

Branch Name:	Bachelor of Science (Information Technology)
Program Code:	ET110
Semester/Year:	Semester - V/ Third Year
Subject Title:	Artificial Intelligence for Real World Application
Subject Code:	15-ITM301-3C
Pre-requisite:	Logic, Calculus, Linear Algebra, and Statistics

Course Objective:

- To gain a basic idea of AI and AI related problem solving, inference, perception, knowledge representation, and learning.
- To know about the Heuristic search techniques and about knowledge representation in AI.
- To know about Predicate Logic and about Reasoning in AI.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	00	02	04	50	25	-	25	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Introduction to AI: The AI Problems, AI Techniques, The Level of The Model, Examples	02	10
2	State Space Search & Heuristic Search Techniques: Defining The Problems as a State Space Search, Production Systems, Production Characteristics, Production System Characteristics, Issues in the Design of Search Programs, Additional Problems. Generate-And-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction.	06	15
3	Knowledge Representation Issues and Approaches: Representations and Mappings, Approaches to Knowledge Representation. Representation Simple Facts in Logic, Representing Instance and Is-A Relationships, Computable Functions and Predicates, Resolution. Procedural versus Declarative Knowledge, Logic Programming, forward versus Backward Reasoning.	10	20
4	Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Semantic Analysis, Discourse and Pragmatic Processing, Spell Checking	04	10

5	Connectionist Models: Introduction: Hopfield Network, Learning in Neural Network, Application of Neural Networks, Recurrent Networks, Distributed Representations, Connectionist AI and Symbolic AI.	8	20
6	Applications of AI: AI in healthcare: Diagnosis, treatment, and medical imaging, AI in finance: Fraud detection, algorithmic trading, and risk assessment, AI in transportation: Autonomous vehicles and traffic optimization, AI in customer service and chatbots, AI in education: Personalized learning and intelligent tutoring systems	10	25

List of Reference Books:

1. Kevin Night, Elaine Rich, and Nair B., “Artificial Intelligence”, McGraw Hill, 2017
2. M. Tim Jones, - Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers Inc.; First Edition, 2008.
3. Nils J. Nilsson, - The Quest for Artificial Intelligence, Cambridge University Press, 2009.
4. Gerhard Welss, - Multi Agents Systems, Second Edition, 2013
5. David L. Poole and Alan K. Mackworth, - Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.
6. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2007

List of Suggested titles of Experiments:

1. Write a program to implement the Hill Climbing problem.
2. Write a program to implement the Towers of Hanoi problem.
3. Write a program to implement the Missionaries and Cannibals problem.
4. Write a program to implement the 8 queen’s problem.
5. Write a program to implement the A* Algorithm.
6. Write a program to implement the Breadth first algorithm.
7. Write a program to implement the Depth first algorithm.
8. Write a program to implement the predicate logic.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	To understand the basic idea of artificial intelligence and its application areas.	1 Remembering 2. Understanding
CLO2	To apply basic principles of AI in solutions that requires problem solving, inference, perception, knowledge representation, and learning.	2 Understanding 3 Applying
CLO3	To demonstrate awareness and a fundamental understanding of various applications of AI techniques.	2 Understanding 3 Applying
CLO4	To understand about Logic programming and about Reasoning related to AI.	2 Understanding 3 Applying 5 Evaluate
CLO5	To know about the different representational techniques in AI.	2. Understanding 3 Applying

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	H											M	L		H	
CLO2	H	H	M		M							M	H	M	L	M
CLO3	M	H	L		M					H		H	M	M	L	M
CLO4	H	M	M	L	M					M		L	M	M	L	M
CLO5	H	M	H	M	H					M		M	H	M	L	H

H: High, M: Medium, L: Low

Branch Name:	Bachelor of Science (Information Technology)
Program Code:	ET110
Semester/Year:	Semester - V/ Third Year
Subject Title:	Data Modelling & Visualization
Subject Code:	15-ITM302-3C
Pre-requisite:	Basics of Python Programming, Python Data Analysis

Course Objective:

- The graphical depiction of data is known as data visualization, and it is used to effectively and dynamically communicate insights to clients, customers, and stakeholders in general.
- It is a means to condense your findings and present them in a way that makes them easier to read and can be used to spot patterns or trends.
- This course will teach you how to design engaging charts and visuals that will appeal to your audience while also increasing their usefulness.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	00	02	04	50	25	-	25	100

Subject Contents

Sr. No	Topic	Total Hours	Weight (%)
1	Introduction to Data Visualization Tools Python Libraries for Visualization, Power BI, Tableau	7	20
2	Data Visualization Tools in Python Introduction to Matplotlib, Basic Plotting with Matplotlib, Line Plots, Area Plots, Histograms, Bar Charts, Pie Charts, Box Plots Scatter Plots, Bubble Plots	8	25
3	Advanced Visualization Tools Waffle Charts, Word Clouds Introduction to Seaborn: Seaborn functionalities and usage, Spatial Visualizations and Analysis in Python with Folium, Case Study.	7	20

4	Tableau initialization Tableau installation, Data source settings in tableau, Data Interpreter, Interface of Tableau sheet, Various menu options	8	15
5	Tableau Visualization Visualization using Tableau, Various graphs in tableau, Real world data visualization tasks	10	20

List of Reference Books:

