Syllabus Book

4th Year B. Tech.
Information Technology

P P Savani University

School of Engineering

Department of Information Technology

Effective From: 2020-21

Authored by: P P Savani University

P P SAVANI UNIVERSITY

SCHOOL OF ENGINEERING

TEACHING & EXAMINATION SCHEME FOR FOURTH YEAR B.TECH. INFORMATION TECHNOLOGY PROGRAMME

Sem	Course Code	Course Title	Offered By	Teaching Scheme					Examination Scheme						
				Contact Hours				Credit	Theory		Practical		Tutorial		Total
				Theory	Practical	Tutorial	Total		CE	ESE	CE	ESE	CE	ESE	
7	SEIT4013	Data Science	IT	3	2	0	5	4	40	60	20	30	0	0	150
	SECE4022	Cloud Computing & Applications	CE	3	2	0	5	4	40	60	20	30	0	0	150
	SECE4031	Internet of Things	CE	2	4	0	6	4	40	60	40	60	0	0	200
	SECE4042	Artificial Intelligence	CE	3	2	0	5	4	40	60	20	30	0	0	150
	SECE4920	Major Project	CE	3			3	3	0	0	100	100	0	0	200
	SEPD4010	Creativity, Problem Solving & Innovation	SEPD	3	0	0	3	3	40	60	0	0	0	0	100
	SEIT4910	Summer Internship / Project 4 Weeks	CE	5			0	0	0	5	0	0	100	100	0
		Elective-III		2	2	0	4	3	40	60	20	30	0	0	150
8	SECE4930	Project	CE	25			25	25	0	0	400	600	0	0	1000

P P SAVANI UNIVERSITY

SCHOOL OF ENGINEERING

TEACHING & EXAMINATION SCHEME FOR FOURTH YEAR B.TECH. INFORMATION TECHNOLOGY PROGRAMME (ELECTIVE COURSES)

Sem	Course Code	Department Elective Course Title	Offered By	Teaching Scheme					Examination Scheme						
				Contact Hours				Credit	Theory		Practical		Tutorial		Total
				Theory	Practical	Tutorial	Total		CE	ESE	CE	ESE	CE	ESE	
7	SECE4523	Machine Learning	CE	2	2	0	4	3	40	60	20	30	0	0	150
	SECE4530	Research Methodology	CE	2	0	1	3	3	40	60	0	0	50	0	150
	SEIT4521	Blockchain Technology	IT	2	2	0	4	3	40	60	20	30	0	0	150
	SEIT4530	Cyber Security	IT	2	2	0	4	3	40	60	20	30	0	0	150
	SEIT4541	Automata Theory & Language Processor	IT	2	2	0	4	3	40	60	20	30	0	0	150

CONTENT

Semester 7

Electives

P P Savani University
School of Engineering

Department of Information Technology

Course Code: SEIT4013
Course Name: Data Science
Prerequisite Course(s): SECE2011 - Database Management System
SECE2031 - Data Structures
SECE3031 - Data Warehouse & Data Mining

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	00	04	40	60	20	30	00	00	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- study fundamentals of data analytics and data science pipeline.
- apply statistical methods, regression techniques, and machine learning algorithms to make sense out of both large and small data sets.
- understand various Data Visualization techniques and their applications.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Data Science** Introduction, Terminology, Data Science Process, Data Science Toolkit, Types of Data, Examples and Applications	06	10
2.	**Data collection and management** Introduction, Sources of Data, Data Collection and APIs, Exploring and Fixing Data, Data Storage and Management, Using Multiple Data Sources	07	15
3.	**Statistics for Data Science** Terminology and Concepts of Probability, Introduction to Statistics, Central Tendencies and Distributions, Variance, Outliner Analysis(Box Plot), Distribution Properties and Arithmetic, Inferential Statistics, Introduction to Testing of Hypothesis, Chi-squared test, ANOVA test	10	25

Section II			
Module No.	Content	Hours	Weightage in %
1.	**Machine Learning Algorithm** Linear Regression, Logistic Regression, Decision Tree, Naïve Bayes, Support Vector Machines, Random Forest, Radial Bases Functions -Appropriate problems for Algorithms	10	25
2.	**Data Visualization** Introduction, Types of Data Visualization, Data for Visualization: Data Types, Data Encodings, Retinal Variables, Mapping Variables to Encodings, Visual encodings, Applications of Data Science, Technologies for Visualization.	07	15
3.	Recent Trends in Various Data Collection and Analysis Techniques, Application Development Methods used in Data Science	05	10

List of Practical:

Sr. No	Name of Practical	Hours
1.	Basics of Python for Data Analysis • Why learn Python for data analysis? • Python 2.7 v/s 3.4 • How to install Python? • Running a few simple programs in Python	04
2.	Python libraries and data structures • Python Data Structures • Python Iteration and Conditional Constructs • Python Libraries	06
3.	Exploratory analysis in Python using Pandas • Introduction to series and data frames • Analytics of dataset- Loan Prediction Problem	06
4.	Data Munging in Python using Pandas	04
5.	Building a Predictive Model in Python • Logistic Regression • Decision Tree • Random Forest	10

