

**FACULTY OF ENGINEERING**  
**Scheme of Instructions & Detailed Syllabus of**  
**III & IV Semester**  
**For**  
**Four Year Degree Programme of Bachelor of Engineering**  
**(B.E)**  
**in**

**Computer Science and Engineering**  
**Artificial Intelligence and Machine Learning**

(With effect from the academic year 2024-25)  
(Approved by College Academic Council on -- -- ----)

Empower Women – Impact the World



**Stanley College of Engineering and Technology for**  
**Women (Autonomous)**  
(Affiliated to Osmania University)  
(Accredited by NAAC with "A" Grade)  
Abids, Hyderabad – 500 001, Telangana.

**B. E . 4 Year (8 semesters) Regular Programme in  
Artificial Intelligence and Machine Learning  
Course Structure**


**(Applicable for the Batch admitted from the Academic Year 2023-24)**

**Semester III**

S. NO	Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	D/P	CONTA CT	CIE	SEE	DURAT ION IN HOUR s	Credits
<b>Theory Courses</b>										
1	SPC301AM	Discrete Mathematics & Graph Theory	3			3	40	60	3	3
2	SPC302AM	OOPS using Java	3			3	40	60	3	3
3	SPC303AM	Database Management Systems	3			3	40	60	3	3
4	SPC304AM	Data Visualization	3	-		3	40	60	3	3
5	SBS301MT	Probability and Statistic for Machine Learning	3	1		4	40	60	3	4
6	SAU903CH	Environmental Science	2			2	40	60	3	0
<b>Practical/Laboratory Courses</b>										
7	SPC311AM	OOPS using Java Lab			3	3	40	60	3	1.5
8	SPC312AM	Database Management Systems Lab			3	3	40	60	3	1.5
9	SPC313AM	Data Visualization Lab			2	2	40	60	3	1
			17	1	8	26	360	540	27	20

  
1. Prof K Syamala  
(University nominee)

  
2. Dr N Naveen  
(subject Expert from UOH)

  
3. Chaitanya C  
(Expert from Industry)

  
4. Dr Srinivasu B  
(chairperson - BOS)

Course Code	Course Title				Core/Elective		
SPC301AM	DISCRETE MATHEMATICS & GRAPH THEORY				Core		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-			3

**Course Objectives:**

This course aims to:

1. Introduce Propositional and Predicate Logic
2. Introduce various proof techniques for validation of arguments
3. Develop an understanding of counting, functions and relations and Familiarize with fundamental notions and applicability of graph theory and algebraic systems

**Course Outcomes :** After completion of the course, the students should be able to

1. Describe rules of inference for Propositional and Predicate logic.
2. Demonstrate use of Set Theory, Venn Diagrams, and relations in Real-world scenarios.
3. Model solutions using Generating Functions and Recurrence Relations.
4. Determine the properties of graphs and trees to solve problems arising in computer science applications.
5. Distinguish between groups, semi groups and monoids in algebraic systems

**UNIT-I:**

Introduction to Propositional Calculus: Basic Connectives and Truth tables, Logical Equivalence: Laws of Logic, Logical Implication; Rules of Inference. Predicates: The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems

**UNIT- II:**

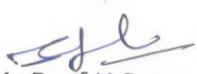
Sets: Sets and Subsets, Operations on sets and the Laws of Set Theory, Counting and Venn Diagrams. Relations: Cartesian Products and Relations. Partial ordering relations, POSET, Hasse diagrams, Lattices as Partially Ordered Sets, Equivalence relations. Pigeon hole principle.

**UNIT - III:**


Generating Functions: Generating Functions, Calculating Coefficient of generating functions. Recurrence Relations: The First Order Linear Recurrence Relation, Second Order Linear. Homogeneous Recurrence relations with constant coefficients, Non Homogeneous Recurrence relations.

**UNIT - IV:**

Introduction to Graphs: Graphs and their basic properties- degree, path, cycle, Sub graphs, Complements and Graph Isomorphism, Euler trails and circuits, Hamiltonian paths and cycles, planar

  
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graphs, Euler formula, Graph Coloring. Trees: Definitions, Properties, Spanning Trees, Minimum Spanning trees: The Algorithms of Kruskal and Prims

**UNIT – V:**

Definition and elementary properties of groups, Semigroups, Monoids, Rings, Fields, Vector spaces and lattices, Introduction, Discrete random variables, Applications to Binary Search Tree:

**Text Books:**

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, 7th Edition, Tata McGraw Hill Publishers.
2. S.B. Singh, Discrete Structures/ 3rd Edition, Khanna Book Publishing, 2019.
3. S.B. Singh, Combinatorics and Graph Theory/ 3rd Edition, Khanna Book Publishing, 2018.
4. C. L. Liu, Elements of Discrete Mathematics, 2nd Edn., Tata McGraw-Hill 2000.

**.Reference Books:**

- J .L. Mott, A. Kandel, T.P .Baker, Discrete Mathematics for Computer Scientists and Mathematicians, Second edition, Prentice Hall of India 1986.
- W. K. Grassmann and J. P. Tremblay, Logic and Discrete Mathematics, A Computer Science Perspective, Prentice Hall Inc 1996



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Course Code	Course Title					Core / Elective	
SPC302AM	OOPS Using JAVA (Common to AI & DS, AI&ML,CSE,IT, CME)					Core	
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
SES101CS	3	-	-	-	40	60	3
<p><b>Course Objectives:</b></p> <ol style="list-style-type: none"> <li>To understand fundamentals of object-oriented programming in Java and create Java application programs using core concepts of OOP like interfaces, exception handling, multithreading, polymorphism, packages.</li> <li>Use I/O streams for Input output operations in various streams and also perform serialization.</li> <li>Explore Collection framework and also design GUI application with different layout managers with event handling.</li> </ol> <p><b>Course Outcomes:</b> At the end of this course, the student will be able to</p> <ol style="list-style-type: none"> <li>Understand the concepts of classes, objects, and polymorphism.</li> <li>Apply concepts of interfaces, user-defined packages during application development.</li> <li>Develop Java Applications using Exception Handling and Multithreading concepts.</li> <li>Compose programs using the Java Collection API.</li> <li>Design GUI Application with Event Handling &amp; Layout Designing concepts</li> </ol>							

### UNIT-I

**Introduction:** OOP concepts, benefits of OOP, history of Java, data types, variables, scope and life time of variables, operators, expressions, control statements, type conversion and casting.


**Classes and Objects:** Concept of classes, objects, constructors, methods, this keyword, super keyword, garbage collection, overloading methods and constructors, parameter passing, Arrays String handling: String, StringBuffer, String Builder

### UNIT -II

**Inheritance:** Base class object, subclass, member access rules, super uses, using final with inheritance, method overriding, abstract classes.

  
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**Interfaces:** Defining and implementing an interface, differences between classes and interfaces and extending interfaces Polymorphism.

**Packages:** Defining, creating and accessing a package, importing packages, exploring packages

### UNIT -III

**Exception handling:** Concepts and benefits of exception handling, exception hierarchy, checked and unchecked exceptions, usage of-try, catch, throw, throws and finally, built in exceptions, creating User defined exceptions.

**Multithreading:** Difference between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

### UNIT -IV

Basic I/O Streams: Java I/O classes and interfaces, Files, Stream and Byte classes, Character streams, Serialization Exploring java.lang: Object class, Wrapper classes Exploring java.util: Scanner, StringTokenizer.

**Collections:** Overview of Java Collection frame work, commonly used Collection classes – Array List, Linked List, Hash Set, Tree Set, Collection Interfaces – Collection, List, Set. Accessing Collection via iterator, working with Map.

### UNIT -V

**GUI Programming with Java:** The AWT class hierarchy, MVC architecture.

**Exploring Swing:** JLabel, ImageIcon, JTextField, the Swing buttons, JTabbedPane, JScrollPane, JList, JComboBox.

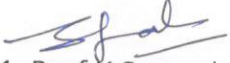
**Layout manager:** Border, Grid, Flow, Card and Grid Bag Layouts.

**Event Handling:** Delegation Event Model, Event Classes, Source of Events, Event Listener Interfaces, Handling mouse and keyboard events, Adapter classes.

**New Features in Java:** Major enhancement made in Java5, Java6, Java7 and Java8 like auto-boxing, generics, var-args, java annotations, enum, lambda expressions, functional interface, method references.

### Text Books:

1. Schildt and Herbert, Java The complete reference, McGraw, 9<sup>th</sup> edition, TMH.
2. E. Balagurusamy, Programming with Java, seventh edition, Tata McGraw Hill.
3. H. M. Dietel and P. J. Dietel, Java How to Program, Sixth Edition, Pearson Education / PH

  
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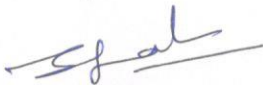
  
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4. James M Slack, Programming and Problem Solving with JAVA, Thomson Learning, 2002.