1. Core Python Programming - Second Edition, R. Nageswara Rao, Dreamtech Press 2016.
2. Communicating Data with Tableau by Ben Jones, O'Reilly Media, Inc 2014.
3. Beautiful Visualization: Looking at Data through the Eyes of Experts (Theory in Practice) by Julie Steele, O'Reilly Media, Inc 2010.
4. Practical Tableau by Ryan Sleeper, O'Reilly Media, Inc 2018.
5. Data Visualization with Python and JavaScript by Kyran Dale, O'Reilly Media, Inc Kevin Night, Elaine Rich, and Nair B., “Artificial Intelligence”, McGraw Hill, 2017

List of Suggested titles of Experiments:

1. Introduction to Matplotlib and Line Plots
2. Use Waffle Charts, Word Clouds, and Regression Plots
3. Prepare various charts using datasets
4. Prepare Various graphs in tableau

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Manipulate large datasets and handle missing or inconsistent values in datasets	3 Applying 4 Analyzing
CLO2	Perform statistical analysis using packages such as Numpy and Scipy.	5 Evaluating
CLO3	Analyze and visualize datasets using packages such as seaborn and matplotlib.	4 Analyzing 2 Understanding
CLO4	Develop interactive visualization using packages such as Plotly and Shiny.	3 Applying
CLO5	Recognize and reduce data and spatial biases	2 Understanding

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	H	M		L	M							M	M		L	
CLO2	M	M		L	M							L	M	M	L	
CLO3	M	M	M	M	H					L		H	M	M	H	L
CLO4	M		M	L	M				L	M	M	M	M	M	L	H
CLO5	M	M	M	H	M	M	L	M				L	M	M	M	L

H: High, M: Medium, L: Low

Branch Name:	Bachelor of Science (Information Technology)
Program Code:	ET110
Semester/Year:	Semester - V/ Third Year
Subject Title:	Data Analytics & Reporting
Subject Code:	15-ITM303-3C
Pre-requisite:	Basic knowledge of programming and Data Structures Algorithms, Mathematics and Statistics

Course Objective:

To provide strong foundation for data analytics and application area related to it and understand the underlying core concepts and emerging technologies in data analytics.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	00	02	04	50	25	-	25	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Introduction to Data Science and Analytics: - Data, features - Pre-processing on data - Cleaning of data - Feature selection techniques like Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA) - Components of Analytics - reporting and analysis	6	10
2	Handling Data Sources : - Different types of data sources: structured, unstructured and semi-structured data - Relational databases: normal forms, transactional data, Structured Query Language (SQL) - NoSQL databases and its types - Handling semi-structured data with JSON, CSV files and XML	6	20
3	Exploratory Data Analysis (EDA), Models and Techniques Working with trend detection, outlier detection, summarization, association rule mining, missing distribution and imputation technique, spurious relationship or spurious correlation, concept of performance window, missing trends or percentile distribution from	8	25

	time perspective and concept of winsorization or flooring - Regression models: linear and non-linear, logistic, variable transformation, spinning of variables, population stability index and characteristic analysis - Regularization, overfitting and under fitting, mean square error, root mean square error, mean absolute percentage error - Decision tree classification, support vector machine, k-means clustering, usage of clustering techniques in variable selection		
4	Reporting Fundamentals - Anatomy and types of reports - Top-down approach: Drill down reports and dashboards - Bottom-up approach: analysis and prediction with ad-hoc queries - Strategies and techniques for effective reporting: best practices	8	20
5	Reports for Data Analysis - Descriptive analysis and its reports: Key Performance Indicator (KPI) dashboards and periodic reports - Diagnostic analysis and detailed drill down reports - Predictive analysis and reports based on predictive models - Prescriptive analysis and reports based on AI/ML models	6	15
6	Data Reporting Tools - Graphs and Charts: types and implementation - Tables: varieties and its usage in standard reports - Dashboards and drill down reports - Interactive reports - Report generation best practices based on case studies	6	10

List of Reference Books:

1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, Introducing Data Science, Manning Publications Co., 1st edition, 2016.
2. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, An Introduction to Statistical Learning: with Applications in R, Springer, 1st edition, 2013.
3. Bart Baesens, Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, Wiley 2014 .
4. D J Patil, Hilary Mason, Mike Loukides, Ethics and Data Science, O' Reilly, 1st edition, 2018.
5. Dr Anil Maheshwari, Data Analytics Made Accessible, Publisher: Amazon.com Services LLC 2024.
6. Joel Grus, Data Science from Scratch: First Principles with Python, O'Reilly, 1st edition, 2015.
7. Cathy O'Neil, Rachel Schutt, Doing Data Science, Straight Talk from the Frontline, O' Reilly, 1st edition, 2013.
8. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2nd edition, 2014.

