the organization.	Knowledge (K2), Analyzing (K5)

CO 5	Create the conducive work environment encompassing the theories of leadership and change management.	Applying (K4)

Text books

1. Robbins Stephen P& Judge Timothy A. ―Organizational Behavior (2019, 9th edition, Pearson)
2. Newstrom J. W., & Davis, K. (2011) Human behavior at work (12th ed.). Tata McGraw Hill

Reference Books

1. Robbins &Coulter : Management (Pearson, 19th Edition, 2019)
2. Luthans Fred: Organizational Behavior, (McGraw Hill International Edition, 12th Edition, 2013)
3. Prasad L. M. : Principles and Practices of Management, (Sultan Chand& Sons, 9th edition,2016)
4. Pareek. U. (2010). Understanding Organizational Behavior (2nd ed.). Oxford University Press

Course code	AOE0762	L T P	credits
Course title	BIOLOGY FOR ENGINEERES	3 0 0	
Course objectives			
	To familiarize the students with basic biological concepts, structures and functions of the cells, bio molecules and their metabolism. Students are also learn and describe the structure of gene, protein synthesis and other gene activities, the physiology of human digestive, respiratory, circulator and nervous system. Students able to demonstrate the concept of microorganisms and their interaction with human beings.		K1, K2
Pre-requisites: Students should know about the basic knowledge of biology			
Course Contents / Syllabus			
UNIT-I	**Cell; Structure and their functions**		**8h**
	The Cells, Cell theory, structure of a Cell, Cell cycle, cell organelles and their functions. Plant Cell and animal Cell, Prokaryotic and Eukaryotic cell. Brief introduction to five kingdoms of classification including monera, protists, fungi, plantae and animalia		
UNIT-II	**Introduction to biomolecules and metabolism**		**8h**
	Structure and functions of biomolecules like carbohydrates, proteins, nucleic acids, lipids and enzymes. Metabolic basis for Living—Anabolic and Catabolic Pathways, Photosynthesis, Respiration.		
UNIT-III	**Genetics**		**8h**
	Prokaryotic gene and Eukaryotic gene structure, Basics of gene replication, Transcription and Translation in Prokaryote and Eukaryotes. Recombinant DNA technology.		
UNIT-IV	**Human physiology**		**8h**
	Basic knowledge of nutrition, Digestive systems, Respiratory system, Blood circulatory system and nervous system		
UNIT-V	**Microbiology**		**8h**
	Structure and function of microscope, Identification and classification of microorganisms, Sterilization and media compositions, Concept of species and strains. Ecological aspects of single celled organisms		
Course outcome:	**After completion of this course students will be able to**		
CO 1	Understand and explain the cells, different cell organelles and their function,		K1,K2
CO 2	Understand and compare different biomolecules, its structure and function and also understand their role in a living organism.		K1,K2
CO 3	Describe and explain the genes and genetic materials (DNA & RNA) and how they replicate, transfer & preserve vital information in living organisms.		K1 ,K2
CO 4	Defines and illustrate the basic knowledge of life processes like nutrition, respiration circulation etc.		K1 ,K2
CO 5	Explain and recognize the different types of microbes, Sterilisation technique and its interaction with humans.		K1 ,K2
Text books (Atleast 3)			
1	**Cell and Molecular Biology-P.K.Gupta 2. Cell Biology-Verma and Agarwal**		
2	**Biology for Engineers ,Wiley Editorial**		

3	**NCERT Biology class XI and XII**	
Reference Books (At least 3)		
1	**Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company**	
2	**"Molecular Genetics (Second edition), Stent, G. S.; and Calendar, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher**	
3	**Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers**	
NPTEL/ YouTube/ Faculty Video Link:		
Unit 1	https://www.youtube.com/watch?v=URUJD5NEXC8 https://www.youtube.com/watch?v=t5DvF5OVr1Y	
Unit 2	https://www.youtube.com/watch?v=fE6shCFJepo https://www.youtube.com/watch?v=XzCROUAoZh8&t=1066s	
Unit 3	https://www.youtube.com/watch?v=A0mFCUE9en4 https://www.youtube.com/watch?v=-mdYzXl9hc4	
Unit 4	https://www.youtube.com/watch?v=0-_8CMmaSBg https://www.youtube.com/watch?v=AfPMpTeYuqI	
Unit 5	https://www.youtube.com/watch?v=ryhdkAJb49A&list=PLGaz8McLWyIww2QAcESaCxM8WN7-vmFEj https://www.youtube.com/watch?v=Lm8Z_wRE_cs&list=PLFpCrsN3l3fB3TaFS8ll0zwlnXJi619DI	