**References Books:**

1. Dr R. Nageswara Rao, Core Java: An Integrated Approach, Dreamtech.
2. Prem Kumar, Getting Inside Java - Beginners Guide : Programming with Java by,Notion Press.
3. Bert Bates, Kathy, Head First Java, Sierra Publisher: O'Reilly Media, Inc, 2nd Edition.
4. T. Budd, An Introduction to OOP, Pearson Education, second edition.



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Course Code	Course Title				Core/Elective		
SPC303AM	<b>DATABASE MANAGEMENT SYSTEMS</b> (Common to AI & DS, AI&ML,CSE, IT & CME)				Core		
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
	3	-	-	-	40	60	3
<b>Course Objectives:</b> <ol style="list-style-type: none"> <li>1. Understand the basic concepts and the applications of database systems.</li> <li>2. Master the basics of SQL and construct queries using SQL.</li> <li>3. Understand the relational database design principles, transaction processing and concurrency control, database storage structure and recovery mechanisms</li> </ol> <b>Course Outcomes:</b> At the end of this course, the student will be able to: <ol style="list-style-type: none"> <li>1. Understand concepts and the applications of database systems and implement in real time applications.</li> <li>2. Construct an Entity-Relationship(E-R) model from specifications and transform to relational model.</li> <li>3. Demonstrate the concepts of relational database management system</li> <li>4. Apply normalization on database.</li> <li>5. Understand principles of database transaction management, storage and recovery of database.</li> </ol>							

### UNIT 1:



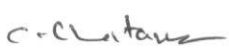

**Introduction:** Database System Applications, Purpose of Database Systems, View of Data, Database Languages–DDL, DML, Relational Databases, Data Storage and Querying, Transaction Management, Database Architecture, Database Users and Administrators.

Introduction to the Relational Model: Structure of Relational Databases, Database Schema, Schema Diagrams, The Relational Algebra.

### UNIT 2:

Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Integrity Constraints, Set Operations, Null Values, Aggregate Functions, Nested Sub queries

Advanced SQL: Join Expressions, Views, Triggers, Cursors, Procedures and Functions

- |   |   |  |   |
|---|---|--|---|
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### UNIT 3:

Database Design and the E-R Model: The Entity- Relationship Model,

Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational schemas, Entity-Relationship Design Issues, Extended E-R Features.

Normalization: Functional Dependencies, Lossless decomposition, 1NF, 2NF, 3NF, Dependency Preservation, BCNF, Multi-valued dependencies, 4NF. Denormalization

### UNIT 4:

**File Structures: file Organization, Sequential files, Sparse index and dense index, B and B+ trees.**

Transaction Management: Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity, Transaction Isolation Levels.

### UNIT 5:

Concurrency Control: Lock-Based Protocols, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols.

Backup and Recovery System: Failure Classification, Recovery Algorithm, Failure with loss of non-volatile storage, Remote Backup systems.

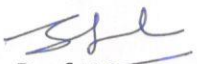
Overview and History of NoSQL Databases: Definition, Types of NoSQL Database

### Text Books:


1. A. Silberschatz, Henry. F. Korth and S. Sudarshan, Database System Concepts, 6th Edition, McGraw Hill Education (India) Private Limited.
2. C.J.Date, A. Kannan, and S. Swami Nadhan, An Introduction to Database systems, 8<sup>th</sup> Edition, Pearson Education.

### Reference Books:

1. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw Hill Education (India) Private Limited.
2. R Elmasri, Shamkant B. Navathe, Database Systems, 6th Edition, Pearson Education.

  
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Course Code	Course Title				Core / Elective		
SPC304AM	DATA VISUALIZATION				Core		
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

**Course Objectives:** The students will try to learn:

1. R programming for Data Visualization
2. Explore Various Visualization Techniques,
3. Develop Interactive Dashboards:

**Course Outcomes:** After successful completion of the course, students should be able to:

1. understand the use of R-software and its fundamental concepts for data analytics
2. Apply visualization techniques to analyze and gain insights from real-world datasets.
3. Apply R Programming to test the hypothesis
4. Use Power BI to create a variety of data visualizations.
5. Build interactive dashboards using R and Power BI to present data insights interactively.

### UNIT-I

Introduction to R programming: What is R? - Installing R and R Studio –R Studio Overview - Working in the Console - Arithmetic Operators – Logical Operations - Using Functions - Getting Help in R and Quitting R Studio- Installing and loading packages. Data structures, variables, and data types in R: Creating Variables - Numeric, Character and Logical Data - Vectors - Data Frames - Factors -Sorting Numeric, Character, and Factor Vectors -Special Values.

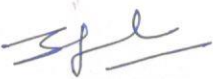
### UNIT-2

Data Visualization using R: Scatter Plots - Box Plots - Scatter Plots and Box- and-Whisker Plots Together -Customize plot axes, labels, add legends, and add colours.


### UNIT-3

Descriptive statistics in R: Measures of central tendency - Measures of variability - Skewness and kurtosis - Summary functions, describe functions, and descriptive statistics by group.

Testing of Hypothesis using R: T-test, Paired Test, correlation, Chi Square test, Analysis of Variance and Correlation

  
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## UNIT-IV

Power BI for Data Visualization and Dashboard Creation: Introduction to Power BI: Interface, data connection, roles. - Creating Basic Visualizations: Bar charts, line charts, scatter plots. - Building Interactive Dashboards: Design principles, combining visualizations. - Effective Data Storytelling using Power BI.

## UNIT-V

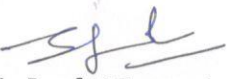
Advanced Data Visualization and Integration: Advanced Visualization Techniques in R. - Integrating R with Power BI: Using R scripts and calculations. - Data Visualization Ethics and Best Practices. - Capstone Project: Applying skills using R and Power BI.

### Text Books:


1. Wickham, H., Çetinkaya-Rundel, M., & Grolemund, G. (2023). R for data science. " O'Reilly Media, Inc."
2. Datar, R., & Garg, H. (2019). Hands-on exploratory data analysis with R: become an expert in exploratory data analysis using R packages. Packt Publishing Ltd.
3. Pradesyah, R. (2021). Power Business Intelligence in the data science visualization process to forecast CPO prices. *International Journal of Science, Technology & Management*, 2(6), 2198-2208.
4. Sinha, Chandraish. *Mastering Power BI: Build business intelligence applications powered with DAX calculations, insightful visualizations, advanced BI techniques, and loads of data sources*. BPB Publications, 2024.
5. Deckler, G., Powell, B., & Gordon, L. (2022). *Mastering Microsoft Power BI: Expert techniques to create interactive insights for effective data analytics and business intelligence*. Packt Publishing Ltd.

### Reference Books

1. Shahababa B. (2011), "Biostatistics with R", Springer, New York.
2. Braun & Murdoch (2007), "A first course in statistical programming with R", Cambridge University Press, New Delhi.
3. Crawley, M. J. (2006), "Statistics - An introduction using R", John Wiley, London 32.
4. Purohit, S.G.; Gore, S.D. and Deshmukh, S.R. (2015), "Statistics using R", second edition. Narosa Publishing House, New Delhi.

  
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CourseCode	CourseTitle				Core/ Elective		
SBS401MT	<b>Probability and Statistics for Machine learning (AI&amp;ML)</b>				<b>Core</b>		
Prerequisite	ContactHoursperWeek				CIE	SEE	Credits
	L	T	D	P			
Basics of Probability	3	1	-	-	<b>40</b>	<b>60</b>	4

### Course Objectives

1. To familiarize the fundamentals of probability, random variables and distributions.
2. To comprehend the concepts of statistics and linear regression.
3. To make an inference about the population of interest on the basis of a random sample taken from that population.

### Course Outcomes

1. Apply probability theory to solve practical problems.
2. Apply various probability distributions to solve practical problems.
3. Perform regression analysis and to compute and interpret the coefficient of correlation.
4. Able to formulate and testing a hypothesis using critical values to draw conclusions and determining probability of making errors in hypothesis tests.
5. Understand the concept of vector spaces, sub space, linear transformation and their properties.

### Unit I

**Introduction of Probability:** Conditional Probability, Theorem of total probability, Baye's theorem and its applications, Random variables, Types of Random Variables, Probability mass function and Probability density function, mathematical expectations, moments, Skewness and Kurtosis.

### Unit II

**Discrete and Continuous probability distributions:** Binomial distribution, poisson distribution, Normal distribution and its properties. Mean, Variance, Moment generating function.  
Joint Distribution: Marginal Distribution.( Discrete and continuous)

### Unit III

**Curve fitting by the method of least squares:** Straight line, second degree polynomial and more general curves, Correlation, regression analysis and Rank correlation.

### Unit IV

#### Testing (Large sample):

Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

### Unit V

#### Testing (Small sample):

Test for single mean, difference of means, F-test, Chi-square test for goodness of fit and independence of attributes.  
Linear Algebra: Vector spaces, subspace, linear independent, linear dependent vectors, linear transformation.