Text Book(s):

Title	Author/s	Publication
Data Mining: Concepts and Techniques	Jiawei Han, Micheline Kamber and Jian Pei	Morgan Kaufmann
Doing Data Science: Straight Talk from the Frontline	Cathy O'Neil and Rachel Schutt	O'REILLY
Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data	EMC Education Services	Wiley

Reference Book(s):

Title	Author/s	Publication
Introduction to Data Science: Big Data, Machine Learning, and More Using Python Tools	Arno D. B. Meysman Davy Cielen and Mohamed Ali	Manning Publications
The Data Science Handbook	Field Cady	Wiley
Data Science	John D. Kelleher and Brendan Tierney	MIT Press
Practical Data Science with R	Nina Zumel and John Mount	Manning Publication

Web Material Link(s):

- https://www.edureka.co/blog/what-is-data-science/
- https://www.analyticsvidhya.com/blog/2016/01/complete-tutorial-learn-data-science-python-scratch-2/
- https://www.ngdata.com/top-tools-for-data-scientists/
- https://towardsdatascience.com/intro-to-data-science-part-2-data-wrangling-75835b9129b4
- https://www.allerin.com/blog/top-5-sources-of-big-data
- https://www.tutorialspoint.com/excel_data_analysis/data_analysis_overview.htm
- https://www.tutorialspoint.com/statistics/data_collection.htm
- https://docs.bokeh.org/en/latest/

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests, each of 30 marks and 1 hour of duration and average of the same will be converted out of 30 marks.
- Submission of assignment which consists of 5 questions to be answered under each module and it consists of 10 marks.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of the performance of practical which will be evaluated out of 10 for each practical and average of the same will be converted to 10 marks.
- Internal viva consists of 10 marks.
- Practical performance/quiz/test consists of 15 marks during End Semester Exam.
- Viva/oral performance consists of 15 marks during End Semester Exam.

Course Outcome(s):

After completion of the course, the student will be able to

- Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists;
- Understand how data is collected, managed and stored for data science;
- Understand how data is analyzed, evaluated and visualized.

P P Savani University
School of Engineering

Department of Computer Engineering

Course Code: SECE4022
Course Name: Cloud Computing & Applications
Prerequisite Course(s): SECE3011 - Computer Networks
SEIT2031 - Operating System

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	00	05	40	60	20	30	00	00	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- understand the principles and paradigm of Cloud Computing
- understand the Service Model with reference to Cloud Computing
- appreciate the role of Virtualization Technologies
- gain ability to design and deploy Cloud Infrastructure
- understand cloud security issues and solutions

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Cloud Computing** Overview, Roots of Cloud Computing, Layers and Types of Cloud, Desired Features of a Cloud, Benefits and Disadvantages of Cloud Computing, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers, Challenges and Risks	05	10
2.	**Cloud Architecture, Services and Applications** Exploring the Cloud Computing Stack, connecting to the Cloud, Infrastructure as a Service, Platform as a Service, Saas Vs. Paas, Using PaaS Application Frameworks, Software as a Service, Cloud Deployment Models, Public vs Private Cloud, Cloud Solutions, Cloud ecosystem, Service management, Identity as a Service, Compliance as a Service	05	10
3.	**Virtualization, Abstraction and Cloud Platform** Introduction to Virtualization Technologies, Load Balancing and Virtualization, Understanding Hypervisors, Understanding Machine Imaging, Porting Applications, Virtual Machines	07	15

	Provisioning and Manageability Virtual Machine Migration Services, Virtual Machine Provisioning and Migration in Action, Provisioning in the Cloud Hypervisors		
4.	**Cloud Infrastructure and Cloud Resource Management** Architectural Design of Compute and Storage Clouds, Layered Cloud Architecture Development, Design Challenges, Inter Cloud Resource Management, Resource Provisioning and Platform Deployment, Global Exchange of Cloud Resources. Administrating the Clouds, Cloud Management Products, Emerging Cloud Management Standards	06	15
Section II			
Module	Content	Hours	Weightage in %
1.	**Cloud Security** Security Overview, Cloud Security Challenges and Risks, Software-as-a- Service Security, Cloud computing security architecture: Architectural Considerations, General Issues Securing the Cloud, Securing Data, Data Security, Application Security, Virtual Machine Security, Identity and Presence, Identity Management and Access Control, Autonomic Security Establishing Trusted Cloud computing, Secure Execution Environments and Communications, , Identity Management and Access control Identity management, Access control, Autonomic Security Storage Area Networks, Disaster Recovery in Clouds	06	15
2.	**AWS Programming, Management Console and Storage** Basic Understanding APIs - AWS programming interfaces, Web services, AWS URL naming, Matching interfaces and services, Elastic block store - Simple storage service, Define the AWS Cloud and its value proposition, Identify aspects of AWS Cloud economic, List the different cloud architecture design principles, Security and Compliance, Define the AWS shared responsibility model, Define AWS Cloud security and compliance concepts, Identify AWS access management capabilities, Identify resources for security support	09	20
3.	**AWS Technology, Billing and Pricing** Define methods of deploying and operating in the AWS Cloud, Define the AWS global infrastructure, Identify the core AWS services, identify resources for technology support, Compare and contrast the various pricing models for AWS, Recognize the various account structures in relation to AWS billing and pricing, Identify resources available for billing support	07	15

