

# Syllabus Book

4<sup>th</sup> Year B. Tech.  
Computer Engineering



**P P Savani University**  
School of Engineering  
Department of Computer Engineering

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. COMPUTER ENGINEERING 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	SECE4013	System Software	CE	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
	SECE4910	Summer Internship / Project 4 Weeks	CE	5			0	0	0	5	0	0	100	100	0
	<b>Elective-III</b>		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. COMPUTER ENGINEERING 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
	SEIT4512	Information Security	IT	2	2	0	4	3	40	60	20	30	0	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
	SECE4513	Data Analytics	CE	2	2	0	4	3	40	60	20	30	0	0	150

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## Semester 7

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## Electives

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1	SECE4523	Machine Learning	17-19
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**P P Savani University**  
**School of Engineering**

**Department of Computer Engineering**

Course Code: SECE4013

Course Name: System Software

Prerequisite Course(s): SECE3020 - Theory of Computation

SECE2031 - Operating System,

SEIT3032 - Design and Analysis of Algorithm.

**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

- understand the design concepts of various system software like Assembler, Linker, Loader and Macro pre-processor, Utility Programs such as Text Editor and Debugger
- understand the execution process of High-level language programs.

**Course Content:**

<b>Section I</b>			
Module No.	Content	Hours	Weightage in %
1.	<b>Introduction</b> Introduction, Software, Software Hierarchy, Systems Programming, Machine Structure, Interfaces, Address Space, Computer Languages, Tools, Life Cycle of a Source Program, Different Views on the Meaning of a Program, System Software Development, Recent Trends in Software Development, Levels of System Software	03	10
2.	<b>Overview of Language Processors</b> Programming Languages and Language Processors, Language Processing Activities, Program Execution, Fundamental of Language Processing, Symbol Tables; Data Structures for Language Processing: Search Data structures, Allocation Data Structures	06	15
3.	<b>Assemblers</b> Elements of Assembly Language Programming, Design of the Assembler, Assembler Design Criteria, Types of Assemblers, Two-Pass Assemblers, One-Pass Assemblers, Single pass Assembler for Intel x86, Algorithm of Single Pass Assembler, Multi-Pass Assemblers, Advanced Assembly Process, Variants of Assemblers Design of two pass assembler	06	15
4.	<b>Macro and Macro Processors</b> Introduction, Macro Definition and Call, Macro Expansion, Nested Macro Calls, Advanced Macro Facilities, Design of a Macro Pre-processor, Design of a Macro Assembler, Functions of	08	10

	a Macro Processor, Basic Tasks of a Macro Processor, Design Issues of Macro Processors, Features, Macro Processor Design Options, Two-Pass Macro Processors, One-Pass Macro Processors		
<b>Section II</b>			
Module No.	Content	Hours	Weightage in %
1.	<b>Linkers and Loaders</b> Introduction, Relocation of Linking Concept, Design of a Linker, Self-Relocating Programs, Linking in MSDOS, Linking of Overlay Structured Programs, Dynamic Linking, Loaders, Different Loading Schemes, Sequential and Direct Loaders, Compile-and-Go Loaders, General Loader Schemes, Absolute Loaders, Relocating Loaders, Practical Relocating Loaders, Linking Loaders, Relocating Linking Loaders, Linkers v/s Loaders	06	20
2.	<b>Scanning and Parsing</b> Programming Language Grammars, Classification of Grammar, Ambiguity in Grammatical Specification, Scanning, Parsing, Top Down Parsing, Bottom up Parsing, Language Processor Development Tools, LEX, YACC	06	10
3.	<b>Compilers</b> Causes of Large Semantic Gap, Binding and Binding Times, Data Structure used in Compiling, Scope Rules, Memory Allocation, Compilation of Expression, Compilation of Control Structure, Code Optimization	06	10
4.	<b>Interpreters &amp; Debuggers</b> Benefits of Interpretation, Overview of Interpretation, the Java Language Environment, Java Virtual Machine, Types of Errors, Debugging Procedures, Classification of Debuggers, Dynamic/Interactive Debugger	04	10