### TEXT/REFERENCE/ADDITIONALBOOKS:

1. R.K.Jain and S.R.K.Iyengar "Advanced Engineering Mathematics", Narosa Publications
2. Dr.B.S, Grewal "Higher Engineering Mathematics", Khanna Publications
3. P. Sivaramakrishna Das &C.Vijaya Kumar, "Engineering Mathematics", Pearson India Education Services Pvt. Ltd.
4. N.P.Bali&M.Goyal, "A text Book of Engineering Mathematics", Laxmi Publications, 2010
5. S.C.Gupta&V.K.Kapoor, "Fundamentals of Mathematical Statistics", S.Chand Pub.

## SEMESTER IV

AU 2020	Environmental Science	3L:0T:0P	0 Credits
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**Course Objective:** People working in industries or elsewhere essentially require the knowledge of environmental science so as to enable them to work and produce most efficient, economical and eco-friendly finished products.

- Solve various engineering problems applying ecosystem to produce eco - friendly products.
- Use relevant air and noise control method to solve domestic and industrial problems.
- Use relevant water and soil control method to solve domestic and industrial problems.
- To recognize relevant energy sources required for domestic and industrial applications.
- Solve local solid and e-waste problems.

### Course Content:

#### Unit-1: Ecosystem

- Structure of ecosystem, Biotic & Abiotic components.
- Food chain and food web.
- Aquatic (Lentic and Lotic) and terrestrial ecosystem.
- Carbon, Nitrogen, Sulphur, Phosphorus cycle.
- Global warming -Causes, effects, process, Green House Effect, Ozone depletion.

#### Unit-2: Air and, Noise Pollution

- Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler).
- Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator).
- Gaseous Pollution Control: Absorber, Catalytic Converter, Effects of air pollution due to Refrigerants, I.C., Boiler.
- Noise pollution: sources of pollution, measurement of pollution level, Effects of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000.

#### Unit-3: Water and Soil Pollution

- Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Turbidity, pH, total suspended solids, total solids BOD and COD: Definition, calculation.
- Waste Water Treatment: Primary methods: sedimentation, froth floatation, Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method: Membrane separation technology, RO (reverse osmosis).
- Causes, Effects and Preventive measures of Soil Pollution: Causes-Excessive use of Fertilizers, Pesticides and Insecticides, Irrigation, E-Waste.

#### **Unit- 4: Renewable sources of Energy**

- Solar Energy: Basics of Solar energy. Flat plate collector (Liquid & Air). Theory of flat plate collector. Importance of coating. Advanced collector. Solar pond. Solar water heater, solar dryer. Solar stills.
- Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. Anaerobic digestion. Biogas production mechanism. Utilization and storage of biogas.
- Wind energy: Current status and future prospects of wind energy. Wind energy in India. Environmental benefits and problem of wind energy.
- New Energy Sources: Need of new sources. Different types new energy sources. Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion.) Concept, origin and power plants of geothermal energy.

#### **Unit-5: Solid Waste Management, ISO 14000 & Environmental Management**

- Solid waste generation- Sources and characteristics of: Municipal solid waste, E- waste, biomedical waste.
- Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries. Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste.
- Air quality act 2004, air pollution control act 1981 and water pollution and control act 1996. Structure and role of Central and state pollution control board.
- Concept of Carbon Credit, Carbon Footprint.
- Environmental management in fabrication industry.
- ISO14000: Implementation in industries, Benefits.

#### **Text Books/References:**

1. S.C. Sharma & M.P. Poonia, Environmental Studies, Khanna Publishing House, New Delhi.
2. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
3. Arceivala, Soli Asolekar, Shyam, Waste Water Treatment for Pollution Control and
4. Reuse, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099-
5. Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000, ISBN 10: 0471144940.
6. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi
7. Rao, C. S., Environmental Pollution Control and Engineering, New Age International Publication, 2007, ISBN: 81-224-1835-X.
8. Rao, M. N.Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New delhi, 1988, ISBN: 0-07- 451871-8.
9. Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, New York; 1978, ISBN: 9780070354760.
10. Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, Academic Press Oxford, UK; 2013. ISBN: 9780123978257.
11. Patvardhan, A.D, Industrial Solid Waste, Teri Press, New Delhi, 2013, ISBN:978-81-7993-502-6
12. Metcalf & Eddy, Waste Water Engineering, Mc-Graw Hill, New York, 2013, ISBN: 077441206.
13. Keshav Kant, Air Pollution & Control, Khanna Publishing House, New Delhi (Edition 2018)

**Suggested Software/Learning Websites:**

- a. <https://www.constitution.org/cons/india/const.html>
- b. <http://www.legislative.gov.in/constitution-of-india>
- c. <https://www.sci.gov.in/constitution>
- d. <https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/>

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Course Code	Course Title					Core / Elective	
SPC311AM	OOPS Using JAVA Lab (Common to AI & DS, AI&ML,CSE, IT & CME)					Core	
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
SPC301CS	-	-	-	3	40	60	1.5

### Course Objectives:

At the end of this course , the student will learn

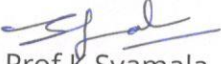
1. To understand fundamentals of object-oriented programming in Java and create Java application programs using core concepts of OOP like interfaces, exception handling, multithreading, polymorphism, packages.
2. Use I/O streams for Input output operations in various streams and also perform serialization.
3. Explore Collection framework and also design GUI application with different layout managers with event handling.

**Course Outcomes:** At the end of this course, the student will be able to

1. Understand the concepts of classes, objects, and polymorphism.
2. Apply concepts of interfaces, user-defined packages during application development.
3. Develop Java Applications using Exception Handling and Multithreading concepts.
4. Compose programs using the Java Collection API.
5. Design GUI Application with Event Handling & Layout Designing concepts

### List of Experiments: Write Programs using Java Language

1. To implement the concept of class with method overloading
2. To implement the concept of Single level and Multi level Inheritance.
3. To implement the concept of Interfaces.
4. To implement Abstract Classes concept.
5. To implement Checked Exception (IOException).
6. To implement Unchecked Exceptions. (ArithmeticException, Null Pointer Exception, Array Index Out Of Bounds Exception).
7. To implement User defined exception handling. (ex: when user enters marks for a subject beyond the minimum and maximum range).\
8. To implement the concept of threading using Thread Class and Runnable Interface.
9. To implement the concept of Thread synchronization.
10. To implement collection class concept Array List.
11. To implement collection class concept Linked List.
12. To implement collection class concept Tree map.

  
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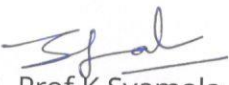
13. To implement collection class concept Hash map.
14. To execute iteration over Collection using Iterator interface and List Iterator Interface.
15. To read a file name from the user, and display information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
16. To copy contents of one file into another file using command line arguments. (simulation of copy command).
17. To implement serialization concept.
18. To implement event handler concept using mouse and key board events.
19. To design a simple application using swings, layout, event handling (basic calculator or sign in screen or billing screen etc.)

**Text Books:**


1. Schildt and Herbert, Java The complete reference, McGraw, 9<sup>th</sup> edition, TMH.
2. E. Balagurusamy, Programming with Java, seventh edition, Tata McGraw Hill.
3. H. M. Dietel and P. J. Dietel, Java How to Program, Sixth Edition, Pearson Education / PH
4. James M Slack, Programming and Problem Solving with JAVA, Thomson Learning, 2002.

**References Books:**

1. Dr R. Nageswara Rao, Core Java: An Integrated Approach, dreamtech.
2. Prem Kumar, Getting Inside Java - Beginners Guide : Programming with Java by,Notion Press.
3. Bert Bates, Kathy, Head First Java, Sierra Publisher: O'Reilly Media, Inc, 2nd Edition.
4. T. Budd, An Introduction to OOP, Pearson Education, second edition.

  
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Course Code	Course Title					Core / Elective	
SPC312AM	DATABASE MANAGEMENT SYSTEMS LAB (Common to AI & DS, AI&ML,CSE, IT & CME)					Core	
	Contact Hours per Week				CIE	SEE	Credits
Pre Requisite	L	T	D	P			
-	-	-	-	3	40	60	1.5

#### Course Objectives:

The course should enable the students to :

1. Learn to design and implement relational databases, including the creation of tables, constraints, and relationships.
2. Understand and apply database normalization techniques to ensure efficient and logical database design.
3. Learn to create and use stored procedures, functions, and triggers to automate and enhance database operations.

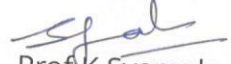
#### Course Outcomes:

At the end of this course, the student will be able to

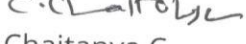
1. Write basic SQL queries to retrieve, manipulate, and manage data in a MySQL database.
2. Demonstrate proficiency in writing advanced SQL queries, including joins, subqueries, and data aggregation.
3. Create and use stored procedures, functions, and triggers to automate and enhance database operations.
4. Apply techniques for optimizing database performance, including indexing
5. Design and implement relational databases, including creating tables, defining constraints, and establishing relationships between tables.