List of Practical:

Sr. No.	Name of Practical	Hours
1	Write pros and cons of Cloud Computing.	04
2	Summarize Cloud service models with real time examples.	04
3	Define Virtualization. Also list and explain different Hypervisors.	04
4	Discuss performance evaluation of service over cloud.	04
5	Software study on Hadoop, MapReduce and HDFS.	04
6	Create an AMI for Hadoop and implementing short Hadoop programs on the Amazon Web Services platform.	06
7	Create a scenario that use Amazon S3 as storage on cloud.	04

Text Book(s):

Title	Author/s	Publication
Cloud Computing Bible	Barrie Sosinsky	John Wiley & Sons

Reference Book(s):

Title	Author/s	Publication
Amazon Web Services for Dummies	Bernard Golden	Dummies
Amazon Web Services in Action	Michael Wittig and Andreas Wittig	Dreamtech Press
Building Applications in the Cloud: Concepts, Patterns and Projects	Christopher M. Moyer	Pearson Addison-Wesley Professional
Cloud Computing Design Patterns	Thomas Erl	Prentice Hall

Web Material Link(s):

- CloudSim 3.0.3
- http://www.cloudbus.org/
- https://aws.amazon.com/
- http://aws.amazon.com/documentation/
- http://docs.aws.amazon.com/IAM/latest/UserGuide/getting-started.html

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 hour of duration and average of the same will be converted out of 30 marks.
- Faculty Evaluation consists of 10 marks as per guidelines provided by Course Coordinator.
- End Semester Examination consists of 60 marks Exam.

Practical:

- Continuous Evaluation Consist of Performance of Practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal Viva consists of 10 marks.
- Practical performance/quiz/test of 15 marks during End Semester Exam.
- Viva/Oral performance of 15 marks during End Semester Exam.

Course Outcome(s):

After completion of the course, the student will be able to

- explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
- apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost by Load balancing approach.
- discuss system virtualization and outline its role in enabling the cloud computing system model.
- illustrate the fundamental concepts of cloud storage and demonstrate their use in storage systems such as Amazon S3 and HDFS.
- analyze various cloud programming models and apply them to solve problems on the cloud.
- understand various management and other distinguish services of AWS.
- analyze the billing of resources and other paradigm: how to deal with disasters.
- understand security and compliances for AWS.
- deploy applications over commercial cloud computing infrastructures such as Amazon

P P Savani University
School of Engineering

Department of Computer Engineering

Course Code: SECE4031
Course Name: Internet of Things
Prerequisite Course(s): SEIT3022 - Embedded Systems

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
02	04	00	04	40	60	40	60	00	00	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- learn how to interface sensors and Actuators with embedded IoT devices
- select connectivity and communication IoT protocols
- implement IoT applications

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	Introduction Introduction to Internet of things, end-to-end IoT Architecture, Requirement of IoT challenges and issues of IoT , selection of hardware and software, case studies of IoT applications.	02	06
2.	Embedded IoT Devices Choosing criteria for embedded IoT devices, Enlist MCU based and MPU based IoT devices, Comparison between Aruino Uno, NodeMCU and ESP32, Architecture of ESP8266, variants of ESP8266, Arduino C, GPIO programming.	05	20
3.	Sensors & Actuators Types of sensors, working principles of actuators, Interfacing & Programming of digital, analog, protocol based sensors and actuators	04	12
4.	Networking IoT platform Raspberry Pi and its variant, Raspberry Pi programming, Choosing a right board, IoT gateway, Tools, Sensing IoT Environments.	04	12

Section II			
Module No.	Content	Hours	Weightage in %
1.	**RFID and iBeacons** Introduction to RFID and iBeacon, Hardware & Software, Hardware used for IoT RFID, Connection to Serve, Data on RFID Server and Classic distributed the problem.	04	14
2.	**IoT connectivity protocols** Networks layer protocols: RPL and 6LowPAN, WiFi, Bluetooth, BLE, LORAwan, NFC, cellular, zegbee, and Ethernet	04	14
3.	**IoT communication protocol: MQTT** Existing cloud platforms, Various application layer IoT protocols, MQTT protocol, Building online server using MQTT, data exchange and storage in cloud, User Interface development.	04	14
4.	**IoT Security** IOT Security, Dangers, Assigning values to Information, Security Components, Key Management, Update Management.	03	08

List of Practical:

Sr. No	Name of Practical	Hours
1.	Getting started with Arduino IDE, add ESP8266 and ESP32 in the Arduino IDE. GPIO Interfacing and programming	04
2.	Digital on/off sensor (PIR and IR) Interfacing programming	04
3.	Analog sensors Interfacing (Accelerometer and gyroscope) & programming	04
5.	Interfacing and programming of actuators	04
6.	Walk through existing library for ESP8266. Configure ESP8266 in station and access mode.	02
7.	Development of an offline server using http protocol	04
8.	Development of an online server	04
9.	Experimenting with existing cloud platforms	04
10.	Development of Android applications suitable for IoT	04
11.	Exchange information using MQTT protocol	04
12.	Getting started with Raspberry Pi and OS Installation	04
13.	Experimenting with Raspberry Pi using Python	04
14.	Dashboard development using visual programming: NodeRED	06
15.	IoT based mini project	08

Text Book(s):

Title	Author/s	Publication
Beginning Arduino (2nd Edition)	Michael McRoberts	TIA
Raspberry Pi IoT Projects	John C. Shovic	Apress

Reference Book(s):

Title	Author/s	Publication
Mastering Internet of Things: Design and create your own IoT applications using Raspberry Pi 3	Peter Waher	Packt

Web Material Link(s):

- https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/
- https://www.tutorialspoint.com/internet_of_things/
- https://www.tutorialspoint.com/arduino/
- https://pythonprogramming.net/introduction-raspberry-pi-tutorials/

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 hour of duration, and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of performance of practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/test consists of 30 marks during End Semester Exam.
- Viva/ Oral performance consists of 30 marks during End Semester Exam.

Course Outcome(s):

After completion of the course, the student will be able to

- understand the fundamentals of the Internet of Things.
- understand IoT architecture, hardware, and software.
- develop projects of the Internet of Things.

P P Savani University
School of Engineering

Department of Computer Engineering

Course Code: SECE4042
Course Name: Artificial Intelligence
Prerequisite Course(s): SECE2031 - Data Structures
SESH2051 - Mathematical Methods for Computation

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	00	05	40	60	20	30	00	00	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- understand basics of AI
- develop roles in future and also introduce the intelligence of machine
- design AI

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**What is AI?** What is an AI Technique? The AI Problems and applications, Major areas of Artificial Intelligence, History of AI	04	10
2.	**Problems, State Space Search & Heuristic Search Techniques** Defining the Problems as a State Space Search, Production Systems: control & search strategies, Depth first and Breadth first search, Hill Climbing, Best first search, A* algorithm	08	20
3.	**Knowledge Representation Issues** Representations and Mappings, Approaches to Knowledge Representation, Using Propositional logic and Predicate Logic, Resolution, Semantic network, Frame based knowledge	06	10
4.	**Representing Knowledge Using Rules** Procedural Versus Declarative Knowledge, Forward Reasoning, Backward Reasoning. Symbolic Reasoning, Under Uncertainty: Introduction to Non Monotonic Reasoning, Logics for Non-monotonic Reasoning	05	10

Section II			
Module No.	Content	Hours	Weightage in %
1.	**Uncertain Reasoning and alternatives** Probability and Bayes' Theorem, Certainty Factors and Rule-Base Systems, Bayesian Networks, Dempster Shafer Theory, Fuzzy sets, Fuzzy Logic, Fuzzy systems, Hidden Markov model	08	20
2.	**Game Theory** Introduction to Game playing, The Minimax search procedure, Alpha-Beta procedure, Refinements, Iterative Deepening	05	10
3.	**Natural Language Processing** Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Spell Checking.	05	10
4.	**Connectionist Models** Introduction to Hopfield Network, Learning in Neural Network, Application of Neural Networks, Recurrent Networks, Introduction to multilayer Neural networks	04	10

List of Practical:

Sr. No.	Name of Practical	Hours
1.	Overview of Artificial Intelligence systems.	02
2.	Write a program to implement BFS (for 8 puzzle problem or Water Jug problem or any AI search problem)	02
3.	Write a program to implement DFS (for 8 puzzle problem or Water Jug problem or any AI search problem)	02
4.	Write a program to Implement A* Algorithm.	04
5.	Explore different python packages which are applicable in AI.	04
6.	Write a program to construct a Bayesian network from given data.	04
7.	Write a program to infer from the Bayesian network.	04
8.	Hidden Markov model implementation using python.	04
9.	Character recognition application using python.	02
10.	NLP application using python.	02

Reference Books for AI:

Title	Author/s	Publication
Artificial Intelligence	By Elaine Rich And Kevin Knight	(2nd Edition) Tata McGraw-Hill
Artificial Intelligence: A Modern Approach	Stuart Russel, Peter Norvig, PHI	

Web links:

- https://nptel.ac.in/courses/106106126/
- https://www.edureka.co/post-graduate/machine-learning-and-ai?utm_source=google&utm_medium=cpc&utm_campaign=ET-PGPINML-05-Search-AI-High-Intent-Minus-18-24&gclid=EAIaIQobChMI55v6_uC55wIVjx0rCh001wW5EAAYAyAAEgJcyfD_BwE

Course Evaluation:

Theory:

- Continuous Evaluation Consist of two tests, each of 30 Marks and 1 hour of duration and average of the same will be converted out of 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation Consist of Performance of Practical which should be evaluated out of 10 for each practical and average of the same will be converted to 10 Marks.
- Internal Viva component of 10 marks.
- Practical performance/quiz/test of 15 Marks during End Semester Exam.
- Viva/Oral performance of 15 Marks during End Semester Exam.