9. Eric Siegel, Predictive Analytics The Power to Predict Who Will Click, Buy, Lie, or Die, 2nd Ed., Wiley. Kevin Night, Elaine Rich, and Nair B., “Artificial Intelligence”, McGraw Hill, 2017

List of Suggested titles of Experiments:

1. Install, configure and run python, numPy and Pandas.
2. Install, configure and run Hadoop and HDFS.
3. Visualize data using basic plotting techniques in Python.
4. Implement NoSQL Database Operations: CRUD operations, Arrays using MongoDB).
5. Implement Functions: Count – Sort – Limit – Skip – Aggregate using MongoDB.
6. Implement word count / frequency programs using MapReduce.
7. Implement a MapReduce program that processes a dataset.
8. Implement clustering techniques using SPARK.
9. Implement an application that stores big data in MongoDB / Pig using Hadoop / R.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Explore the fundamental concepts of data analytics	1 Remembering 2. Understanding
CLO2	Understand data analysis techniques for applications handling large data	2 Understanding 3 Applying 4 Analyze
CLO3	Understand various machine learning algorithms used in data analytics process	2 Understanding 3 Applying 4 Analyze
CLO4	Visualize and present the inference using various tools	3 Applying 5 Evaluate
CLO5	Learn to think through the ethics surrounding privacy, data sharing and algorithmic decision-making	2. Understanding 3 Applying

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	H									L			M	L	L	
CLO2	L	M	M	L	H					H			H	M	M	
CLO3	M	M	L	M	H					M			M	L	M	M
CLO4	H	L	M	L	M				M	L	M	L	H	M	M	M
CLO5		M		H		L	M	L					M	M	M	M

H: High, M: Medium, L: Low

Branch Name:	Bachelor of Science (Information Technology)
Program Code:	ET110
Semester/Year:	Semester - V/ Third Year
Subject Title:	Cyber Law
Subject Code:	15-ITE301-3C
Pre-requisite:	Basics of knowledge of computer and Information technology.

Course Objective:

- The main objective of this course is to make the students aware regarding problem formulation and transforming human readable steps into suitable in cyber world.
- The course also intends to prepare the students aware about the uses of internet as well as activity going in the daily crime in internet.
- Other track of the course focuses on the challenges to Indian laws and cybercrime scenario in India and punishment toward the referred crimes.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	00	02	04	50	25	-	25	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Evolution and growth of ICT: Introduction, information, communication, fundamental of software and hardware network, types of network, topology, Internet and e-commerce	6	15
2	Fundamental of Cyber Crime: Introduction to Cyber laws in India, computer crime, cybercrime, classification of cybercrimes, cyber-criminal, A Case Study: current trends in cyber-attacks, fundamental of Data exclusivity laws.	8	15
3	Mobile and Wireless Devices in Cyber Crime: Introduction, proliferation of mobile and Wireless device, trends immobility, Attacks on wireless networks, Attack on mobile/cell phone, mobile device: security implication for organization	10	20

4	Cyber Crime Tools and Techniques: Introduction, proxy server and anonymizers, phishing, password cracking, keylogger and spywares, virus and worms, Trojan horses and backdoor, steganography, DoS and DDoS Attacks, SQL injection, Buffer overflow	8	30
5	Legal Perspective of Cyber Security: Introduction, cyber-crime and the legal landscape around the world, the Indian IT act, challenges to Indian laws and cyber-crime scenario in India, digital signature and the Indian IT act, amendments to Indian IT Act. Cyber-crime and punishment.	4	20

List of Reference Books:

1. Cyber security: Understanding Cyber-crime Computer Forensics and Legal Perspectives by Nina Godbole & Sunit Belapure, WILEY 2011.
2. Cyber laws by C.K.Punia 2009.
3. Data and computer communication, William Stallings, Pearson 2014.
4. Cyber laws and IT protection by Harish Chander 2012.
5. Cyber Forensics Concepts and Approaches, B. Ravi Kumar Jain/ICFAI, University Press 2006.
6. Introduction to data communication and networking, Behrouz Forouzan, 4th Edition 2007 The McGraw-Hill Companies, Inc.

List of Suggested titles of Experiments:

1. Study about different network topology.
2. Study about different networking commands.
3. Study about firewall of different operating system.
4. Study about different cyber threats in Internet.
5. Study of tools used to detect the cyber threats in computers.
6. Using Wireshark, create a Filter to capture only FTP traffic.
7. Using Wireshark, identify the version of SSL protocol used (SSLv1, SSLv2, SSLv3, TLSv1, TLSv2, etc.) in any HTTPS web portal of your choice. You may need to login to get this information.
8. Carry out a port scanning on an internal lab machine using nmap.
9. Demonstration of sql injection.
10. A recent case study on cyber-crime.

E-Resources (If any):

1. nptel.ac.in
2. <http://cyberlawsindia.net/>
3. <http://meity.gov.in/content/cyber-laws>

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand the meaning and different forms of ICT	1 Remembering 2. Understanding
CLO2	Realize the activities carried using forensic technologies in detection of cyber crime	2 Understanding 3 Applying 4 Analyze
CLO3	Understand the core concepts of defensive and offensive security.	2 Understanding 3 Applying
CLO4	Cyber Crime Cases and IT act of India and amendments.	2 Understanding 3 Applying 4 Analyze
CLO5	Relate the laws enforced by the judiciary to handle cybercrimes and cyber frauds	2. Understanding 3 Applying

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	H				L					L		M	M	L	L	
CLO2	M	M		H	H	L				M		L	H	L	H	
CLO3	L	L	M	M	L	M			M	M		L	H	M	M	L
CLO4	M	L	H	M	L	L	M	L				H	H	M	L	M
CLO5		L		H	L	M	H	M				M	L	M	M	L

H: High, M: Medium, L: Low

Branch Name:	Bachelor of Science (Information Technology)
Program Code:	ET110
Semester/Year:	Semester - V/ Third Year
Subject Title:	Foundation of Data Science
Subject Code:	15-ITE302-3C
Pre-requisite:	Strong background in mathematics, familiarity with object-oriented programming (OOP) and SQL