#### List of Experiments:

1. Introduction to MySQL & Installation of MySQL ,
2. Creating Database/ Table Space
  - Managing Users: - Create User, Delete User
  - Managing Passwords
  - Managing roles: - Grant, Revoke
3. Creation of Tables using SQL- Overview of using SQL tool, Data types in SQL, Creating Tables without integrity constraints, Altering Tables and Dropping Tables
4. Practicing DML commands- Insert, Select, Update, Delete
5. Practice DDL and DML commands on a Relational Database, specifying the Integrity constraints. (Primary Key, Foreign Key, CHECK, NOT NULL, DEFAULT, UNIQUE)

  
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6. Practice Queries using COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING, ANY, ALL, IN, EXISTS, NOT EXISTS,
7. Query optimization through Nested Query
8. Apply the concepts of Joins, SET operations and SQL functions on any two relational schemas
9. Creating and updating View. Query implementation using View
10. Procedures and Stored Procedures Creation, Execution and Modification of stored Procedure
11. Implementation of Triggers.
12. Implementation of Cursors.
13. Index creation through SQL(create index in MYSQL ,View index ,Change ordering of index key, Compare time taken to search with and without using index)
14. Implementation of Database Backup & Recovery Commands  
TCL Commands: Rollback, Commit, Save point.  
DCL Commands: Grant and Revoke
15. CASE STUDIES
  - a) Student Information System
  - b) Airline flight information
  - c) Bus reservation System.

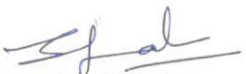
Note: For the given case studies design an E-R Model and Relation Model.
16. Creation of small fully fledged database application (Insertion, Updation, Deletion, Displaying of Data) for any one of the above mentioned case study.

**Text Books:**


1. Vikram Vaswani, The Complete Reference MySQL, 1st Edition, McGraw Hill Education (India) Private Limited.
2. Joan Casteel, Oracle 10 g: SQL, 1st Edition, Thomson Course Technology.

**Reference Books:**

1. A. Silberschatz, Henry. F. Korth and S. Sudarshan, Database System Concepts, 6th Edition, McGraw Hill Education (India) Private Limited.
2. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw Hill Education (India) Private Limited.

  
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Course Code	Course Title				Core / Elective		
SPC313AM	DATA VISUALIZATION LAB				Core		
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	-	-	-	40	60	3

**Course Objectives:** The students will try to learn:

1. Understand the importance of data visualization for business intelligence and decision making.
2. Learn about categories of visualization and application areas
3. Familiarize with the data visualization tools

**Course Outcomes:** After successful completion of the course, students should be able to:

1. Use R and Power BI for data visualization
2. Apply data visuals to convey trends in data over time using tableau
3. Construct effective data visuals to solve workplace problems
4. Explore and work with different plotting libraries
5. Learn and create effective visualizations

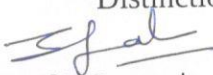
### List of Experiments

#### Week-1:

1. Write R script for some inbuilt functions like : help(), c(), ls(), rm(), sqrt(), seq(), min(), max(), assign(), print().
1. Write a R program to take input from the user (name and age) and display the values. Also print the version of R installation.
2. Write a program to use R as a calculator.
3. Write R script to perform arithmetic and logical operations
4. Write a program to assign value to a variable in difference ways.
5. Write a R program to extract first 10 English letter in lower case and last 10 letters in upper case and extract letters between 22nd to 24th letters in upper case.

#### Week-2

6. Write R script to create an array, passing in a vector of values and a vector of dimensions. Also provide names for each dimension.
7. Write R script to create a  $4 \times 4$  matrix,  $3 \times 3$  matrix with labels and fill the matrix by rows and  $2 \times 2$  matrix with labels and fill the matrix by columns.
8. Write R script to create  $3 \times 3$  matrix to perform addition, subtraction, multiplication and division operations.
9. Write R script to print even numbers from 10 to 30 using all available loops in R.
10. Write R script to print result as given below using decision making statements: >70 Distinction, >60 First, >40 pass <40 Fail.

  
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### Week-3

11. Write R script to create data frame "student" with the fields of stud\_id, stud\_name, email\_id and mobile\_no. Perform following operations:
  1. Display data of data frame
  2. Display summary of data frame. Display structure of data frame
  3. Extract and display only stud\_name and mobile\_no from data frame
12. Write R script to create a Data frames which contain details of 5 employees and display the details. Create another data frame with same columns and merge it with first one.

### Week-4:

13. Write R script to read and write excel
14. Write R script to read and write csv file.
15. Write R script to read and write XML file.
16. Write R script to read and download Web data file.
17. Write R script to workJSON file.
18. Write R script to work with Database file.

### Week-5

19. Write R script to create bar chart(3 different styles preferable).
20. Write R script to create single and multiple Line graph (3 different styles preferable).
21. Write R script to create scatter plot.(3 different styles preferable).
22. Write R script to create pie chart(5 different styles preferable).
23. Write R script to create boxplot (2 different styles preferable).
24. Write R script to create Histogram.

### Week-6

25. Write R script to calculate mean , median and mode of given data.
26. Write R script for finding probability by using Normal distribution.
27. Write R script for finding probability by using Binomial distribution.
28. Write R script for Analysis of Variance (ANOVA) Test :One Way & Two Way ANOVA.

### Week-7

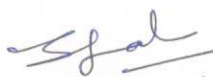
29. Write R script for Time Series Analysis.
30. Write R script for Survival Analysis.

### Week-8


1. Install Power BI Desktop and Explore the Power BI interface.
2. Import data from Excel, CSV, and databases and Use Power Query Editor to clean and transform data.

### Week -9

1. Create relationships between tables and Manage and edit existing relationships.
2. Create calculated columns and measures using DAX and Apply basic DAX functions like SUM, AVERAGE, and COUNT.

  
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### Week-10

1. **Create bar charts, line charts, pie charts, and tables and** Customize visualizations (e.g., colors, labels, and formatting).
2. Create maps, scatter plots, and waterfall charts.

### Week-11:

1. Combine multiple visualizations into a single dashboard.
2. Share reports and dashboards with others.
3. Enable the Q&A feature in a report.
4. Ask natural language questions to generate visualizations.

### Textbooks

1. Wickham, H., Çetinkaya-Rundel, M., & Golemund, G. (2023). R for data science. " O'Reilly Media, Inc."
2. Datar, R., & Garg, H. (2019). Hands-on exploratory data analysis with R: become an expert in exploratory data analysis using R packages. Packt Publishing Ltd.
3. Pradesyah, R. (2021). Power Business Intelligence in the data science visualization process to forecast CPO prices. *International Journal of Science, Technology & Management*, 2(6), 2198-2208.
4. Sinha, Chandraish. *Mastering Power BI: Build business intelligence applications powered with DAX calculations, insightful visualizations, advanced BI techniques, and loads of data sources*. BPB Publications, 2024.
5. Deckler, G., Powell, B., & Gordon, L. (2022). *Mastering Microsoft Power BI: Expert techniques to create interactive insights for effective data analytics and business intelligence*. Packt Publishing Ltd.

### Reference Books

1. Shahababa B. (2011) , "Biostatistics with R", Springer, New York.
2. Braun & Murdoch (2007), "A first course in statistical programming with R", Cambridge University Press, New Delhi.
3. Crawley, M. J. (2006), "Statistics - An introduction using R", John Wiley, London 32.
4. Purohit, S.G.; Gore, S.D. and Deshmukh, S.R. (2015), "Statistics using R", second edition. Narosa Publishing House, New Delhi.



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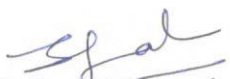
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**B. E . 4 Year (8 semesters) Regular Programme in  
Artificial Intelligence and Machine Learning  
Course Structure**


**(Applicable for the Batch admitted from the Academic Year 2023-24)**

**Semester IV**

S. NO	Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits	
			L	T	D/P	CONTACT HOURS	CIE	SEE	DURATION IN HOURS	Credits	
<b>Theory Courses</b>											
1	SPC401AM	Computer System Design	3			3	40	60	3	3	
2	SPC402AM	Operating Systems	3			3	40	60	3	3	
3	SPC403AM	Artificial Intelligence	3			3	40	60	3	3	
4	SPC404AM	Automata Theory and Compiler Design	3	-		3	40	60	3	3	
5	SPC405AM	Data Analytics	3			3	40	60	3	3	
6	SMC901HS	Indian Constitution	2			2	40	60	3	0	
<b>Practical/Laboratory Courses</b>											
7	SPC411AM	OS & CD Lab			3	3	40	60	3	1.5	
8	SPC413AM	Data analytics Lab			3	3	40	60	3	1.5	
9	SHS912EG	Advanced Communication Skills lab			2	2	40	60	3	1	
10		Internship-1	(To be evaluated in 5 <sup>th</sup> semester. To be carried out in summer after 4 <sup>th</sup> semester)								
			17		8	25	360	540	27	19	

  
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Course Code	Course Title					Core/Elective	
SPC401AM	Computer System Design					Core	
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3
<b>Course Objectives</b> <ol style="list-style-type: none"> <li>To explain the operation and design of combinational and arithmetic logic circuits.</li> <li>To understand the Instruction Set Architecture and the basic components of CPU.</li> <li>To learn the I/O Organization, Interrupt-driven I/O, and DMA</li> </ol>							
<b>Course Outcomes:</b> Students will be able to <ol style="list-style-type: none"> <li>understand the Boolean algebra to minimize the logical expressions and optimize the implementation of logical functions.</li> <li>understand the number representation , combinational circuits and sequential circuits.</li> <li>Understand the various computer components, interconnection structures, bus interconnection, and data transfer.</li> <li>Describes the instruction formats, computer registers, instruction cycle, memory reference instructions, input-output, and interrupts.</li> <li>Understand various addressing modes and data transfer/manipulation.</li> </ol>							

### UNIT-I

**Introduction to logic circuits** – Variables and functions, Logic gates and networks. Boolean algebra, Synthesis using gates, Design examples. Optimized implementation of logic functions using K-Map upto 5 - Variable maps and Quine- McCluskey Tabular method.