**List of Practical:**

Sr. No	Name of Practical	Hours
1.	Write a program to read data from file and count the frequency of each word.	02
2.	Implement a symbol table routine to determine whether an identifier lexeme has previously seen & store a new lexeme into symbol table	04
3.	Implement One pass assembler.	02
4.	Implement Two pass assembler.	04
5.	Write a program to implement Macro processor.	02
6.	Implement a lexical analyzer that reads the input one character at a time and returns to the parser the token it has found.	04
7.	Write a program to left factor the given grammar	04
8.	Write a program to remove the Left Recursion from a given grammar.	04
9.	Implement recursive descent or predictive parser.	02
10.	Implement operator precedence or LR parser.	02

**Text Book(s):**

Title	Author/s	Publication
Compilers-Principles, Techniques and Tools	Aho. A.V., Sethi. R. & Ullman. J. D.	Pearson, 2006

**Reference Book(s):**

<b>Title</b>	<b>Author/s</b>	<b>Publication</b>
System Software -An Introduction to System Programming	Leland L. B.	3rd Ed, Addison Wesley, reprint, 2003
Compiler Construction-Principles and Practice	Louden, K. C	1st Ed, Thomson, 1997
System Programming and Operating System	Dhamdhare. D. M.,	2nd Ed, TMH, 1999
Compiler Design in C,	Houlb A. I.,	PHI, EEE, 1995

**Web Material Link(s):**

- <https://nptel.ac.in/courses/106/108/106108052/>
- [https://www.youtube.com/watch?v=Qkwj65l\\_96I](https://www.youtube.com/watch?v=Qkwj65l_96I)

**Course Evaluation:****Theory:**

- Continuous Evaluation Consist of two Tests of 30 Marks and 1 Hour of duration and finally the total will be converted to 30.
- Faculty Evaluation consists of 10 marks as per guidelines provided by Course Coordinator.
- End Semester Examination will consist of 60 marks.

**Practical:**

- Continuous Evaluation Consist of Performance of Practical which should be evaluated out of 10 for each practical in the next turn and average of the same will be converted to 10 Marks.
- Internal Viva component of 10 Marks.
- Practical performance/quiz/test of 20 Marks during End Semester Exam.
- Viva/Oral performance of 10 Marks during End Semester Exam.

**Course Outcome(s):**

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

- understand the execution process of HLL programs.
- understand the working of scanners and parsers.
- understand the basic design of various system software.
- implement various system software.

**P P Savani University**  
**School of Engineering**

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**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	04	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:**

<b>Section I</b>			
Module No.	Content	Hours	Weightage in %
1.	<b>Introduction to Cloud Computing</b> 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.	<b>Cloud Architecture, Services and Applications</b> 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	07	10
3.	<b>Virtualization, Abstraction and Cloud Platform</b> Introduction to Virtualization Technologies, Load Balancing and Virtualization, Understanding Hypervisors, Understanding Machine Imaging, Porting Applications, Virtual Machines	05	15



	Provisioning and Manageability Virtual Machine Migration Services, Virtual Machine Provisioning and Migration in Action, Provisioning in the Cloud Hypervisors		
4.	<b>Cloud Infrastructure and Cloud Resource Management</b> 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
<b>Section II</b>			
Module No.	Content	Hours	Weightage in %
1.	<b>Cloud Security</b> 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	08	15
2.	<b>AWS Programming, Management Console and Storage</b> 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	07	20
3.	<b>AWS Technology, Billing and Pricing</b> 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 will consist of 60 Marks.