Course Objective:

Available data need to be analyzed to make quicker and better decisions. Data science helps in managing, analyzing and understanding trends in data leading to design the strategy for better profitability and results.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	00	02	04	50	25	-	25	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Introduction: What is Data Science? Big Data and Data Science – Datafication – Current landscape of perspectives – Skill sets needed; Matrices – Matrices to represent relations between data, and necessary linear algebraic operations on matrices -Approximately representing matrices by decompositions (SVD and PCA); Statistics: Descriptive Statistics: distributions and probability – Statistical Inference: Populations and samples – Statistical modeling – probability distributions – fitting a model – Hypothesis Testing – Intro to R/ Python.	8	15
2	Data preprocessing: Data cleaning – data integration – Data Reduction Data Transformation and Data Discretization. Evaluation of classification methods – Confusion matrix, Students T-tests and ROC curves- Exploratory Data Analysis – Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA – The Data Science Process.	10	25
3	Basic Machine Learning Algorithms: Association Rule mining – Linear Regression- Logistic Regression – Classifiers – k-Nearest Neighbors (k-NN), k-means -Decision tree – Naive Bayes- Ensemble Methods –	10	25

	Random Forest. Feature Generation and Feature Selection – Feature Selection algorithms – Filters; Wrappers; Decision Trees; Random Forests.		
4	Clustering: Choosing distance metrics – Different clustering approaches – hierarchical agglomerative clustering, k-means (Lloyd’s algorithm), – DBSCAN – Relative merits of each method – clustering tendency and quality.	8	20
5	Data Visualization: Basic principles, ideas and tools for data visualization.	4	15

List of Reference Books:

1. Cathy O’Neil and Rachel Schutt, “Doing Data Science, Straight Talk From The Frontline”, O’Reilly, 2014.
2. Jiawei Han, Micheline Kamber and Jian Pei, “Data Mining: Concepts and Techniques”, Third Edition. ISBN 0123814790, 2011.
3. Mohammed J. Zaki and Wagner Miera Jr, “Data Mining and Analysis: Fundamental Concepts and Algorithms”, Cambridge University Press, 2014.
4. Matt Harrison, “Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization, O’Reilly, 2016.
5. Joel Grus, “Data Science from Scratch: First Principles with Python”, O’Reilly Media, 2015.
6. Wes McKinney, “Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython”, O’Reilly Media, 2012.

List of Suggested titles of Experiments:

Consider dataset with student name, gender, Enrollment no, semester result with marks of each subject, his mobile number, city. Implement following in Python or R.

1. Perform descriptive analysis and identify the data type.
2. Implement a method to find out variation in data. For example the difference between highest and lowest marks in each subject semester wise.
3. Plot the graph showing result of student in each semester.
4. Plot the graph showing the geographical location of students.
5. Plot the graph showing number of male and female students.
6. Implement a method to treat missing value for gender and missing value for marks.
7. Implement linear regression to predict the 5th semester result of student.
8. Implement logistic regression and decision tree to classify the student as average or clever.

List of Open Source Software/learning website:

1. www.analyticsvidhya.com/
2. www.kaggle.com/

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand the fundamentals of data science & statistics.	1 Remembering 2. Understanding
CLO2	Apply the most appropriate Data preprocessing and analysis method in any given situation.	2 Understanding 3 Applying
CLO3	Understand different Machine Learning Algorithms.	1 Remembering 2. Understanding 4 Analyze
CLO4	Use of different clustering approaches.	2 Understanding 3 Applying 5 Evaluate
CLO5	Design and implement various machine learning algorithms in a range of real-world applications.	3 Applying 4 Analyze 5 Evaluate

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	M				L					L		H	M	L	M	
CLO2	M	H	M	M	M					M		L	M	M	M	
CLO3	H	M	L	M	L					H		M	M	M	M	L
CLO4	M	M	M	M	M				L	M		L	M	M	M	L
CLO5	M	H	H	H	M	M			M	L	L	M	H	H	H	M

H: High, M: Medium, L: Low

Branch Name:	Bachelor of Science (Information Technology)
Program Code:	ET110
Semester/Year:	Semester - V/ Third Year
Subject Title:	Wireless Networks
Subject Code:	15-ITE303-3C
Pre-requisite:	Computer Networks

Course Objective:

- To understand the concept about Wireless networks, protocol stack and standards.
- To understand and analyze the network layer solutions for Wireless networks.
- To study about fundamentals of 3G Services, its protocols and applications.
- To have in depth knowledge on internetworking of WLAN and WWAN.
- To learn about evolution of 4G Networks, its architecture and applications.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	00	02	04	50	25	-	25	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	WIRELESS LAN : Introduction-WLAN technologies: - IEEE802.11: System architecture, protocol architecture, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, WPAN – IEEE 802.15.4, Wireless USB, Zigbee, 6LoWPAN, WirelessHART	8	15
2	MOBILE NETWORK LAYER : Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: Routing: Destination Sequence distance vector, IoT: CoAP	10	25

3	3G OVERVIEW : Overview of UMTS Terrestrial Radio access network-UMTS Core network Architecture: 3GPP Architecture, User equipment, CDMA2000 overview- Radio and Network components, Network structure, Radio Network, TD-CDMA, TD – SCDMA.	10	25
4	INTERNETWORKING BETWEEN WLANS AND WWANS: Internetworking objectives and requirements, Schemes to connect WLANS and 3G Networks, Session Mobility, Internetworking Architecture for WLAN and GPRS, System Description, Local Multipoint Distribution Service, Multichannel Multipoint Distribution System.	8	20
5	4G & BEYOND: Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, IMS Architecture, LTE, Advanced Broadband Wireless Access and Services, MVNO.	4	15