**Number representation:** Addition and Subtraction of signed and unsigned numbers.

**Data Representation:** Fixed and Floating Point representations.

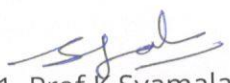
### UNIT-II

**Combinational circuit building blocks:** Adders and Subtractors, Multiplexers. Demultiplexers, Parity Checkers and Generators, Decoders. Encoders. Code converters, BCD to 7-segment converter, Arithmetic comparator circuits.


**Sequential Circuits:** Basic Latch, Gated SR Latch, gated D Latch, Master-Slave edge triggered flip-flops, T Flip-flop, JK Flip-flop, Excitation tables. Registers and Counters.

### UNIT-III

**Overview of Computer Function and Interconnections:** Computer components, Interconnection structures, Bus interconnection, Bus structure, and Data transfer.

  
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**Register Transfer Microoperations:** Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic, Logic and Shift Microoperations, Arithmetic Logic Shift Unit.

#### UNIT-IV

**Basic Computer Organization and Design:** Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory reference instruction, Input-Output and Interrupt.

**Central Processing Unit:** General Register Organization, Stack Organization, Instruction formats, Addressing modes, Data Transfer and Manipulation, and Program control. Floating Point Arithmetic Operations.

#### UNIT-V


**Memory organization:** Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory; Input or output organization: Input or output Interface, asynchronous data transfer, modes of transfer, priority interrupt, direct memory access.

#### Text Books

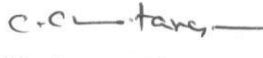
1. Moris Mano and Michael D Ciletti, Digital Design, Pearson, fourth edition, 2008.
2. M. M. Mano, Computer System Architecture, 3rd Edition, Prentice Hall.
3. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, 5th Edition, McGraw Hill, 2002.
4. Pal Chouduri, Computer Organization and Design, Prentice Hall of India, 1994.

#### Reference Books

1. Zvi Kohavi, Switching and Finite Automata Theory, 3<sup>rd</sup> ed., Cambridge University Press-New Delhi, 2011.
2. Carl Hamacher, Zvonko G Vranesic, Safwat G Zaky, "Computer Organization", McGraw-Hill, 5th Edition, 2002.
3. William Stallings, "Computer Organization and Architecture", Pearson Edition, 8th Edition, 2010

  
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Course Code	Course Title					Core/Elective	
SPC402AM	OPERATING SYSTEMS (Common to AI & DS, AI&ML, CSE, IT , CME )					Core	
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

**Course Objectives:** Students will be able:

- To learn fundamentals of Operating Systems.
- To understand the functions of Operating Systems.
- To learn memory management.

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

- Understand functional architecture of operating systems and file systems.
- Analyze various algorithms for CPU Scheduling
- Implement programs on multi-threading libraries for an OS.
- Explore application programs using system calls.
- Solve synchronization problems.

### UNIT-I

**Introduction:** Batch, iterative, time sharing, multiprocessor, distributed, cluster and real-time systems, UNIX system introduction and commands.

**Operating System Structures:** Computer system structure, Network structure, I/O Structure, Storage Structure, Dualmode operation, System components, Operating-System Services, System Calls, System Programs, System structure, Virtual Machines, System Design and Implementation, System Generation.

### UNIT-II

**Processes:** Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching.

**Thread:** Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads.


**Process Scheduling:** Foundation and Scheduling objectives, Types of Schedulers, Scheduling Criteria, Scheduling algorithms, multi processor scheduling.

### UNIT-III

**Process Synchronization:** Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Peterson's Solution, classical problems of synchronization: The Bounded buffer problem, Producer/Consumer Problem, readers' & writers' problem, Dining philosopher's problem. Semaphores, Event Counters, Monitors, Message Passing.

  
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**Deadlocks:** Definition, Necessary and sufficient conditions for Deadlock, Methods for Handling deadlocks: Deadlock prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

#### UNIT-IV

**Memory Management:** Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation, Fragmentation, and Compaction; Paging: Principle of operation–Page allocation–Hardware support for paging, structure of page table, Protection and sharing, Disadvantages of paging.

**Virtual Memory:** Basics of Virtual Memory–Hardware and control structures–Locality of reference, Page fault, Working Set, Dirty page/Dirty bit–Demand paging, Page Replacement algorithms, Trashing.

#### UNIT-V

**File Management:** Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods, Free-space management, directory implementation, efficiency, and performance.

**Secondary-Storage Structure:** Disk structure, Disk scheduling algorithms, Disk Management, RAID structure.

#### Textbooks:


1. Avi Silberschatz, Peter Galvin, Greg Gagne, Operating System Concepts Essentials, 9<sup>th</sup> Edition, Wiley Asia Student Edition, 2017.
2. William Stallings, Operating Systems: Internals and Design Principles, 5<sup>th</sup> Edition, PHI, 2016.
3. Maurice Bach, Design of the Unix Operating Systems, 8<sup>th</sup> Edition, PHI, 2009.
4. Daniel P. Bovet, Marco Cesati, Understanding the Linux Kernel, 3<sup>rd</sup> Edition, O' Reilly and Associates.
5. Naresh Chauhan, Principles of Operating Systems, Oxford University Press, 2014.

#### Reference Books:

1. Dhananjay Dhamdhere, Operating Systems A Concept approach, 3<sup>rd</sup> Edition, McGraw Hill Education.
2. Deitel & Deitel, Operating systems, 3<sup>rd</sup> Edition, Pearson Education, India, 2008

  
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Course Code	Course Title				Core / Elective		
SPC403AM	ARTIFICIAL INTELLIGENCE				Core		
	Contact Hours per Week				CIE	SEE	Credits
Pre Requisite	L	T	D	P			
SPC301AM	3	-	-	-	40	60	3

### COURSE OBJECTIVE

1. To become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
2. To Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
3. Explore the current scope, potential, limitations, and implications of intelligent systems

### COURSE OUTCOMES

On completion of the course, students will be able to

1. Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
2. Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
3. Create logical agents to do inference using first order logic.
4. Under expert system concepts
5. solve problem using fuzzy logic

### UNIT I:

**Introduction:** Introduction to AI, Intelligent system, Foundations of AI, Sub-Areas of AI, Applications

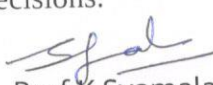
**Agents:** Agents and Environments, Good Behavior: The concept of Rationality, Performance measures, The nature of Environments, The Structure of Agents, Simple Agents, Rational Agents, Problem Solving Agents, Intelligent Agents

**Solving Problems By Search:** Problem Solving Agents, Example problems, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Depth-first search, Depth limited search, Iterative deepening depth first search,


### UNIT II:


**Informed (Heuristic) Search Strategies:** Greedy best-first search, A\* Search: Minimizing the total estimated solution cost, Heuristic Functions, Local Search Algorithms and Optimization Problems.

**Adversarial Search:** Games, Optimal decisions in games, Alpha- BetaPruning, Imperfect real time decisions.

  
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Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems,

### UNIT III:

**Logical Agents** – Knowledge-Based agents, The Wumpus World, Logic, Propositional Logic: A Very Simple Logic, Propositional theorem proving.

**First Order Logic:** Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

**Inference In First Order Logic:** Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining Algorithm , Backward Chaining algorithm, Resolution.

### UNIT IV:

**Classical Planning:** Definition of Classical Planning, Planning Graphs, other Classical Planning Approaches,

**Expert System:** Introduction, Phases in Building Expert Systems, Expert System Architecture, Expert System versus Traditional Systems, Rule-Based Expert Systems.

### UNIT V:

**Uncertainty Measures:** Introduction, Probability Theory, Bayesian Belief Networks.


**Fuzzy Logic Systems:** Introduction, Crisp Sets, Fuzzy Sets, Fuzzy Terminology, Fuzzy Logic Control, Neuro Fuzzy Systems.