Course Outcome(s):

After completion of the course, the student will be able to

- learn the fundamentals of distributed environment.
- develop efficient distributed system with their own logic & capabilities.
- understand the security aspects in distributed environment.

P P Savani University
School of Engineering

Center for Skill Enhancement and Professional Development

Course Code: SEPD4010
Course Name: Creativity, Problem Solving & Innovation
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	00	00	03	100	00	00	00	00	00	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- achieve expertise with the technicalities of creativity and problem solving.
- advance an assertiveness for innovation.
- advance creative thinking skills using shaft of learning components leading to understanding of plans of creativity, problem solving and innovation
- discuss uses of the concepts of creativity and problem-solving skills in personal, social, academic, and profession life.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Creativity, Problem Solving and Innovation** • Definitions of Problem Solving, Creativity and Innovation • Need for Problem Solving and Innovation & Scope of Creativity • Types and Styles of Thinking • Strategies to Develop Creativity, Problem Solving and Innovation Skills	08	17
2.	**Questioning and Learning** • Introduction to Questioning, Learning and Visualization and its Strategies • Sources and Methods of Questioning and Learning • Finding Perspective, Visualizing thinking • Mind Mapping	07	16
3.	**Creative Thinking and Problem Solving** • Need of Creative Thinking • Cracking Creativity - Reversals, Reversing Perspective, seeing all sides, Looking in other world, • Finding what you are not looking for and following up • Fishbone Diagram • SCAMPER Technique	08	17

Section II			
Module No.	Content	Hours	Weightage in %
1.	**Logic and Reasoning** • Basic Concept of Logic • Divergent Vs Convergent Thinking, Inductive Vs Deductive Thinking • Fusion of Ideas for Problem Solving • Moral Reasoning • Improvisation	08	17
2.	**Practices of Playing** • Collaboration and Brainstorming • The Spirit of Koinonia • QFT Model • Connecting the Unconnected • Making Novel Combinations	07	16
3.	**Review Strategies for Creative problem-solving methods** • A Heuristic Technique • Problem-Solving Strategies: Why Bother? • Five Building Blocks as per Fogler & LeBlanc • Strategy for Critical Thinking for Choosing • Lateral Thinking • Six Thinking Hats by Edward De Bono • Design Thinking	07	17

Text Book(s):

Title	Author/s	Publication
Thinker Toys	Michael Michalko	Random House Publication 2006
Crackling Creativity, The Secrets of Creative Genus	Michael Michalko	Ten Speed Press 2001

Reference Book(s):

Title	Author/s	Publication
Zig Zag, The Surprising Path to Greater Creativity	R Keith Sawyer	Jossy-Bass Publication 2013
De Bono's Thinking Course	Edward De Bono	Penguin Publication 1994
Six Thinking Hats	Edward De Bono	Penguin Publication 1999
How to Mind Map	Tony Buzan	Thorsons Publication 2002
The Myths of Innovation	Scott Berkum	Berkun Publication 2010
Creative confidence: Unleashing the creative Potential within Us all	Tom Kelly and David Kelly	William Collins Publication 2013
The all Laughed	Ira Flatow	Harper Publication 1992
The Ultimate Lateral & Critical Thinking Puzzle book	Paul Sloane, Des MacHale & M.A. DiSpezio	Sterling Publication 2002

Course Evaluation:

Section	Module No.	Evaluation Criteria	Marks
1	1	Group Activity on Brainstorming	15
	2	Mind Mapping Activity	10
	3	Chart Preparation on 'Practicality of Fishbone Diagram'	15
		Group presentation on 'SCAMPER Technique & its applications'	10
2	1	Group Presentation on Critical Analysis of a Govt. scheme/ policy/ budget (merit/ demerit, pros/cons etc)	15
	2	Group Discussion/ Debate/ Elocution	10
	3	Problem Solving Activity (Individual)	10
		Presentation (Learning Outcomes)	15
		Grand Total	**100**

Course Outcome(s):

After completion of the course, the student will be able to

- establish creativity in their day to day actions and educational output.
- solve all types of problems with an optimistic and an impartial attitude.
- reflect innovatively and work towards problem solving in a tactical way.
- initiate different and advanced practices in their selected field of profession.