List of Reference Books:

1. Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education 2012.(Unit I,II,III)
2. Vijay Garg, "Wireless Communications and networking", First Edition, Elsevier 2007.(Unit IV,V)
3. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband", Second Edition, Academic Press, 2008.
4. Anurag Kumar, D.Manjunath, Joy kuri, "Wireless Networking", First Edition, Elsevier 2011.
5. Simon Haykin , Michael Moher, David Koilpillai, "Modern Wireless Communications", First Edition, Pearson Education 2013

List of Suggested titles of Experiments:

1. Program in NS 3 to connect WIFI TO BUS(CSMA).
2. Program in NS 3 to create WIFI SIMPLE INFRASTRUCTURE MODE.
3. Program in NS 3 to create WIFI SIMPLE ADHOC MODE.
4. Program in NS 3 to connect WIFI TO WIRED BRIDGING.
5. Program in NS 3 to create WIFI TO LTE(4G) CONNECTION.
6. Program in NS3 for CREATING A SIMPLE WIFI ADHOC GRID.
7. Introduction to GSM Architecture.
8. Introduction to 4G & BEYOND technologies.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Identify and choose wireless transmission standard, physical layer protocol and MAC layer protocol on the basis of various network applications.	1 Remembering 2. Understanding
CLO2	Understand and explain mobile IP and data routing using it. Classify ad hoc network protocols	2 Understanding 3 Applying 4 Analyze 5 Evaluate
CLO3	Understand the TCP protocol for wireless networks and able to do congestion free transmission over wireless networks.	2 Understanding 3 Applying 4 Analyze
CLO4	Understand the major concepts involved in wireless wide-area networks and its architecture.	2 Understanding 3 Applying 5 Evaluate
CLO5	Have knowledge of 4G technologies and analyze various smart antenna techniques, modulation and coding techniques used in 4G technology	2. Understanding 3 Applying

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	M				M					L		M	M	M	M	
CLO2	M	M	M	M	H					M		L	M	M	M	
CLO3	L	M	H	H	H					L		M	M	M	H	L
CLO4	M	M	L	H	L				M	M		H	M	M	H	L
CLO5	H	M	M	H	H				L	M	L	L	H	H	H	M

H: High, M: Medium, L: Low

Branch Name:	Bachelor of Science (Information Technology)
Program Code:	ET110
Semester/Year:	Semester - V/ Third Year
Subject Title:	Cryptography and Network Security
Subject Code:	15-ITE304-3C
Pre-requisite:	Discrete Structures and Linear Algebra

Course Objective: This course will provide students with a practical and theoretical knowledge of Cryptography and network security. By the end of the course, students should be able to:

- Understand the fundamental principles of access control models and techniques, authentication and secure system design.
- Have a strong understanding of different cryptographic protocols and techniques and be able to use them.
- Apply methods for authentication, access control, intrusion detection and prevention.
- Identify and mitigate software security vulnerabilities in existing systems.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	00	02	04	50	25	-	25	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Introduction: Introduction to Cryptography, Security Threats, Vulnerability, Active and Passive attacks, Security services and mechanism, Conventional Encryption Model, CIA model. Math Background: Modular Arithmetic, Euclidean and Extended Euclidean algorithm, Prime numbers, Fermat and Euler's Theorem.	8	15
2	Classical Cryptography: Dimensions of Cryptography, Classical Cryptographic Techniques. Block Ciphers (DES, AES): Feistel Cipher Structure, Simplified DES, DES, Double and Triple DES, Block Cipher design Principles, AES, Modes of Operations.	8	25

3	Public-Key Cryptography: Principles Of Public-Key Cryptography, RSA Algorithm, Key Management, Diffie- Hellman Key Exchange, Elgamal Algorithm, Elliptic Curve Cryptography.	10	25
4	Hash and MAC Algorithms : Authentication Requirement, Functions, Message Authentication Code, Hash Functions, Security Of Hash Functions And Macs, MD5 Message Digest Algorithm, Secure Hash Algorithm, Digital Signatures Key Management : Key Distribution Techniques, Kerberos	8	20
5	Security in Networks : Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls – Design and Types of Firewalls, Personal Firewalls, IDS, Email Security – PGP, S/MIME	6	15

List of Reference Books:

1. William Stallings (2006), Cryptography and Network Security: Principles and Practice, 4th edition, Pearson Education, India.
2. William Stallings (2000), Network Security Essentials (Applications and Standards), Pearson Education, India.
3. Charlie Kaufman (2002), Network Security: Private Communication in a Public World, 2nd edition, Prentice Hall of India, New Delhi.
4. Atul Kahate (2008), Cryptography and Network Security, 2nd edition, Tata Mc Grawhill, India.
5. Robert Bragg, Mark Rhodes (2004), Network Security: The complete reference, Tata Mc Grawhill, India.