### Text Book


1. Stuart Russell, Peter Norvig, Artificial Intelligence – A Modern Approach, Third Edition (2019), Pearson
2. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning, 2011
3. Elaine Rich, Kevin Knight, Shivashankar B Nair, “Artificial Intelligence” Tata McGraw Hill, Third Edition, 2019

### Reference Book

1. Nils J. Nilsson, Artificial Intelligence: A New Synthesis, (1998), Elsevier
2. Daniela Witten, Gareth James, Robert Tibshirani, and Trevor Hastie, An Introduction to Statistical Learning with Applications in R (Springer Texts in Statistics)
3. George F Luger , Artificial Intelligence, Structures and strategies for Complex Problem Solving, Sixth Edition,(2009), Pearson

  
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Course Code	Course Title				Core/ Elective		
SPC404AM	<b>AUTOMATA THEORY AND COMPILER DESIGN</b>				Core		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3
<b>Course Objectives:</b> <ol style="list-style-type: none"> <li>1. Develop and Design finite automata to accept a set of strings of a language.</li> <li>2. Understand the concepts o context free grammars and unrestricted grammars</li> <li>3. To Understand and Design top-down and bottom-up parsers</li> </ol> <b>Course Outcomes:</b> At the end of the Course the student shall be able to <ol style="list-style-type: none"> <li>1. Explain finite state machines for modeling and their power to recognize the languages.</li> <li>2. Summarize the concept of Regular languages and context free languages</li> <li>3. Construct PDA and Turing machines for the given set of languages</li> <li>4. Classify various phases of compiler</li> <li>5. Apply parsing techniques for a given grammar</li> </ol>							

## UNIT-I

**Fundamentals:** Formal Languages, Strings, Alphabets, Languages, Chomsky Hierarchy of languages.  
**Finite Automata:** Introduction to Finite State machine, Acceptance of strings and languages, Deterministic finite automaton (DFA) and Non-deterministic finite automaton (NFA), Equivalence of NFA and DFA – Equivalence of NDFAs with and without  $\epsilon$ -moves, Minimization of finite automata, Equivalence between two DFA's, Finite automata with output – Moore and Mealy machines,

## Unit-II

**Regular Languages:** Regular expressions, Identity rules, Conversion of a given regular expression into a finite automaton, Conversion of finite automata into a regular expression, Pumping lemma for regular sets, Closure properties of regular sets (proofs not required).

**Context Free Grammars:** Context free grammars and languages, Derivation trees, Leftmost and rightmost derivation of strings and Sentential forms, Ambiguity, left recursion and left factoring in context free grammars, Minimization of context free grammars, Normal forms for context free grammars, Chomsky normal form, Greibach normal form,

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### UNIT-III

**Pushdown Automata:** Introduction to Pushdown automata, Acceptance of context free languages, Acceptance by final state and acceptance by empty state and its equivalence, Equivalence of context free grammars and pushdown automata, Inter-conversion (Proofs not required).

**Turing Machine:** Introduction to Turing Machine, Design of Turing machines, Types of Turing machines.

### UNIT-IV

**Introduction To Compiling:** Overview of Compilers, Phases of a Compiler.

**Lexical Analysis:** The Role of Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, A language for specifying Lexical Analyzers(LEX).

### Unit-V

**Syntax Analysis:** The role of the Parser, First and Follow, Predictive Parsing, LR Parsers-SLR, Canonical LR, Parser Generator(YACC).

**Semantic Analysis:** Attributes and attribute grammars, Symbol table, Data types and Type checking, Intermediate languages, Declarations

### Text Books:


1. John E Hopcroft, Rajeev Motwani, Jeffrey D.Ullman, "Introduction to Automata Theory Languages and Computation", 3rd Edition, Pearson Education, 2011.
2. Alfred Aho, Monica S Lam, Ravi Sethi, Jeffrey D.Ullman, "Compilers- Principles Techniques and Tool", 2nd Edition, Pearson Education India, 2013.

### Reference Books:

1. Peter Linz, "An introduction to Formal Languages and Automata", 6th Edition, Jones & Bartlett, 2016
2. V.Raghavan, "Principles of Compiler Design", 1st Edition, McGrawHill Education, 2017.
3. Mishra and Chandrashekar, "Theory of Computer Science – Automata Languages and Computation", 3rd Edition, PHI, 2009
4. Michel Sipser, "Introduction to Theory of Computation", 2nd Edition, Thomson, 2012

  
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Course Code	Course Title				Core/Elective		
SPC405AM	<b>DATA ANALYTICS</b>				<b>Core</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-			3

### Course Objectives:

1. The primary objectives of data warehousing are designed to support decision-making processes
2. Improve the overall efficiency of an organization's data management.
3. The practical knowledge of data analytics capabilities of python packages.

**Course Outcomes:** After completion of the course, the students should be able to

1. Understand the basic of data warehouses
2. Knowledge of multidimensional data models
3. Enhance the quality of data through data processes and Python programming
4. Implementing data structures in Python
5. Analyzing large volume data by using Python libraries to enable trend analysis

### UNIT-I

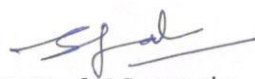
**Overview of Python and its Applications:** Basic syntax: comments, variables, and data types, Conditional statements: if, elif, else, Looping constructs: for, while, Nested loops, Break, continue, and pass statements,

**Functions and Modules:** Defining and calling functions, Function arguments, Return values and scope of variables, Lambda functions and higher-order functions, Importing and using modules  
**Strings and Regular Expressions**


**Data Structures:** Range, Lists, Tuple, Set, Dictionaries: creation, manipulation, and methods and applications

### UNIT-II

**File Handling and Exceptions:** Reading from and writing to files, Working with CSV files using the csv module, Understanding exceptions and error handling Try, except, else, and finally blocks, Handling exceptions in file operations

  
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**Working with Libraries:** NumPy for numerical operations, Pandas for data manipulation and analysis, Matplotlib for data visualization

**Database Connectivity:** Connecting to databases using mysql and other libraries, Performing CRUD operations

### UNIT-III

**Data:** Scientific research, Concepts, Measurement of Concepts, Variables, Types of Variables Independent and dependent, Continuous and Discrete, Numerical and Nonnumerical, Numerical Variables: Interval and Ratio, Nonnumerical Variables: Categorical and Ordinal, Definition of data, Modalities of data, Types of data, Data collection methods, Popular online datasets.

Descriptive Data Summarization, Measuring the Central Tendency, Measuring the Dispersion of Data-Range, Quartiles, Variance and Standard Deviation,

**Data Cleaning:** Need for cleaning the Data, treating of missing values, treating duplicate values,

**Data Preprocessing:** Standardizing the data, Normalizing the data, Outliers and their detection, treating the outliers. Data Integration, Data Reduction, Data Transformation and Discretization

### UNIT – IV

**Data Warehouse:** Definition, Data Warehouse Framework, Data Warehouse Types, Operational Database (OLTP) Vs Data Warehouse (OLAP), Data Warehouse three-tier Architecture, Data Warehouse Models, Data Mart, ETL Process, Metadata Repository.

### UNIT – V


Data Cube, Dimensions, Dimension Table, Fact Table, Cuboids, Multidimensional Data Models, Star Schema, Snowflake Schema and Fact constellation Schema, Concept Hierarchies, OLAP Operations.

### TEXT BOOKS:


1. Jiawei Han & Micheline Kamber Data Mining: Concepts and Techniques, Jiawei Han Micheline Kamber, Jian Pei, 3rd Edition Elsevier.
2. W. H. Inmon , Building the Data Warehouse, John Wiley & Sons, 2005
3. McKinney, Wes, Python for Data Analysis. O'Reilly Media, Inc., 2nd Edition 2018.

### REFERENCE BOOKS:

1. Paulraj Ponniah, Data Warehousing Fundamentals for IT Professionals, John Wiley & Sons, 2011.

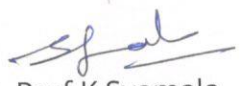
  
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2. Ralph Kimball and Margy Ross, The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling, John Wiley & Sons, 2011.
3. Varga, Ervin, Practical data science with python 3: synthesizing actionable insights from data. Apress, 2019.