B.TECH FOURTH YEAR			
Course code	**AOE0766**	**L T P**	**Credits**
Course Title	**Sensor Technology**	**3 0 0**	**3**

Course Objectives: Student will learn about

1	The concept of sensors and it's characteristics.
2	Various sensor materials and technology used in designing sensors.
3	Commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level.
4	The use of basic electronics circuits and intelligent sensors for industrial automation.
5	The fundamentals of mechanical terms like pressure, position, force, strain and sensor application in different areas.

Pre-requisites: Basic Electronics and Electrical Engineering

Course Contents / Syllabus

UNIT-I	**Sensors Fundamentals**	**8 hours**

Sensors & Transducers: Definition, Classification & selection of sensors, Sensor Characteristics, Measurement of displacement using Potentiometer, Measurement of position using Hall effect sensors

UNIT-II	**Sensor Materials and Technologies**	**8 hours**

Materials: Passive Materials, Active Materials, Silicon, Polysilicon, semiconductors, Plastics, and Ceramics, Sensor Fabrication, Sensor Technologies: Surface Processing, Nano-Technology, IoT sensors. Pollution sensors, RFID sensors, image sensors, biometric sensors, MEMS and NEMS sensors.

UNIT-III	**Measurement of Physical parameters**	**8 hours**

Measurement of temperature using Thermistors, Thermocouple & RTD, Concept of thermal imaging, Proximity sensors: Capacitive, Use of proximity sensor as accelerometer and vibration sensor, Flow Sensors: Ultrasonic & Laser, Level Sensors: Ultrasonic & Capacitive.

UNIT-IV	**Interface Electronic Circuits & Intelligent Sensors**	**8 hours**

Input Characteristics of Interface Circuits, Excitation Circuits, Analog to Digital Converters, Direct Digitization and Processing, Bridge Circuits, Data Transmission.

Intelligent Sensors: General Structure of smart sensors & its components, Characteristic of smart sensors: Self calibration, Self-testing & self-communicating, Application of smart sensors: Automatic robot control & automobile engine control.

UNIT-V	**Sensor application in Different Areas**	**8 hours**

Velocity and Acceleration; Force, Strain, Pressure Sensors. Batteries for Low Power Sensors, LVDT & Optical Encoder, Measurement of force using strain gauge, Measurement of pressure using LVDT based diaphragm & piezoelectric sensor.

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

CO1	Explain the concept of sensors and its characteristics.	**K_1**
CO2	Explain the different materials and technologies used in designing sensors.	**K1, K2**
CO3	Explain and apply sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level.	**K2 , K3**
CO4	Apply the basic electronics circuits and intelligent sensors for industrial automation.	**K2**, K3
CO5	Explain the basic fundamentals of mechanical terms like position, strain, and apply sensor for measurement of parameters in different areas.	**K2, K3**

Text books:

1. DVS Murthy, Transducers and Instrumentation, PHI 2nd Edition 2013
2. S. Gupta, J.P. Gupta / PC interfacing for Data Acquisition & Process Control, 2nd ED / Instrument Society of America, 1994.
3. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press).

Reference Books:

1. Arun K. Ghosh, Introduction to measurements and Instrumentation, PHI, 4th Edition 2012.
2. D. Patranabis, Sensors and Transducers, PHI Publication, New Delhi
3. Mechatronics- Ganesh S. Hegde, Published by University Science Press (An imprint of Laxmi Publication Private Limited).