List of Suggested titles of Experiments:

1. W.A.P. to implement Ceaser Cipher
2. W.A.P. to implement Affine Cipher with equation $c=3x+12$
3. W.A.P. to implement Playfair Cipher with key ldrp
4. W.A.P. to implement polyalphabetic Cipher
5. W.A.P. to implement AutoKey Cipher
6. W.A.P. to implement Hill Cipher. (Use any matrix but find the inverse yourself)
7. W.A.P. to implement Rail fence technique
8. W.A.P. to implement Simple Columnar Transposition technique
9. W.A.P. to implement Advanced Columnar Transposition technique
10. W.A.P. to implement Euclidean Algorithm
11. W.A.P. to implement Advanced Euclidean Algorithm
12. W.A.P. to implement Simple RSA Algorithm with small numbers

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand cryptography and network security concepts and application	1 Remembering 2. Understanding
CLO2	Apply security principles to system design	2 Understanding 3 Applying 4 Analyze 5 Evaluate
CLO3	Identify and investigate network security threat	2 Understanding 3 Applying 4 Analyze
CLO4	Analyze and design network security protocols	2 Understanding 3 Applying 5 Evaluate
CLO5	Conduct research in network security	2. Understanding 3 Applying

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	M				L					M		L	M	M	L	
CLO2	M	L	M	H	L					L		M	L	H	M	
CLO3	L	M	L	M	M					M		L	M	M	M	M
CLO4	H	M	H	L	H				M	L		M	M	L	M	M
CLO5	H	H	L	M	H				L	H	M	M	H	M	H	H

H: High, M: Medium, L: Low

Branch Name:	Bachelor of Science (Information Technology)
Program Code:	ET110
Semester/Year:	Semester - V/ Third Year
Subject Title:	Advanced Machine Learning Techniques
Subject Code:	15-ITE305-3C
Pre-requisite:	Machine Learning, Probability Theory

Course Objective: This course will introduce key concepts in pattern recognition and machine learning; including specific algorithms for classification, regression, clustering and probabilistic modeling. In summary, this course will provide a broad view of the general issues arising in the application of algorithms to analyzing data, common terms used, and common errors made if applied incorrectly.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	00	02	04	50	25	-	25	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Key concepts : Supervised/Unsupervised Learning, Loss functions and generalization, Probability Theory, Parametric vs Non-parametric methods, Elements of Computational Learning Theory Ensemble Learning, Bagging, Boosting, Random Forest	6	15
2	Kernel Methods for non-linear data, Support Vector Machines, Kernel Ridge Regression, Structure Kernels, Kernel PCA, Latent Semantic Analysis	8	25
3	Bayesian methods for using prior knowledge and data, Bayesian inference, Bayesian Belief Networks and Graphical models, Probabilistic Latent Semantic Analysis, The Expectation-Maximization (EM) algorithm, Gaussian Processes	10	20
4	Dimensionality Reduction - CCA, LDA, ICA, NMF - Canonical Variates - Feature Selection vs Feature Extraction	8	20
5	Filter Methods - Sub-space approaches - Embedded methods Low-Rank approaches - Recommender Systems. Application areas : Security ,Scientific	4	15
6	Recent trends in supervised and unsupervised learning algorithm, dimensional reducibility, feature selection and extraction	4	05

List of Reference Books:

1. Pattern Recognition and Machine Learning, Christopher M. Bishop
2. John Shawe-Taylor and Nello Cristianini, Kernel Methods for Pattern Analysis.
3. The Elements of Statistical Learning, Springer 2009
4. Machine Learning Algorithms, 2nd Edition, Giuseppe Bonaccorso, Packt Publication
5. TensorFlow Machine Learning, Nick McClure, Packt Publication

List of Suggested titles of Experiments:

1. Write a python program to import and export data using Pandas library functions
2. Demonstrate various data pre-processing techniques for a given dataset
3. Implement Dimensionality reduction using Principle Component Analysis (PCA) method.
4. Write a Python program to demonstrate various Data Visualization Techniques.
5. Implement Simple and Multiple Linear Regression Models.
6. Develop Decision Tree Classification model for a given dataset and use it to classify a new sample.
7. Implement Naïve Bayes Classification in Python
8. Build KNN Classification model for a given dataset.
9. Build Artificial Neural Network model with back propagation on a given dataset.
10. Write a python program to implement K-Means clustering Algorithm.
11. Mini Project in a group of max. 3 students
12. Writing a research paper on selected topic from content with latest research issues in that topic.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Key concepts, tools and approaches for pattern recognition on complex data sets	1 Remembering 2. Understanding
CLO2	Kernel methods for handling high dimensional and non-linear patterns	2 Understanding 3 Applying 4 Analyze 5 Evaluate
CLO3	State-of-the-art algorithms such as Support Vector Machines and Bayesian networks.	2 Understanding 3 Applying 4 Analyze
CLO4	Solve real-world machine learning tasks: from data to inference	2 Understanding 3 Applying 5 Evaluate
CLO5	Theoretical concepts and the motivations behind different learning frameworks	2. Understanding 3 Applying

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	M				M					M		L	M	L	M	
CLO2	M	M	M	L	H					L		M	H	M	M	
CLO3	M	H	M	H	M					M		M	L	M	H	L
CLO4	M	M	H	M	L				M	H		L	M	H	L	H
CLO5	H	L	M	M	H				L	L	M	H	L	H	M	M

H: High, M: Medium, L: Low

Branch Name:	Bachelor of Science (Information Technology)
Program Code:	ET110
Semester/Year:	Semester - V/ Third Year
Subject Title:	Sensor Device and Components
Subject Code:	15-ITE306-3C
Pre-requisite:	Basic Electronics