P P Savani University
School of Engineering

Department of Computer Engineering

Course Code: SECE4523
Course Name: Machine Learning
Prerequisite Course(s): Data Structures (SECE2031),
Design and Analysis of Algorithms (SEIT3032),
Mathematical Methods for Computation (SESH2051)

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
02	02	00	03	40	60	20	30	00	00	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- master the concepts of supervised and unsupervised learning, recommendation engine, and time series modeling.
- implement models such as support vector machines, kernel SVM, naive Bayes, decision tree classifier, random forest classifier, logistic regression, K-means clustering and more in Python.
- comprehend the theoretical concepts and how they relate to the practical aspects of Machine Learning.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Artificial Intelligence and Machine Learning** Learning Problems, designing a learning system, Issues with machine learning. Concept Learning, Version Spaces and Candidate Eliminations, Inductive bias.	04	10
2.	**Supervised learning** Decision Tree Representation, Appropriate problems for Decision tree learning, Algorithm, Hypothesis space search in Decision tree learning, inductive bias in Decision tree learning, Issues in Decision tree learning, Radial Bases, Functions, Case Based Reasoning.	06	20
3.	**Artificial Neural networks and genetic algorithms** Neural Network Representation, Appropriate problems for Neural Network Learning, Perceptrons, Multilayer Networks	05	20

	and Back Propagation Algorithms, Remarks on Back Propagation Algorithms. Case Study: face Recognition.		
Section II			
Module No.	Content	Hours	Weightage in %
1.	**Bayesian Learning** Bayes Theorem, Bayes Theorem and Concept Learning, Maximum Likelihood and Least squared Error Hypothesis, Maximum likelihood hypothesis for Predicting probabilities, Minimum Description Length, Principle, Bayes Optimal Classifier, Gibbs Algorithm, Naive Bayes Classifier. Case Study: Learning to classify text.	06	20
2.	**Unsupervised learning** Unsupervised learning, Applications, challenges, K- Nearest Neighbor Learning Locally Weighted Regression, SVM, Apriori Algorithm, EM Algorithm.	05	20
3.	**Overview** Typical application areas, such as Recommender System.	04	10

List of Practical:

Sr. No.	Name of Practical	Hours
1.	Introduction	02
2.	Classifying with distance measures	02
3.	Constructing Decision trees	02
4.	Classification using Decision Trees	02
5.	K-means	02
6.	Classification with k-Nearest Neighbors	02
7.	Random Forest	02
8.	Support vector machines	02
9.	Expectation Maximization	02
10.	Page Rank	04
11.	Naive Bayes Classification	04
12.	CART	04

Text Book(s):

Title	Author/s	Publication
Machine Learning	Tom M Mitchell	McGraw Hill

Reference Book(s):

Title	Author/s	Publication
Pattern Recognition and Machine Learning	Christopher Bishop	Springer-Verlag New York Inc.
Real-World Machine Learning	Henrik Brink, Joseph Richards, Mark Fetherolf	DreamTech
Machine Learning in Action	Peter Harrington	DreamTech

Web Material Link(s):

- https://nptel.ac.in/courses/106/105/106105152/
- https://in.mathworks.com/campaigns/offers/machine-learning-with-matlab.html?gclid=EAIaIQobChMIrv2dqpOh5wIVkoiPCh0t9g8CEAAYASAAEgKl-fD_BwE&ef_id=EAIaIQobChMIrv2dqpOh5wIVkoiPCh0t9g8CEAAYASAAEgKl-fD_BwE:G:s&s_kwcid=AL!8664!3!281794527296!b!!g!!%2Bmachine%20%2Blearning&s_eid=psn_57384022552&q=+machine%20+learning
- https://wqu.org/programs/datascience/?utm_source=datawrkz&utm_medium=search&utm_campaign=datascience&gclid=EAIaIQobChMIr_TK5ZOh5wIVzQorCh0YdQBvEAAYASAAEgLb5PD_BwE

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, and average at the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the Course Coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of performance of practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal viva consists of 10 marks.
- Practical performance/quiz/drawing/test consists of 15 marks during End Semester Exam.
- Viva/ Oral performance consists of 15 marks during End Semester Exam.

Course Outcome(s):

After completion of the course, the student will be able to

- Learn the concept of Machine learning and range of problems that can be solved by machine learning.
- Compare different types of learning algorithms and apply machine learning concepts in real life problems.

P P Savani University
School of Engineering

Department of Information Technology

Course Code: SEIT4521
Course Name: Blockchain Technology
Course Prerequisite(s): SECE2031 - Data Structures

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
02	02	00	03	40	60	20	30	00	00	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help the learners to

- understand blockchain and its applications.
- analyze IBM's strategy in blockchain platform.
- understand security in blockchain based networks.