  
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## SEMESTER V

Course Code	:	AU301
Course Title	:	Indian Constitution
Number of Credits	:	0 (L: 3, T: 0, P: 0)
Course Category	:	AU

### Course Content

#### Unit 1: The Constitution - Introduction

- The History of the Making of the Indian Constitution
- Preamble and the Basic Structure, and its interpretation
- Fundamental Rights and Duties and their interpretation
- State Policy Principles

#### Unit 2 – Union Government

- Structure of the Indian Union
- President – Role and Power
- Prime Minister and Council of Ministers
- Lok Sabha and Rajya Sabha

#### Unit 3 – State Government

- Governor – Role and Power
- Chief Minister and Council of Ministers
- State Secretariat

#### Unit 4 – Local Administration

- District Administration
- Municipal Corporation
- Zila Panchayat

#### Unit 5 – Election Commission

- a. Role and Functioning
- b. Chief Election Commissioner
- c. State Election Commission

### Suggested Learning Resources:

S. No.	Title of Book	Author	Publication
1	Ethics and Politics of the Indian Constitution	Rajeev Bhargava	Oxford University Press, New Delhi, 2008
2	The Constitution of India	B.L. Fadia	Sahitya Bhawan; New edition (2017)
3	Introduction to the Constitution of India	DD Basu	Lexis Nexis; Twenty-Third 2018 edition


Course Code	Course Title				Core/Elective		
SPC411AM	OPERATING SYSTEM AND COMPILER DESIGN LAB				Core		
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
	-	-	-	3	40	60	1.5
<p><b>Course Objectives:</b> Students will be able:</p> <ol style="list-style-type: none"> <li>1. Understand Unix commands.</li> <li>2. Implement Process management related techniques.</li> <li>3. Implement memory management techniques</li> </ol> <p><b>Course Outcomes:</b> After completion of this course, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Implement CPU scheduling algorithms.</li> <li>2. Apply the Banker's algorithm for deadlock avoidance.</li> <li>3. Implement page replacement and disk scheduling techniques.</li> <li>4. Solve producer-consumer problem, reader-writer problem, dining philosophers problem.</li> </ol>							

### OS Lab - List of Experiments

1. Program to implement Unix system calls(fork(),wait(),exec(),sleep())and file management.
2. Program to implement multithread concepts.
3. Program to implement CPU scheduling algorithms:(i)FCFS(ii)SJF(iii)Round Robin
4. Program to implement Shared memory and Inter Process Communication(IPC)techniques.
5. Program to implement Process Synchronization for Dining Philosopher problem
6. Program to implement Process Synchronization for Producer-Consumer problem.
7. Program to implement Process Synchronization for Readers-Writers problem.
8. Program to implement deadlock detection.
9. Program to implement Bankers Algorithm for Deadlock Avoidance.
10. Program to implement Page Replacement Algorithm using FIFO
11. Program to implement the following Page Replacement Algorithms using LRU and LFU.
12. Program to implement FCFS Disk Scheduling Algorithm.
13. Program to implement SSTF Disk Scheduling Algorithms
14. Case Study on Linux Systems

  
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## CD LAB - List of Experiments

1. To identify whether given string is keyword or not.
2. Count total no. of keywords in a file. [Taking file from user]
3. Count total no of operators in a file. [Taking file from user]
4. Count total occurrence of each character in a given file. [Taking file from user]
5. Write a C program to insert, delete and display the entries in Symbol Table.
6. Write a LEX program to identify following:
  - 6.a) Valid mobile number
  - 6.b) Valid url
  - 6.c) Valid identifier
  - 6.d) Valid date (dd/mm/yyyy)
  - 6.e) Valid time (hh:mm:ss)
7. Write a lex program to count blank spaces, words, lines in a given file.
8. Write a lex program to count the no. of vowels and consonants in a C file.
9. Write a C program for implementing the functionalities of predictive
10. Implement SLR(1) Parsing algorithm
11. Write a C program for constructing recursive descent parsing.
12. Write a C program to generate three address code

  
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Course Code	Course Title				Core / Elective		
SPC412AM	DATA ANALYTICS LAB				Core		
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	3	40	60	1.5

### Course Objectives:

The students will try to learn:

1. Installation and usage of python packages useful for data exploration and visualization.
2. Data handling using python in practice.
3. The practical knowledge of data analytics capabilities of python packages.

**Course Outcomes:** At the end of this course, the students will be able to:

1. Understand data types, control structures, and basic data structures and Solve problems using algorithms and Python's data structures.
2. Use libraries like NumPy, Pandas, and Matplotlib for data manipulation and visualization and Handle large datasets and perform data analysis tasks.
3. Manipulate the tabular data using pivoting and cross-tabling to generate contingency tables and Manipulate the tabular data by joining multiple data table.
4. Explore the data using the data visualization techniques.
5. Analyze the time series data and its trends.

### List of Experiments:

#### WEEK 1 : Installation of python and related packages

- a. Install python, and packages; NumPy, SciPy and Panda.
- b. Programs on standard I/O, operators AND Expressions
- c. programs on functions and different arguments
- d. programs on list, tuples, sets, dictionaries
- e. programs on strings and regular expressions

#### WEEK 2 : Working with CSV files and XLS files.

- a. Study matrix operations: rank, inverse, condition number
- b. Solving for simultaneous equations in 3 or 4 variables.
- c. Save a List to CSV, XLSX and TXT files.

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- d. Save a Dictionary to CSV, XLSX and TXT files.
- e. Load data from CSV, XLSX and TXT pandas to a List.
- f. Load data from CSV, XLSX and TXT pandas to a Dictionary.

### WEEK 3 : Basic operations on Dataframe.

- a. Attribute filtering based on conditions.
- b. Attribute filtering based on slicing.
- c. Attribute filtering based on queries.

### WEEK 4: Summary Statistics of the data

- a. Compute ranking statistics of the data.
- b. Compute statistical averages of numerical attributes.
- c. Compute statistical ratios of numerical attributes.
- d. Interpret the results.

### WEEK 5 : Handling Missing Values

- a. Drop the rows containing missing values
- b. Impute missing values with statistical averages.
- c. Impute missing values using linear interpolation.\
- d. Interpret the results.

### WEEK 6 : Handling Time series data


- a. Display the date and time information in different formats.
- b. Generate summary statistics during a period.
- c. Compute rolling mean and rolling std deviations and plot.

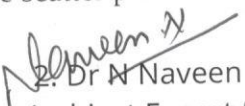
### WEEK 7 : Visualization of categorial data

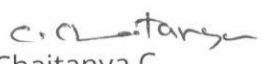
- a. Plot categorical data as vertical and horizontal bar charts and label it.
- b. Plot categorical data as vertical grouped bar chart and label it.
- c. Plot categorical data as vertical stacked bar chart and label it
- d. Interpret the results.

### WEEK 8 : Visualization of correlations.

- a. Plot the pair wise scatter plots of numerical attributes

  
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- b. Identify the type of correlations.
- c. Interpret the results.

**WEEK 9 : Visualization of distributions**

- a. Plot the histograms of numerical data.
- b. Plot the counts of categorial data.
- c. Plot the data distributions (or densities).
- d. Create the box-and-whisker plots of numerical attributes.

**WEEK 10 : Handling outliers in the data.**

- a. Identify the outliers using quartile method.
- b. Identify the outliers using standard deviation method.
- c. Compare the performance of two methods.
- d. Remove outliers from the data.

**WEEK 11: Data Scaling and Transformation.**



- a. Scaling the data using different python scalers.
- b. Normalization as a special case of data scaling.
- c. Data transformation using standardization

**TEXTBOOKS**

1. R. Nageswara Rao, “Core Python Programming, 3ed: Covers fundamentals to advanced topics like OOPS, Exceptions, Data structures, Files, Threads, Net”, Dreamtech press, 3rd edition, 2021.
2. Eric Jacqueline Kazil & Katharine Jarmul,” Data Wrangling with Python”, O’Reilly Media, Inc, 2016.

**REFERENCE BOOKS:**

1. Dr. Tirthajyoti Sarkar, Shubhadeep,” Data Wrangling with Python: Creating actionable data from raw sources”, Packet Publishing Ltd, 2019.
2. Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, by Glenn J. Myatt.
3. Wes McKinney, “Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Ipython”, O’Reilly, 2nd Edition, 2018.
4. Dr. John P. Hoffmann, “Principles of Data Management and Presentation”, 1st edition, 2017.

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Course Code	Course Title						Core / Elective
SHS912EG	ADVANCED COMMUNICATION SKILLS LAB (Common to all branches)						Core
Prerequisite	Contact Hours per week				CIE	SEE	Credit
	L	T	D	P			
English Lab	-	-	-	2	40	60	1

**Course Objectives:**

1. To facilitate the students with a wide range of vocabulary, so as to enable them to use language more effectively in formal and informal situations
2. To equip the students to face interviews
3. To understand the importance of personal and professional communication

**Course Outcomes:**

By the end of the course students will be able to:

1. Develop sound communication skills through listening to competitive test modules. (UNDERSTAND, ANALYZE)
2. Practise speaking and reading techniques for a quick and better comprehension. (APPLY)
3. Use appropriate verbal and non-verbal skills for a successful career. (APPLY)
4. Develop awareness of attending interviews. (UNDERSTAND)
5. Enhance creative skills and competence. (CREATE)

**SYLLABUS:**

**UNIT I - Listening Skills**

- Types of listening: Appreciative Listening, Empathetic, Comprehensive/ Active, Critical / Analytical listening.
- Listening for comprehension (TOEFL, IELTS, PTE)

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Chairperson  
Board of Studies  
Dept. of English  
SCETW, HYDERABAD-1

*Dr. C. Muralikrishna*  
Dr. C. MURALIKRISHNA  
PROFESSOR,  
DEPT. OF ENGLISH  
OSMANIA UNIVERSITY, HYD-2.