**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 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	
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:**

<b>Section I</b>			
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 Arduino 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

<b>Section II</b>			
<b>Module No.</b>	<b>Content</b>	<b>Hours</b>	<b>Weightage in %</b>
1.	<b>RFID and iBeacons</b> Introduction to RFID and iBeacon, Hardware & Software, Hardware used for IoT RFID, Connection to Server, Data on RFID Server and Classic distributed the problem.	04	14
2.	<b>IoT connectivity protocols</b> Networks layer protocols: RPL and 6LowPAN, WiFi, Bluetooth, BLE, LORAWAN, NFC, cellular, zigbee, and Ethernet	04	14
3.	<b>IoT communication protocol: MQTT</b> 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.	<b>IoT Security</b> IoT Security, Dangers, Assigning values to Information, Security Components, Key Management, Update Management.	03	08

**List of Practical:**

<b>Sr. No</b>	<b>Name of Practical</b>	<b>Hours</b>
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):**

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

**Reference Book(s):**

<b>Title</b>	<b>Author/s</b>	<b>Publication</b>
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/internet_of_things/)
- <https://www.tutorialspoint.com/arduino/>
- <https://pythonprogramming.net/introduction-raspberry-pi-tutorials/>

**Course Evaluation:****Theory:**

- Continuous Evaluation consists of two tests 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 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.

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**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	04	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:**

<b>Section I</b>			
Module No.	Content	Hours	Weightage in %
1.	<b>What is AI?</b> What is an AI Technique? The AI Problems and applications, Major areas of Artificial Intelligence, History of AI	04	10
2.	<b>Problems, State Space Search &amp; Heuristic Search Techniques</b> 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.	<b>Knowledge Representation Issues</b> Representations and Mappings, Approaches to Knowledge Representation, Using Propositional logic and Predicate Logic, Resolution, Semantic network, Frame based knowledge	06	10
4.	<b>Representing Knowledge Using Rules</b> Procedural Versus Declarative Knowledge, Forward Reasoning, Backward Reasoning. Symbolic Reasoning, Under Uncertainty: Introduction to Non-Monotonic Reasoning, Logics for Non-monotonic Reasoning	05	10

<b>Section II</b>			
Module No.	Content	Hours	Weightage in %
1.	<b>Uncertain Reasoning and alternatives</b> 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.	<b>Game Theory</b> Introduction to Game playing, The Minimax search procedure, Alpha-Beta procedure, Refinements, Iterative Deepening	05	10
3.	<b>Natural Language Processing</b> Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Spell Checking.	05	10
4.	<b>Connectionist Models</b> 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 Book(s):**

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=EAlaIqObChMI55v6\\_uC55wIVjx0rCh001wW5EAAYyAAEgJcyfD\\_BwE](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=EAlaIqObChMI55v6_uC55wIVjx0rCh001wW5EAAYyAAEgJcyfD_BwE)



**Course Evaluation:****Theory:**

- Continuous Evaluation Consist of Two Test Each of 30 Marks and 1 Hour of duration.
- Faculty evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.
- End Semester Examination will consist 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:**

<b>Section I</b>			
Module No.	Content	Hours	Weightage in %
1.	<b>Introduction to Creativity, Problem Solving and Innovation</b> <ul style="list-style-type: none"> <li>• Definitions of Problem Solving, Creativity and Innovation</li> <li>• Need for Problem Solving and Innovation &amp; Scope of Creativity</li> <li>• Types and Styles of Thinking</li> <li>• Strategies to Develop Creativity, Problem Solving and Innovation Skills</li> </ul>	08	17
2.	<b>Questioning and Learning</b> <ul style="list-style-type: none"> <li>• Introduction to Questioning, Learning and Visualization and its Strategies</li> <li>• Sources and Methods of Questioning and Learning</li> <li>• Finding Perspective, Visualizing thinking</li> <li>• Mind Mapping</li> </ul>	07	16
3.	<b>Creative Thinking and Problem Solving</b> <ul style="list-style-type: none"> <li>• Need of Creative Thinking</li> <li>• Cracking Creativity - Reversals, Reversing Perspective, seeing all sides, Looking in other world,</li> </ul>	08	17