Course Content:

Section I			
Module No	Content	Hours	Weightage in %
1.	**Introduction to Blockchain** Blockchain types, Public key cryptography, Hashing, Digital Signature, Business networks, Assets, Ledgers, Transactions and Contracts, the problem with existing networks, how blockchain solves this problem, Requirements of a blockchain for business.	05	10
2.	**Blockchain Networks** Overview of active networks, TradeLens - Improving global trade, IBM Food Trust - Supply Chain Transparency, IBM World Wire - Global Payments, Decentralised and Trusted Identity, Further Examples by Industry, Key Players for Blockchain Adoption	05	20
3.	**IBM and Blockchain** How IBM can help with a Blockchain Project, IBM's Blockchain strategy, the IBM Blockchain Platform, The Linux Foundation's Hyperledger Project, Hyperledger Fabric, Continuing your Blockchain Journey	05	20

Section II			
Module No	Content	Hours	Weightage in %
1	**Blockchain composed** What is Hyperledger Composer, Components and Structure of Composer, An example Business Network: Car Auction Market, Extensive, Familiar, Open Tool Set	05	10
2.	**Blockchain fabric development** Participants and Components Overview, Developer Considerations	05	20
3.	**Blockchain architecture** Administrator (operator) Considerations, Security: Public vs. Private Blockchains, Architect Considerations, Network Consensus Considerations	05	20

List of Practical:

Sr No	Name of Practical	Hours
1.	Demo - Vehicle Lifecycle Demo: Transfer assets in blockchain	04
2.	Demo of Hyperledger Composer	04
3.	Create a Hyperledger Composer solution	06
4.	Write your first blockchain application	08
5.	Build your own network	08

Text Book:

Title	Author/s	Publication
Blockchain Basics – A Non-Technical Introduction in 25 Steps.	Daniel Drescher	Apress

Reference Book:

Title	Author/s	Publication
Mastering Blockchain	Imran Bashir	Packt
The Business Blockchain – Promise, practice, and application of the next internet technology.	William Mougayar	Wiley

Web Material Link(s):

- https://www.udemy.com/course/blockchain-and-bitcoin-fundamentals/
- https://cognitiveclass.ai/courses/blockchain-course
- https://www.coursera.org/courses?query=blockchain

Course Evaluation:

Theory:

- Continuous Evaluation Consists of Two Tests; evaluation of each test consists of 15 marks. The duration of each test is 60 minutes.
- Students have to appear for a quiz/group discussion, which consists of 10 marks.
- End Semester Examination will consist of 60 Marks.

Practical:

- Continuous Evaluation consists of performance of practical, which should be evaluated out of 10 per each practical. At the end of the semester, average of the entire practical will be converted to 10 Marks.
- Internal Viva consists of 10 marks.
- Practical performance/quiz/test of 15 Marks during End Semester Exam.
- Viva/Oral performance of 15 Marks during End Semester Exam.

Course Outcome(s):

After completion of the course, the student will be able to

- understand blockchain and its applications.
- create their own Hyperledger composer solution.
- create their own Blockchain application.
- build their own network.

P P Savani University
School of Engineering

Department of Information Technology

Course Code: SEIT4530
Course Name: Cyber Security
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
02	02	00	03	40	60	20	30	00	00	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- identify and classify various cybercrimes with respect to organizational weaknesses in order to mitigate the security risk and estimate the impact on society and world.
- interpret and apply Indian IT laws in various legal issues.

Course Content:

Section – I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Cyber Security** Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats: - Cyber Warfare-Cyber Crime-Cyber Terrorism-Cyber Espionage, need for a Comprehensive Cyber Security Policy, need for a Nodal Authority, Need for an International convention on Cyberspace, Security Standards.	03	10
2.	**Cyber Security Vulnerabilities and Cyber Security Safeguards** Cyber Security Vulnerabilities-Overview, vulnerabilities in Software, System Administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness, Cyber Security Safeguards- Overview, Access Control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection System, Response, Scanning, Security Policy, Threat Management	06	20
3.	**Securing Web Application, Services and Servers** Introduction, Basic security for HTTP Applications and Services,	03	10

	Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges		
4.	**Intrusion Detection and Prevention** Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation	03	10
Section – II			
Module No.	Content	Hours	Weightage In %
1.	**Cryptography and Network Security** Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls-Types of Firewalls, User Management, VPN Security Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec	05	17
2.	**Cyberspace and the Law** Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013	05	17
3.	**Cyber Forensics** Introduction to Cyber Forensics, Handling Preliminary analysis, Investigating Investigations, Controlling an Investigation, conducting disk-based Information-hiding, Scrutinizing E-mail, Validating E-mail Header information, Tracing Internet access, Tracing Memory in real-time.	05	16

List of Practical:

Sr. No	Name of Practical	Hours
1.	TCP scanning using NMAP	2
2.	Port scanning using NMAP	2
3.	TCP / UDP connectivity using Netcat	2
4.	Network vulnerability using OpenVAS	4
5.	Web application testing using DVWA	2
6.	Manual SQL injection using DVWA	4
7.	XSS using DVWA	4
8.	Automated SQL injection with SqlMap	4
9.	Write a program to create and simulate an attack. Then explain how to avoid it.	6

Text Book(s):

Title	Author/s	Publication
Cybersecurity for Beginners	Raef Meeuwisse	Cyber Simplicity Ltd

Reference Book(s):

Title	Author/s	Publication
Cyber Security	Nina Godbole, SunitBelapure	Wiley India, New Delhi
Anti-Hacker Tool Kit,4th Edition	Mike Shema	McGrawHill Publication
The Indian Cyber Law	Suresh T. Vishwanathan;	Bharat Law House New Delhi
Handbook of Applied Cryptography	Menezes, van Oorschot and Vanstone	CRC Press
Computer Security, 3/e	Gollmann	Wiley

Web Material Link(s):

- https://nptel.ac.in/courses/106105031/
- https://www.javatpoint.com/cyber-security-tutorial

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the Course Coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of performance of practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal viva consists of 10 marks.
- Practical performance/quiz/drawing/test consists of 15 marks during End Semester Exam.
- Viva/ Oral performance consists of 15 marks during End Semester Exam.

