



Bansilal Ramnath Agarwal Charitable Trust's  
**Vishwakarma Institute of Technology**  
(An Autonomous Institute affiliated to Savitribai Phule Pune University)

Structure & Syllabus of  
**Second Year B.Tech.**  
**(Instrumentation and Control Engineering)**  
Pattern 'B23'

Effective from Academic Year 2023-24

Prepared by: - Board of Studies in Instrumentation & Control Engineering

Approved by: - Academic Board, Vishwakarma Institute of Technology, Pune

Chairman – BOS

Signed by

Dean Academics

Chairman – Academic Board



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**Vision statement of Institute**

To be globally acclaimed Institute in Technical Education and Research for holistic Socio-economic development

**Mission statement of Institute**

- To endure that 100% students are employable in Industry, Higher studies, Become Entrepreneurs, Civil/Defense Services / Government Jobs and other areas like Sports and Theatre.
- To strengthen Academic Practices in terms of Curriculum, Pedagogy, Assessment and Faculty Competence.
- Promote Research Culture amongst Students and Faculty through Projects and Consultancy.
- To make students Socially Responsible Citizen.

**Core Values**

- Faculty Centric Initiatives
- Academic Practices
- Research Culture
- Use of Technology for Social and National Development

**Vision statement of Department**

To be recognized as a leading contributor in imparting technical education and research in Instrumentation & Control engineering for development of the society.

**Mission statement of Department**

- To deliver knowledge of Instrumentation and Control Engineering by strengthening involvement of Research institutions and industries in academics
- To build conducive environment for advanced learning through participation of faculty and students in collaborative research, consultancy projects, student exchange programs and internships
- To develop competent Engineers with entrepreneurial skills to address socio-economic needs.

## Program Educational Objectives (PEO)

### Programme: B. Tech. (Instrumentation and Control Engineering)

The Graduates would demonstrate

1. Core competency in Instrumentation and Control Engineering to cater to the industry and research needs.
2. Multi-disciplinary skills, team spirit and leadership qualities with professional ethics, to excel in professional career and/or higher studies.
3. Preparedness to learn and apply contemporary technologies for addressing impending challenges for the benefit of organization/society.
4. Knowledge of recommended standards and practices to design and implement automation solutions.

### Program Outcomes

#### Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research –based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **Program Specific Outcomes (PSOs)**

Graduates shall have the ability to:

1. Evaluate the performance of suitable sensors / Process components/ Electronic / Electrical components for building complete automation systems.
2. Analyze real-world engineering problems in the area of Instrumentation and Control.
3. Design or Develop measurement / electronic / embedded and control systems with computational algorithms to provide practical solutions to multidisciplinary engineering problems.

Vishwakarma Institute of Technology  
 Title : Course Structure

Issue 01 : Rev No. 00 : Dt. 01/08/22  
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**S.Y. B.Tech - Instrumentation and Control Engineering Structure for Pattern B-23, Module-3  
 with effect from Semester-1 of Academic Year 2023-24**

Course Type	Course Code	Course Name	Teaching Learning Scheme (Hrs./Week)				Credits	Assessment Scheme (100 mark scale)													
			Th	Lab	Tut	Total		In Semester Assessment						End Semester Assessment					Total		
								Lab 10	CP 20	MSE-MCQ 30	MSE Review 30	Seminar / GD / HA 20			ESE 30			ESE Review 70		CVV 20	
												Written	MCQ	Practical							
S1	MD2201	Data Science	2	2	1	5	4	10	20				20			30				20	100
S2	CS2221	Internet of Things	2	2	1	5	4	10	20					20			30			20	100
S3	CS2218	Object Oriented Programming	2	2	1	5	4	10	20								50			20	100
S4	CS2227	Database Management Systems	2	2	1	5	4	10	20			20			30					20	100
S5	IC2223	Applies Electronics	2	0	0	2	2								100						100
S6	IC2236	Design Thinking-3	0	0	1	1	1														Graded
S7	IC2240	Engineering Design and Innovation - III	0	8	0	8	4				30								70		100
<b>Total</b>			<b>10</b>	<b>16</b>	<b>5</b>	<b>31</b>	<b>23</b>	<b>40</b>	<b>80</b>			<b>30</b>	<b>40</b>	<b>20</b>	<b>0</b>	<b>160</b>	<b>30</b>	<b>50</b>	<b>70</b>	<b>80</b>	<b>600</b>