	<ul style="list-style-type: none"> <li>Finding what you are not looking for and following up</li> <li>Fishbone Diagram</li> <li>SCAMPER Technique</li> </ul>		
<b>Section II</b>			
Module No.	Content	Hours	Weightage in %
1.	<b>Logic and Reasoning</b> <ul style="list-style-type: none"> <li>Basic Concept of Logic</li> <li>Divergent Vs Convergent Thinking, Inductive Vs Deductive Thinking</li> <li>Fusion of Ideas for Problem Solving</li> <li>Moral Reasoning</li> <li>Improvisation</li> </ul>	08	17
2.	<b>Practices of Playing</b> <ul style="list-style-type: none"> <li>Collaboration and Brainstorming</li> <li>The Spirit of Koinonia</li> <li>QFT Model</li> <li>Connecting the Unconnected</li> <li>Making Novel Combinations</li> </ul>	07	16
3.	<b>Review Strategies for Creative problem-solving methods</b> <ul style="list-style-type: none"> <li>A Heuristic Technique</li> <li>Problem-Solving Strategies: Why Bother?</li> <li>Five Building Blocks as per Fogler &amp; LeBlanc</li> <li>Strategy for Critical Thinking for Choosing</li> <li>Lateral Thinking</li> <li>Six Thinking Hats by Edward De Bono</li> <li>Design Thinking</li> </ul>	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 Berkun	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
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**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
<b>Grand Total</b>			<b>100</b>

**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.

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**Department of Computer Engineering**

Course Code: SECE4523

Course Name: Machine Learning

Prerequisite Course(s): SECE2031 - Data Structures,  
SEIT3032 - Design and Analysis of Algorithms,  
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	
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:**

<b>Section I</b>			
Module No.	Content	Hours	Weightage in %
1.	<b>Introduction to Artificial Intelligence and Machine Learning</b> Learning Problems, Designing a Learning System, Issues with Machine Learning. Concept Learning, Version Spaces and Candidate Eliminations, Inductive Bias	04	10
2.	<b>Supervised learning</b> 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.	<b>Artificial Neural Networks and Genetic Algorithms</b> Neural Network Representation, Appropriate Problems for Neural Network Learning, Perceptron's, Multilayer Networks	05	20

	and Back Propagation Algorithms, Remarks on Back Propagation Algorithms Case Study: face Recognition		
<b>Section II</b>			
Module No.	Content	Hours	Weightage in %
1.	<b>Bayesian Learning</b> 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.	<b>Unsupervised learning</b> Unsupervised learning, Applications, challenges, K- Nearest Neighbor Learning Locally Weighted Regression, SVM, Apriori Algorithm, EM Algorithm.	05	20
3.	<b>Overview</b> 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=EAIaIQobChMIrv2dqp0h5wIVkoiPCh0t9g8CEAAYASAAEgKl-fD\\_BwE&ef\\_id=EAIaIQobChMIrv2dqp0h5wIVkoiPCh0t9g8CEAAYASAAEgKl-fD\\_BwE:G:s&s\\_kwcid=AL!8664!3!281794527296!b!!g!!%2Bmachine%20%2Blearning&s\\_ei\\_d=psn\\_57384022552&q+=+machine%20+learning](https://in.mathworks.com/campaigns/offers/machine-learning-with-matlab.html?gclid=EAIaIQobChMIrv2dqp0h5wIVkoiPCh0t9g8CEAAYASAAEgKl-fD_BwE&ef_id=EAIaIQobChMIrv2dqp0h5wIVkoiPCh0t9g8CEAAYASAAEgKl-fD_BwE:G:s&s_kwcid=AL!8664!3!281794527296!b!!g!!%2Bmachine%20%2Blearning&s_ei_d=psn_57384022552&q+=+machine%20+learning)
- [https://wqu.org/programs/datascience/?utm\\_source=datawrkz&utm\\_medium=search&utm\\_campaign=datascience&gclid=EAIaIQobChMIr\\_TK5ZO0h5wIVzQorCh0YdQBvEAAAYASAAEgLb5PD\\_BwE](https://wqu.org/programs/datascience/?utm_source=datawrkz&utm_medium=search&utm_campaign=datascience&gclid=EAIaIQobChMIr_TK5ZO0h5wIVzQorCh0YdQBvEAAAYASAAEgLb5PD_BwE)

**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

- the concept of Machine learning and range of problems that can be solved by machine learning.
- They will be able to compare different types of learning algorithms and apply machine learning concepts in real life problems.