Course Outcome(s):

After completion of the course, the student will be able to

- Understand cyber-attack, types of cybercrimes, cyber laws and also how to protect them self and ultimately society from such attacks.
- Apply Information Security Standards compliance during software design and development.

P P Savani University
School of Engineering

Department of Computer Engineering

Course Code: SEIT4541
Course Name: Automata Theory & Language Processor
Prerequisite Course(s): Discrete Mathematics (SESH2040)

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
02	00	01	03	40	60	00	00	50	00	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- understand basics of formal languages and automata.
- design grammars and automata for different formal languages.
- develop logic building to solve computational problems.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Review of Mathematical Preliminaries** Principle of Mathematical Induction, Proof by Contradiction, Introduction to Formal Languages and Automata, Alphabets, Strings and their properties, Languages, Determinism and Non-determinism	03	10
2.	**Finite Automata** Introduction to Transition systems, Description of Finite Automata, String acceptability by Finite Automata, Construction of NFA, NFA with $\in$- moves, The Equivalence between DFA, NFA and $\in$-NFA, Minimization of FA, Finite Automata with output- Moore and Mealy Models.	06	20
3.	**Regular Expression and Regular Language** Regular Expressions, Identities for RE, Construction of RE equivalent to FA using Arden's Theorem. Construction of FA equivalent to RE, Kleen's Theorem, Properties of Regular Languages and FA: Closure and Decision properties, Limitations of FA.	06	20

Section II			
Module No.	Content	Hours	Weightage in %
1.	**Grammar:** Definition, Chomsky hierarchy, Context Free Grammar- Definition, Derivation, sentential form, parse tree, Ambiguous Grammar Removing ambiguity from grammar, Left Recursion, Left Factoring, Language generated by grammar, Construction of Grammar, Simplification of CFGs, Normal Forms for CFG: Chomsky Normal Form, Greibach Normal Form, Decision Properties of CFG Regular Grammar- Definition: Left Linear Grammar, Right Linear Grammar, The Conversion from: RG to FA and FA to RG, The Equivalence between LLG and RLG.	07	25
2.	**Push Down Automata** Definition, Description of PDA, Acceptance by PDA, Operations on PDA, Construction of PDA, Equivalence between CFG and PDA, Deterministic PDA and Non-Deterministic PDA. **Turing Machine** Definition, Description of TM, Representation of TM, Language Acceptability by TMs, Construction of TM, Variants of TM: Multitape Turing Machines and NTM, Universal TM, The Model of LBA and Relationship between LBA and CSL, RS and RES, Closure properties of RS and RES.	08	25

List of Tutorial:

Sr No	Name of Tutorial	Hours
1.	Problems based on proofs	01
2.	Problems based on identify the class language	01
3.	Problems based on DFA	01
4.	Problems based on minimal state automata	01
5.	Problems based on finite automata	01
6.	Problems based on Moore and Mealy machine	01
7.	Problems based on regular expressions and regular sets	01
8.	Problems based on pumping lemma	01
9.	Problems based on closure property	01
10.	Problems based on CNF and GNF	01
11.	Problems based on context-free grammar and language	01
12.	Problems based on PDA	01
13.	Problems based on TM	01
14.	Problems based on decidability	01
15.	Problems based on string/language validity	01

Text Book(s):

Title	Author/s	Publication
Theory of Computer Science: Automata, Languages and Computation	By K.L.P. Mishra and N. Chandrasekaran	3rd Edition, PHI Learning Private Ltd.

Reference Book(s):

Title	Author/s	Publication
Introduction to Automata theory, languages and Computation	By John E. Hopcroft, Rajiv Motwani and Jeffery D. Ullman	3rd Edition, Pearson
Introduction to Languages and the Theory of Computation	By John C. Martin	4th Edition, McGraw Hill

Web Material Link(s):

- https://nptel.ac.in/courses/106104028/
- https://www.eecs.wsu.edu/~ananth/CptS317/Lectures/

Course Evaluation:

Theory:

- Continuous Evaluation consists of two test each of 30 marks and 1 Hour of duration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Tutorial:

- Continuous Evaluation Consist of Performance of tutorial which should be evaluated out of 10 for each tutorial and average of the same will be converted to 50 Marks.

Course Outcome(s):

After completion of the course, the student will be able to

- acquire a fundamental understanding of the core concepts in automata theory and formal languages.
- design grammars and automata (recognizers) for different language classes.
- identify formal language classes and prove language membership properties.
- apply this basic knowledge of Theory of Computation in the computer field to solve computational problems.