NPTEL/ YouTube /Learning Source:

https://youtu.be/1uPTyjxZzyo

https://youtu.be/q8UuRkOQ9A0

www.nptel.ac.in

B.TECH FOURTH SEMESTER

Course Code	AOE0867	L	T	P	Credit
Course Title	INDUSTRY 4.0	3	0	0	3

Course objective:

The student develop concept related to Automation, familiarize students with the concepts and techniques of robot manipulator, its drive systems and end effectors, introduce the students with Cloud Computing, Bigdata, Cyber Security, understand various types of systems and models in simulation and familiarize students with the concepts rapid prototyping.

Pre-requisites:

Course Contents / Syllabus

UNIT-I	INTRODUCTION TO AUTOMATION	8 hours

Pneumatic system: production and distribution of compressed air, components of pneumatic system, Different types of valves, graphical symbols, graphical representation and design of pneumatic system, electro- pneumatics. Hydraulic system: Different types of valves such as flow, direction control valve, hydraulic pumps, Actuators and auxiliary elements in hydraulics, their applications and use of their graphical symbols, Synthesis and design of circuits (up to 2 cylinders), hydraulic system design, electro-hydraulics.

UNIT-II	FUNDAMENTALS OF ROBOT	8 hours

Robotics – Introduction – Basic structure(manipulator) – classification of robot and Robotic systems – laws of robotics – work space, precision movement. Drive systems Hydraulic, pneumatic and electric systems– servo motors – stepper motors – servo-control. Robot Kinematics: forward and inverse kinematics – trajectory planning: interpolation and approximation. End Effectors: Types of robot end effectors – grippers: mechanical, magnetic, vacuum grippers – Tools as end effectors – Robot applications.

UNIT-III	INTRODUCTION OF CLOUD, BIG DATA AND CYBER SECURITY	8 hours

Introduction to Cloud Computing: Introduction to Cloud Computing, Definition of Cloud, Characteristics of Cloud Computing, Cloud Computing Layered Architecture and Deployment Models, Cloud Computing Service Models

Introduction to Big Data: Types of digital data, history of Big Data innovation, introduction to Big Data platform, drivers for Big Data, Big Data architecture and characteristics, 5 Vs of Big Data, Big Data technology components, Introduction to Security, Security Threats and Vulnerabilities Need of security, CIA Triad, Introduction to security attacks, services and mechanism. Overview of Security threats and Vulnerability: Types of attacks on Confidentiality, Integrity and Availability.

Vulnerability and Threats, Malware: Virus, Worms, Trojan horse. Security Counter Measures:Intrusion Detection and its categories, Antivirus Software.

UNIT-IV	SIMULATION	8 hours

Introduction: Simulation: a tool, advantages and disadvantages of simulation, areas of application, systems and system environment, components of a system, discrete and continuous systems, discrete event system simulation.

General Principles: Concepts in discrete event simulation, time advance algorithm, manual simulation using event scheduling, basis properties and operations.

Models In Simulation: Terminology and concepts, statistical models: queuing systems; inventory systems; reliability and maintainability, limited data, discrete distributions: Bernoulli distribution; Bionomial distribution; Geometric distribution, continuous distribution: Uniform distribution; Exponential distribution; Gamma distribution; Normal distribution; Weibull distribution; Triangular Distribution; Lognormal distribution, poisson process.

UNIT-V	Additive Manufacturing	8 hours

Elementary Introduction & Understanding of 3D Printing and necessary skill set to pursue in Technology. Design Requirements and Analysis and Career Aspects. A Model Printing on FFF Material i.e. PLA or ABS. Deep Understanding of Composite FDM 3D Printing Technology. Introduction to LDM Technology, Mechanism for Clay Extrusion, Operations & Precautions. Slurry Preparation & Material Prospects & Explanation of slicing software (Preform) for SLA technology. Detailed Explanation of Reverse Engineering, Methods of Reverse Engineering, Advantages and Applications.