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**Department of Information Technology**

Course Code: SEIT4512

Course Name: Information Security

Prerequisite Course(s): SESH2051- Mathematical Methods for Computation  
SECE3011 - Computer Networks

**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

- understand cryptography theories, algorithms and systems.
- understand the various key distribution and management schemes.
- understand how to deploy hashing techniques to secure data in transits across different networks.

**Course Content:**

<b>Section - I</b>			
Module No.	Content	Hours	Weightage in %
1.	<b>Introduction</b> Symmetric Cipher Model, Cryptography and Cryptanalysis, Types of Security, Security Services, Security Attacks and Security Mechanisms, Substitution and Transposition techniques	03	07
2.	<b>Classical Encryption Techniques</b> Substitution Ciphers, Permutation/Transposition Ciphers, Play Fair and Hill Ciphers, Polyalphabetic Ciphers, OTP and Machine Ciphers	03	07
3.	<b>Stream Ciphers and Block Ciphers</b> Block Cipher structure, Data Encryption standard (DES) with example, strength of DES, Design principles of block cipher, AES with Structure, its Transformation Functions, Key Expansion, Example and Implementation	03	15
4.	<b>Multiple encryption and triple DES</b> Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback Mode, Output Feedback Mode, Counter Mode	02	06



5.	<b>Public Key Cryptosystems</b> Requirements and Cryptanalysis, RSA algorithm, its computational aspects and security, Diffie-Hillman Key Exchange algorithm, Man-in-Middle attack	04	15
<b>Section - II</b>			
Module No.	Content	Hours	Weightage In %
1.	<b>Key Management and Distribution</b> Symmetric key distribution using symmetric and asymmetric encryptions, distribution of public keys, X.509 certificates, Public key infrastructure	03	10
2.	<b>Cryptographic Hash Functions</b> Simple hash functions, its requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA)	03	10
3.	<b>Message Authentication Codes</b> Requirements of MAC and security, MACs based on Hash Functions, Macs based on Block Ciphers	03	10
4.	<b>Digital Signature, its Properties</b> Requirements and security, various digital signature schemes (Elgamal and Schnorr), NIST digital Signature algorithm	03	10
5.	<b>Advanced Topics</b> - Intruders, Virus, Trojans, Malware, Ransomware, Requirements of Security in Various area of Computer Science	03	10

**List of Practical:**

Sr. No	Name of Practical	Hours
1.	Write a program to implement ceaser cipher	2
2.	Write a program to implement the Playfair cipher	2
3.	Write a program to implement the columnar transposition cipher	2
4.	Write a program to implement rail fence transposition cipher	2
5.	Write a program to implement Vernam cipher	2
6.	Write a program to implement n-gram Hill Cipher.	2
7.	Write a program to implement the Vigenere Cipher	2
8.	Write a program that implements the Extended Euclidean Algorithm to find inverse of a given number in the Galois field.	2
9.	Write a program to implement DES Cipher	4
10.	Write a program to implement AES Cipher	4
11.	Write a program to implement RSA Cryptosystem	4
12.	Demonstration of Wireshark for Packet Capturing	2

**Text Book(s):**

Title	Author/s	Publication
Cryptography and Network Security: Principles and Practice, 5/e	William Stallings	Prentice Hall

**Reference Book(s):**

<b>Title</b>	<b>Author/s</b>	<b>Publication</b>
Cryptography and Network Security	Behrouz A. Forouzan	McGraw-Hill
Network Security: Private Communications in a Public World, second edition	Kaufman, Perlman and Speciner	Prentice Hall
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/106/106/106106129/>
- <http://www.omnisecu.com/security/index.php>

**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

- learn the concepts related to applied cryptography, including plaintext, cipher text, symmetric cryptography, asymmetric cryptography, and digital signatures.
- learn the theory behind the security of different cryptographic algorithms.
- learn the need of digital signatures for secure transmission and applying various hashing strategies to make system integrated towards various attacks.