Course Objective:

- To provide the basic understanding of measurement and instrumentation systems and the insight of the sensors
- To introduce the concept of the reactive, inductive and capacitive sensors and self-generating sensors.
- To familiarize the characteristics, working principle and application of special purpose transducers.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	00	02	04	50	25	-	25	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Sensors: Difference between sensor, transmitter and transducer - Primary measuring elements - selection and characteristics: Range; resolution, Sensitivity, error, repeatability, linearity and accuracy, impedance, backlash, Response time, Dead band. Signal transmission - Types of signal: Pneumatic signal; Hydraulic signal; Electronic Signal. Principle of operation, construction details, characteristics and applications of potentiometer, Proving Rings, Strain Gauges, Resistance thermometer, Thermistor, Hot-wire anemometer, Resistance Hygrometer, Photo resistive sensor.	7	20
2	Inductive & Capacitive Transducer: Inductive transducers: Principle of operation, construction details, characteristics and applications of LVDT, Induction potentiometer, variable reluctance transducer, synchros, microsyn. Capacitive transducers: - Principle of operation, construction details, characteristics of Capacitive	10	25

	transducers – different types & signal conditioning- Applications: - capacitor microphone, capacitive pressure sensor, proximity sensor.		
3	Actuators: Definition, types and selection of Actuators; linear; rotary; Logical and Continuous Actuators, Pneumatic actuator- Electro-Pneumatic actuator; cylinder, rotary actuators, Mechanical actuating system: Hydraulic actuator - Control valves; Construction, Characteristics and Types, Selection criteria. Electrical actuating systems: Solid-state switches, Solenoids, Electric Motors- Principle of operation and its application: D.C motors - AC motors - Single phase & 3 Phase Induction Motor; Synchronous Motor; Stepper motors - Piezoelectric Actuator.	10	25
4	Micro Sensors And Micro Actuators : Micro Sensors: Principles and examples, Force and pressure micro sensors, position and speed micro sensors, acceleration micro sensors, chemical sensors, biosensors, temperature micro sensors and flow micro sensors. Micro Actuators: Actuation principle, shape memory effects-one way, two way and pseudo elasticity. Types of micro actuators- Electrostatic, Magnetic, Fluidic, Inverse piezo effect, other principles.	6	15
5	Sensor Materials And Processing Techniques: Materials for sensors: Silicon, Plastics, metals, ceramics, glasses, Nano materials Processing techniques: Vacuum deposition, sputtering, chemical vapour deposition, electro plating, photolithography, silicon micro machining, Bulk silicon micro machining, Surface silicon micro machining, LIGA process.	5	15

List of Reference Books:

1. Patranabis.D, “Sensors and Transducers”, Wheeler publisher, 1994.
2. Sergej Fatikow and Ulrich Rembold, “Microsystem Technology and Microbotics”, First edition, Springer –Verlag New York, Inc., 1997.
3. Jacob Fraden, “Hand Book of Modern Sensors: Physics, Designs and Application” Fourth edition, Springer, 2010.
4. Robert H Bishop, “The Mechatronics Hand Book”, CRC Press, 2002.
5. Thomas. G. Bekwith and Lewis Buck.N, Mechanical Measurements, Oxford and IBH publishing Co. Pvt. Ltd.
6. Massood Tabib and Azar, “Microactuators Electrical, Magnetic, thermal, optical, mechanical, chemical and smart structures”, First edition, Kluwer academic publishers, Springer, 1997.
7. Manfred Kohl, “Shape Memory Actuators”, first edition, Springer 2009
8. Sawhney. A.K, “A Course in Electrical and Electronics Measurements and Instrumentation”, 18th Edition, Dhanpat Rai& Company Private Limited, 2007.

List of Suggested titles of Experiments:

1. Measurement of Speed by Magnetic Pickup and Optoelectronic sensor.
2. Measurement of Temperature by a) Thermistor b) Thermocouple.
3. Study and Calibration of Strain Gauge.
4. Measurement of Torque using Opto-electronic sensor.
5. Measurement of Pressure.
6. Measurement of Displacement by Capacitive pickup.
7. Measurement of Displacement by Light dependent resistor.
8. Level Measuring System.
9. Study and Calibration of LVDT.
10. Study and Calibration of RTD.
11. Measurement of displacement by Inductive pickup.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Gain the basic idea of measurements, characteristics and the errors associated with sensors and Transducer.	1 Remembering 2. Understanding
CLO2	Demonstrate the concept of resistive, inductive and capacitive sensors that can employed for real life applications	2 Understanding 3 Applying 4 Analyze 5 Evaluate
CLO3	Realize the concept of Actuators employed for real life applications.	2 Understanding 3 Applying 4 Analyze
CLO4	Understand the working principle of special purpose sensors and the need for developing smart sensors.	2 Understanding 3 Applying 5 Evaluate
CLO5	Describe the taxonomy of the Sensor devices and its design constraints for physical design	2. Understanding 3 Applying

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	M				M					L		M,	M	M	M	
CLO2	M	L	M	H	L					M		L	M	L	M	
CLO3	L	M	M	M	H					M		M	M	M	M	M
CLO4	M	H	H	L	L				M	H		M	L	L	L	H
CLO5	L	M	M	M	M				L	M	M	L	M	M	M	H