Course outcome: After completion of course students will be able to

CO 1	Understand the concept of self-driven vehicles.	K_3
CO 2	Explain the basic concepts of hardware and software architectures.	K_3
CO 3	Know on the safety assurance for Autonomous vehicles.	K_3
CO 4	Understand and explain latest trends and technology in vehicle dynamic modeling	K_4
CO 5	Understand the concept related to vehicle longitudinal control.	K_3

Text books :

1. The Handbook of Research on Integrating Industry 4.0 in Business and Manufacturing

Reference Books:

1) M. Gordan, “Industry 4.0 - Perspectives and Applications”.
2) Routledge,” Additive Manufacturing in Industry 4.0“.

Link: NPTEL/ YouTube/ Faculty Video Link:

Unit 1	https://onlinecourses.nptel.ac.in/noc21_me83
Unit 2	https://www.youtube.com/watch?v=vSaGIzbw_kQ

Unit 3	https://www.youtube.com/watch?v=PEl3RWFKOFk
Unit 4	https://www.youtube.com/watch?v=zmbS_TmNDP4&list=PLSGws_74K01-4rcWuB5BEATHSsOrBd1ye
Unit 5	https://www.youtube.com/watch?v=t7yv4gSnNkE&list=PLwdnzlV3ogoWI8QEu4hsT-n_r8UbWbquy

B.TECH FOURTH YEAR			
Course Code	**AOE0872**	**L T P**	**Credits**
Course Name	**Wireless Communication**	**3 0 0**	**3**

Course Objective: Student will learn about

1	The fundamentals of mobile communication systems.	
2	The concept of cellular communication.	
3	Propagation Models and channel fading	
4	Contention free Multiple access technique (TDMA/FDMA/CDMA) and contention based (Pure ALOHA, Slotted ALOHA, CSMA).	
5	Various modern wireless technologies.	

Pre-requisites: Basic Knowledge of Digital Communication

Course Contents / Syllabus

UNIT-I	**Introduction of Wireless Communication**	**8 Hours**

History and evolution of mobile radio systems. General Model of Wireless Communication Link Types of mobile wireless services/systems-Cellular, WLL, Paging, Satellite Systems, Future trends in personal wireless systems.

UNIT-II	**Cellular Concepts and System Design Fundamentals**	**8 Hours**

Cellular Infrastructure, Cellular System Components, Antennas for Cellular Systems, Operation of Cellular Systems, frequency reuse, channel assignment, handoff strategies, Interference and system capacity.

UNIT-III	**Mobile Radio Propagation Models**	**8 Hours**

Radio wave propagation issues in personal wireless systems, Propagation models, Channel Noise and Losses, Fading in Land Mobile Systems, Multipath Fading, Fading Effects on Signal and Frequency, Shadowing; Wireless Channel Modeling: AWGN Channel, Rayleigh Channel,

UNIT- IV	**Equalization, Diversity Techniques & Multiple Access Techniques**	**8 Hours**

Equalization, Rake receiver concepts, Diversity Techniques, Linear predictive coders and channel coding. Multiplexing and Multiple Access: FDMA, TDMA, CDMA, OFDMA, Multiple Access for Radio Packet Systems: Pure ALOHA, Slotted ALOHA, CSMA and their versions; Packet and Pooling Reservation Based Multiple Access Schemes.

UNIT-V	**Wireless Systems & Standards**	**8 Hours**

GSM system for mobile Telecommunication, General Packet Radio Service, Edge Technology; CDMA 2000, IMT 2000 and UMTS, Long Term Evolution (LTE), Introduction to Mobile Adhoc Networks, Li-Fi Communication, Ultra-Wideband Communication, Mobile data networks, Introduction to 4G, 5G and concept of NGN.

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

CO 1	Explain with various generations of mobile communications.	K1, K2
CO 2	Explain concept of cellular communication.	K2

CO 3	Describe the basics of wireless communication.	K2
CO 4	Explain and differentiate contention free and contention based multiple access techniques.	K2,K4
CO 5	Explain Various modern wireless technologies.	K2

Text Books:

1. T.S. Rappaport, "Wireless Communication-Principles and practice", Pearson Publications, Second Edition.
2. Upena Dalal, "Wireless Communication and Networks", Oxford Press Publications.
3. T L Singal ,"Wireless Communications ", McGraw Hill Publications.