- Listening to a variety of speakers in different contexts from Ted talks and Podcasts- Informative, Motivational, Anecdotal, Entrepreneurial

## UNIT II - Speaking and Reading Skills

- Public Speaking (Ceremonial, Demonstrative, Informative and Persuasive)
- Emceeing and Formal Announcements
- Reading Newspaper and Reading for Comprehension (, Skimming and Scanning-Facts, Summarizing and Critical Analysis)

## UNIT III - Preparing for an Interview

- Vesume and Resumewith Cover Letter,
- Building profiles on professional networks- LinkedIn
- Group Discussion - Factual, Controversial and Case Study
- Dialogue Writing

## UNIT IV - Interview Skills

- Types of Interviews - Telephonic, HR, Panel and Online
- Attending an Interview (Body Language, Etiquette and Dress Code)
- Frequently Asked Questions- Self Introduction, Strengths & Weaknesses, etc.
- Mock interviews

## UNIT V - Creative Skills

- Book Review & Film Review from published materials,
- Making of Vlogs - Formal & Informal

### Suggested Reading:

1. Anne Dannellon, *Team Talk The Power of Language in Team Dynamics*, Harvard Business School Press, Boston, Massachusetts, 1996.
2. Friederike Klippel, *Keep Talking*, Cambridge University Press London, 1984.
3. Lewis, Hedwing *Body Language: A Guide for Professionals*, Response Book (a division of Saga Publications India, Pvt. Ltd.) New Delhi, 1998.
4. Hari Mohan Prasad and Rajnish Mohan, *How to prepare for Group Discussion and Interview*, 2- Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2005.

*Breath*

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Course Code	Course Title				Core / Elective		
SPW511AM	INTERNSHIP-1				Core		
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	-	50	-	2


### Internship Guidelines for IV and VI semester Students

#### Guidelines for Selection of Summer Internships

- Students should opt for summer internship that would provide to gain ample field knowledge in the relevant field of engineering such that theoretical knowledge gained in the class can be applied to solve the practical/ field problem.
- Students should take a challenging task, may be small portion, and apply the knowledge gained to solve it. Summer internship can also involve data collection from different sources including generating experimental data, collection of data from field etc. Later on the student is required to analyze the data collected and arrive at meaningful conclusions.
- Summer internship shall be aimed at solving some of the problems of the society/ local region that should have practical applications and benefit the society.
- Students should devote 4-6 weeks for summer internship. If any student undergoes internship duration is less than 04 weeks, such interns shall not be considered. If any credits are given to the internship program then student must register as per the course registration process.
- Different central and state government organizations, CSIR labs, premier institutions like IITs and IIMs, DRDO, public sector undertaking organizations, top IT companies, skill enhancement centers recognized by state or central governments, research labs and Industries (small scale to large scale) can be considered for summer internships.
- Head of the department should depute faculty members for monitoring the student summer internship by communicating to the company guide.
- The internship done by the student is assessed in two stages. i) External evaluation for 25 marks and ii) Internal evaluation for remaining 25 marks.
- HOD should constitute summer internship evaluation boards consisting of dept faculty members that may include one faculty from other dept. The evaluation board should involve in the evaluation process. Board can take decision to reject the student summer internship if it doesn't meet the requirements of summer internships. Such students have to repeat the summer internship.
- Student Shall apply for permission through HOD at least 6 working days prior to the commencement of Internship.
- Students are responsible to get the weekly attendance of the internship attended and submit the same to their respective supervisor on every Saturday.

  
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## MONITORING & EVALUATION OF INTERNSHIP

The industrial training (internship) of the students will be evaluated in two stages:

1. Evaluation by faculty supervisor on the basis of the site visit(s) or periodic communication.
2. Evaluation through seminar presentation/viva-voce

### EVALUATION THROUGH SEMINAR PRESENTATION/VIVA-VOICE

The student will give a seminar based on his training report, before an expert committee constituted by the concerned department as per the norms of the institute. The evaluation will be based on the following criteria:

- Quality of content presented.
- Proper planning for presentation.
- Effectiveness of presentation.
- Depth of knowledge and skills.

Attendance record, daily diary, departmental reports shall also be analyzed along with the Internship Report.



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**DEPARTMENT OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING**

**Syllabus Status for BOS**

III-semester

S. No	Code	Subject Name	Semester	Branch
1	SPC301AM	Discrete Mathematics & Graph Theory	III	IT,AI&ML
2	SPC302AM	OOPS using Java	III	Common
3	SPC303AM	Database Management Systems	III	Common
4	ES301EC	Data Visualization	III	AI &ML
5	SBS301MT	Mathematics-III	III	Service
6	SPC311AM	OOPS using Java Lab	III	Common
7	SPC312AM	Database Management Systems Lab	III	Common
8	SPC313AM	Data Visualization Lab	III	AI &ML

IV-semester

S. No	Code	Subject Name	Semester	Branch
1	SPC401AM	Computer System Design	IV	AI&ML
2	SPC402AM	Operating Systems	IV	Common
3	SPC403AM	Data analytics	IV	AI & ML
4	SPC404AM	Automata Theory and Compiler Design	IV	IT, AI &ML
5	SPC405AM	Artificial Intelligence	IV	AI &ML
6	SPC411AM	OS & CD Lab	IV	AI &ML
7	SPC413AM	Data analytics using Python	IV	AI &ML
8	SHS912EG	Advanced Communication Skills lab	IV	service

*Joimva*



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**Department of Information Technology  
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Changes in Syllabus

**Subject Name : Discrete Mathematics(OLD)  
Discrete Mathematics and Graph Theory(New)**

Branch Name: IT, AI&ML

Unit	Old	New
Unit I	Sets, Relations and Functions	Added Propositional Calculus
Unit II	Elementary Combinations	Sets, Relations and Pigeonhole Principle
Unit III	Propositional Logic	Functions, Coefficients , Recurrence Relations
Unit IV	Algebraic Structures and Morphism	Graphs- Introduction
Unit V	Graphs and Trees	Algebraic Structures, Discrete Random Variables, BST
Text book	<b>Kenneth H Rosen</b>	<b>All topics except Discrete Random Variables</b>

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Changes in Syllabus

**Subject Name: OOPS Using Java(OLD)  
OOPS Using Java(New)**

Branch : ALL

Unit	Old	New
Unit I	Java Buzzwords	Removed
Unit II	Same	Same
Unit III	Same	Same
Unit IV		Removed Bitset, Date, Calendar, Timer
Unit V		Removed premain method in New Features
Text book	<b>Herbert and Schildt</b>	<b>All topics covered</b>

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Changes in Syllabus

**Subject Name : Database Management Systems(OLD)  
Database Management Systems(New)**

Branch : All

Unit	Old	New
Unit I		Removed EF Codd rules and history of database Introduction to relational model and relational algebra added from Unit II(old)
Unit II		Removed Modification of Database, Transaction,SQL datatypes and schemas, Index, types of indices, functions and packages. Added Integrity Constraints topic
Unit III		Removed Redundant attributes in entity set, Features of good relational design Added Constraints, denormalization
Unit IV		Removed static and dynamic hashing, Added B& B+ trees Removed Transaction and SQL Statements
Unit V		Removed weak level of consistency in practice, buffer management from advanced recovery techniques Added overview and history of NoSQL databases
Text book	<b>Henry F Korth</b>	<b>All topics covered</b>

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Changes in Syllabus

**Subject Name: Operating Systems(OLD)  
Operating Systems(New)**

Branch : ALL

Unit	Old	New
Unit I		Completely changed
Unit II	Same	Same
Unit III	Same	Same
Unit IV		Added Virtual memory
Unit V	Same	Same
Text book	<b>Galvin</b>	<b>Sufficient for all units</b>

*Galvin*



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Changes in Syllabus

**Subject Name: Computer Organization and Microprocessor(OLD)  
split into two subjects Computer Organization and Architecture(New),  
Microprocessors and Microcontrollers(New)**

**Branch : IT**

Unit	Old	New
Unit I		Completely changed
Unit II		Part-2 Added from Unit-I to Unit-II
Unit III	Same	Added Instruction Cycle
Unit IV		Removed 8085 architecture
Unit V	Same	Completely Changed
Text book	<b>M Morris Mano</b>	<b>Sufficient for all units</b>

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**Department of Information Technology  
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Changes in Syllabus

**Subject Name: Data Communications and Computer Networks(OLD)  
Data Communications and Computer Networks(NEW)**

Branch : IT , AI &ML

Unit	Old	New
Unit I		Added- components, network connection categories and types Removed interface switching Added data and signals Added Physical layer concepts
Unit II		Datalink layer is same as old syllabus Added wired and wireless LAN concepts
Unit III	Same	ARP , RARP protocols moved to Unit-III from Unit-III Network layer is same as old
Unit IV		Same, but detailed concepts mentioned
Unit V	Same	Socket programming removed Security in Internet is added Application Layer is same as old syllabus
Text book	<b>Reference 1 or Reference 2 can be followed for all units</b>	

*Coimlav*



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**Department of Information Technology  
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Changes in Syllabus

**Subject: Data Visualization(NEW)**

**Branch : AI &ML**

**Subject: Data Analytics (NEW)**

**Branch : AI &ML**

**Subject: Automaton Theory and Compiler Design(NEW)**

**Branch : AI &ML**

*Srinva*

**Subject: Data Analytics(NEW)**