H: High, M: Medium, L: Low

Branch Name:	Bachelor of Science (Information Technology)
Program Code:	ET110
Semester/Year:	Semester - V/ Third Year
Subject Title:	Entrepreneurship Skills
Subject Code:	15-SEC310-3C
Pre-requisite:	Data analysis , Technical skills, Communication , Critical thinking

Course Objective: Entrepreneur creates new business establishments or transforms old business establishments thus they work as engines of growth and play an important role in the development of economy. Our fast growing economy provides ample opportunities for engineers to become successful entrepreneur. As entrepreneurship requires distinct skill set which could not be developed while teaching technical subjects a separate course has been introduced for the same. This course aims at developing competencies in students for becoming a successful entrepreneur.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
00	00	04	02	-	-	25	25	50

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Entrepreneurship Development - Concept & Scope: • Charms of becoming an intrapreneur/ entrepreneur. • Entrepreneurship: scope in local and global Market. Steps in setting up of a business. • Traits of successful intrapreneur/ entrepreneur.	8	15
2	Facility Planning: • Selection of Product/ Service, core competence, product life cycle, new product development process, mortality curve, creativity and innovation in product modification/development. • Process selection: Technology life cycle, forms and cost of transformation, factors affecting process selection. • Factors affecting selection of location for an industry. Importance of material handling and its relevance with facility location. • Calculate capacity of plant and its relation with economies of scale. Including flexibility in capacity	7	20

3	Support agencies for MSME: • Categorization of MSME, ancillary industries • Support agencies for entrepreneurship guidance, training, registration. • Support agencies for technical consultation, technology transfer and quality control. • Support agencies for marketing and finance	7	20
4	Managing critical resources: • Managing finance: Sources of financetypes, advantages and disadvantages, methods of cost control & importance, managing working capital. • Materials Management: MRP, JIT • Time management: art of managing time • Information system: Developing suitable information systems.	6	15
5	Project planning: • Preparation of business plan and techno economic feasibility study. • Breakeven point, return on investment and return on sales.	4	10
6	Managing enterprise • Identifying a USP, developing a marketing plan • Developing supply chain, planning for initial orders	4	10
7	Risk Management • Planning for calculated risk taking, initiation with low cost projects • Integrated futuristic planning, angel investors, and role of incubation centers	4	10

List of Reference Books:

1. Entrepreneurship development and Management Author: Dr. R.K. Singal · Publisher: S.K. Kataria & Sons · Edition: 3rd 2016.
2. Entrepreneurial Development S S Khanka S. Chand Publishing, 2006 - Business & Economics.
3. Developing Entrepreneurship: A Handbook, T. Venkateswara Rao, Publisher: Learning Systems, 1978 Original from the University of California Digitized 13 Feb 2009.
4. Entrepreneurship and Venture Management. Front Cover. Clifford M. Baumbach, Joseph Mancuso. Prentice-Hall, 1975
5. Planning an Industrial unit J. N. Vyas 2000.
6. Manual for the preparation of industrial - feasibility studies UNIDO 1991
7. New project opportunities GITCO. GITCO LTD Gujarat Industrial and Technical Consultancy Organization Ltd. A MULTIDISCIPLINARY CONSULTANCY ORGANIZATION <https://www.gitco.co.in/>.
8. Corporate creativity: the winning edge by Pradip N. Khandwalla. New Delhi: Tata McGraw-Hill Publishing Co. Ltd., 2003.
9. EDI STUDY MATERIAL EDI, BHAT, Ahmedabad Website : <http://www.ediindia.org>

List of Learning Websites

1. <http://www.ediindia.org>
2. <http://smallb.in/>
3. <http://www.msme.gov.in>
4. <http://nimsme.org>
5. <http://www.nsic.co.in>

List of suggested student Practical activities:

Following is the list of proposed activities, students should prepare a portfolio of the completed activities for future use:

1. Develop two products from household waste (attach photographs).
2. Download product development and innovative films from internet.
3. Prepare a collage for “Traits of successful entrepreneurs.”
4. Invite entrepreneurs, industry officials, bankers for interaction.
5. Identify your hobbies and interests and convert them into business idea.
6. Convert your project work into business.
7. Choose any advertisement and analyze its good and bad points.
8. Decide any product and analyze its good and bad features.
9. Select any product and prepare its cost sheet.
10. Choose any product and study its supply chain
11. Choose a product and design a unique selling proposition, brand name, logo, advertisement (print, radio, and television), jingle, packing, packaging, and label for it.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Students will pick up about Foundation of Entrepreneurship Development and its theories.	1 Remembering 2. Understanding
CLO2	Students will explore entrepreneurial skills and management function of a company with special reference to SME sector.	2 Understanding 3 Applying 4 Analyze 5 Evaluate
CLO3	Students will identify the type of entrepreneur and the steps involved in an entrepreneurial venture.	2 Understanding 3 Applying 4 Analyze
CLO4	Students will understand various steps involved in starting a venture and to explore marketing methods & new trends in entrepreneurship.	2 Understanding 3 Applying 5 Evaluate

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	M							L		M	L	M	M	L	M	
CLO2		M	M	L	M			M	M	L	M	L	M	M	M	
CLO3		M	H	M	L			H	L	M	H	M	L	M	M	H
CLO4		L	M	H	M			L	M	H	M	H	M	M	M	M
CLO5		M	L	H	M		M	M	H	M	L	M	L	L	M	M

H: High, M: Medium, L: Low