Reference Books:

1. Andrea Goldsmith, "Wireless Communications", Cambridge University Press.
2. S. Haykin & M. Moher, "Modern wireless communication", Pearson, 2005.

NPTEL/ YouTube/ Faculty Video Link:

Unit 1	https://youtu.be/JCGMP37-2EA
Unit 2	https://youtu.be/f2wlHL1Sok8
	https://youtu.be/0PWILK-hqbQ
Unit 3	https://youtu.be/SFcRtZ30rqs
	https://youtu.be/BKf2mN9W6Nk
	https://youtu.be/tePZhxRLsjE
Unit 4	https://youtu.be/GLmF3YB0pQU
	https://youtu.be/QHqZwBoTJRY
Unit 5	https://youtu.be/t3FVP5wuG4g
	https://youtu.be/ixY0Cau4mBM

Course code	AOE0871	L T P	credits
Course title	Nano Technology	3 0	3
Course objective:			
	This course is designed to make students understand the intersection of nanotechnology and other allied subjects. It will also acquaint students with macro/nanofabrication mechanism, modern nano devices, polymers and biomaterial applications. Students will know about the use and applications of nanotechnology in sciences, food, agriculture, information technology, mechanicals, electronics/ computer communications.		**K1, K2. K3 K4,**
Pre-requisites: Basic knowledge of chemistry, physics and basic engineering subjects			
Course Contents / Syllabus			
UNIT-I	**Introduction to Nanotechnology**		**8**
	Nanotechnology, History, Origin, Fundamental Concepts, Approaches, Current research, Moore's Law, Micro and Nanofabrication process with examples		
UNIT-II	**Nanomaterials synthesis and applications**		**8**
	Nanomaterials synthesis and applications: Carbon based nanomaterials Inorganic nanomaterials, their classification, Synthesis process, properties and applications.		
UNIT-III	**Nanotechnology tool and techniques**		**8**
	Surface Plasmon Resonance (SPR), Spectroscopy (UV and FTIR), Zeta potential, Dynamic Light Scattering (DLS), X-ray diffraction (XRD), Transmission Electron Microscopy (TEM), Scanning Electron Microscope (SEM), Scanning Probe Microscopy (STM and AFM), Improved diagnostic devices (Nanowires and Cantilever)		
UNIT-IV	**Biomaterials and polymers**		**8**
	Biomaterials, Properties of Biomaterials, Polymer as Biomaterial, Metals and Alloys, Hard Tissue Replacement, Application of Biomaterials and Polymers		
UNIT-V	**Application of Nanotechnology in Sciences** and Technology		**8**
	Medical sciences, Food and Agriculture sciences, Information and communication (Memory storage, Novel semiconductor devices, Quantum computers) Aerospace technology, Vehicle manufacturing technology, Sports technology, Steel, glass and Coatings technology.		
Course outcome: After completion of this course students will be able to			
CO 1	Explain and solve the basics of nano-science, nanobiotechnology, nanotechnology and its techniques.		**K1, K3**
CO 2	Devise and categorized the effective strategies of nanomaterials synthesis through physical, chemical and biological process.		**K4**
CO 3	Compare and connect the potential tools and techniques used for characterization of nanomaterials and their applications		**K2, K4**
CO 4	Classify, compare and differentiate the synthesis and application of different classes of biomaterials and polymers and their uses		**K1, K2**
CO 5	Understanding and conclude the concept of nanotechnology and their applications in sciences, engineering and technology		**K2,K4**
Text books (Atleast 3)			

1	Nanotechnology by Mark Ratner and Daniel Ratner, Pearson Education-2003	
2	Guozhong Cao ,"Nanostructures and Nanomaterials , synthesis , properties and applications" , Imperial College Press ,2004.	
3	Hari Singh Nalwa, "Nanostructured Materials and Nanotechnology", Academic Press, 2002	
Reference Books (Atleast 3)		
1	Microfabrication and Nanomanufacturing-Mark James Jackson-2018	
2	MEMS and Nanotechnology –Based sensors and devices communication, Medical and Aerospace applications -A.R.Jha-2008	
3	Drug Delivery: Engineering Principles for Drug Therapy, M. Salzman-2001	