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**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:**

<b>Section I</b>			
Module No	Content	Hours	Weightage in %
1.	<b>Introduction to Blockchain</b> 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.	<b>Blockchain Networks</b> 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.	<b>IBM and Blockchain</b> 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	<b>Blockchain composed</b> What is Hyperledger Composer, Components and Structure of Composer, An example Business Network: Car Auction Market, Extensive, Familiar, Open Tool Set	05	10
2.	<b>Blockchain fabric development</b> Participants and Components Overview, Developer Considerations	05	20
3.	<b>Blockchain architecture</b> 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 the 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.

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**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:**

<b>Section - I</b>			
Module No.	Content	Hours	Weightage in %
1.	<b>Introduction to Cyber Security</b> 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.	<b>Cyber Security Vulnerabilities and Cyber Security Safeguards</b> 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.	<b>Securing Web Application, Services and Servers</b> 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.	<b>Intrusion Detection and Prevention</b> 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
<b>Section - II</b>			
Module No.	Content	Hours	Weightage In %
1.	<b>Cryptography and Network Security</b> 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.	<b>Cyberspace and the Law</b> 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.	<b>Cyber Forensics</b> 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 the 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.



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**Department of Computer Engineering**

Course Code: SECE4513

Course Name: Data Analytics

Prerequisite Course(s): SECE2011 - Database Management System

SECE2031 - Data Structures

SECE3031 - Data Warehouse and 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	
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

- find a meaningful pattern in data.
- learn to analyze the data using intelligent techniques.
- make better business decisions by using advanced techniques in data analytics.

**Course Content:**

<b>Section I</b>			
Module No.	Content	Hours	Weightage in %
1.	<b>Introduction, Data Definitions and Analysis Techniques</b> Introduction to Data Analytics, Types of Data Analytics, Process of Data Analytics, Importance and Challenges of Big Data Analytics Elements, Variables, Data Categorization, Levels of Measurement, Data Management and Indexing.	07	25
2.	<b>Statistics for Data Analytics</b> Introduction, Statistical Hypothesis Generation and Testing, Descriptive Statistics, Inferential Statistics through Hypothesis Tests, Chi-Square Test, T-Test, Analysis of Variance, Correlation Analysis, Maximum Likelihood Test	08	25
<b>Section II</b>			
Module No.	Content	Hours	Weightage in %
1.	<b>Data Analysis Techniques</b> Regression Analysis and its types, K Nearest Neighbors Regression & Classification Techniques, Clustering, Association Rules Analysis	10	35

2.	<b>Prescriptive Analytics</b> Creating Data for Analytics through Designed Experiments, Active Learning and Reinforcement Learning, Visual Data Analysis Techniques, Interaction Techniques	05	15
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**List of Practical:**

Sr. No	Name of Practical	Hours
1.	Importing and exporting data in python	02
2.	Python packages for data analytics	02
3.	Preprocessing of data (Data formatting, data normalization, missing values etc.) in python	02
4.	Analysis of variance and correlation	02
5.	Mathematical computing using NumPy	02
6.	Data manipulation with pandas	02
7.	Data visualization with python (matplotlib, seaborn etc.)	02
8.	Model building using Scikit-Learn library	02
9.	Linear Regression	02
10.	Association Rule Analysis	04
11.	Data Visualization Using Tableau	04
12.	Case Study	04

**Text Book(s):**

Title	Author/s	Publication
Data Mining and Business Analytics with R	Johannes Ledolter	Wiley

**Reference Book(s):**

Title	Author/s	Publication
Intelligent Data Analysis	Michael Berthold, David J. Hand	Springer, 2007
Mining of Massive Datasets	Anand Rajaraman, Jeffrey David Ullman	Cambridge University Press

**Web Material Link(s):**

- <https://www.coursera.org/learn/data-analytics-business>
- <https://nptel.ac.in/courses/110106072/>

**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

- optimize business decisions and create competitive advantage with data analytics.
- handle large scale analytics projects from various domains.
- build a complete business data analytics solution.