# SEMESTER I

**MD2201:: DATA SCIENCE****Course Prerequisites:**

1. Linear Algebra Basics
2. Central Tendency & Measures of Dispersion – Mean, Mode, Median
3. Probability
4. Some exposure to programming environment – C programming; Python

**Course Objectives:**

1. Understand data processing pipeline
2. Perform dimensionality reduction operations
3. Optimize the performance of functions
4. Apply descriptive statistics tools
5. Deduce meaningful statistical inferences
6. Use unsupervised classification algorithms
7. Use supervised classification algorithms
8. Utilize the data science principles for an entire project life cycle as a case study

**Credits: 4****Teaching Scheme :**  
**Theory : 2 Hours/Week**  
**Tut : 1 Hours/Week**  
**Lab : 2 Hours/Week****Course Relevance:**

The course is offered in S.Y. B.Tech. to all branches of Engineering

Data Science is a multidisciplinary field. It uses scientific approaches, procedures, algorithms and frameworks to extract knowledge and insight from a huge amount of data.

Data Science uses concepts and methods which belong to fields like information technology, Mathematics, Statistics, Computer Science etc.

Data Science influences the growth and improvements of the product by providing a lot of intelligence about customers and operations, by using methods such as data mining and data analysis.

The course is relevant to all branches of Engineering and beyond, since data is generated as an obvious outcome of many processes.



Data science definition, raw data, processed data and their attributes, meta data, data cleaning, data science pipeline. **(3 Hours)**

Normal distribution, evaluating normal distribution, Binomial distribution, confidence Intervals, central limit Theorem, hypothesis testing **(6 Hours)**

Vector norms, Unconstrained Optimization **(4 Hours)**

Simple and multiple linear regression; Logistic regression, non-linear regression, polynomial regression **(4 Hours)**

Nearest Neighbor Classification – Knn approach, branch and bound algorithm, projection algorithm; Naïve Bayes Classification; Classification using decision trees, divisive and agglomerative clustering, K-means clustering **(6 Hours)**

Evaluation of model performance – Confusion matrices, sensitivity, specificity, precision, recall, F-measure, Classifier performance measurement metrics – Training & Testing strategies – Resubstitution, Hold-out, Cross validation, Bootstrap. **(3 Hours)**

**List of Tutorials:**

1. Data Visualization
2. Distances and Projections
3. Singular Value Decomposition
4. Principal Component Analysis
5. Optimization
6. Normal & Binomial Distribution
7. Hypothesis Testing
8. ANOVA test
9. Linear Regression
10. Logistic Regression
11. Nearest Neighbor Classification
12. Decision Trees based classification
13. Naive Bayes classification
14. Clustering
15. Evaluation of model performance
16. Bagging & Boosting approaches

**List of Practical's: (Any Six)**

1. Data visualization
2. Unconstrained Optimization
3. Hypothesis Testing
4. Linear regression
5. Logistic Regression
6. Nearest Neighbor classification
7. Naive Bayes classification
8. Clustering
9. Classifier performance using Confusion matrix and other attributes
10. Cross Validation methods

**List of Course Projects:**

1. Movie recommendation system
2. Customer Segmentation using Machine Learning
3. Sentiment analysis
4. Uber Data analysis
5. Loan prediction
6. HVAC needs forecasting
7. Customer relationship management
8. Clinical decision support systems
9. Development of machine learning solutions using available data sets (multiple projects)
10. Fraud detection

**List of Course Seminar Topics:**

1. Data wrangling
2. Predictive modeling
3. Data analytics in life science (multiple topics)
4. Ensemble modeling techniques
5. Text pre-processing
6. Feature scaling for machine learning
7. Multivariate normal distribution applications
8. Distance metrics and their applications
9. Visualization techniques such as Chernoff's faces
10. Tree based algorithms
11. Ridge regression
12. LASSO

**Assessment Scheme:**

1. Written ESE:30
2. Course Project:20
3. Laboratory Work:10
4. Seminar Presentation:20
5. CVV:20

**Text Books:**

1. 'A Beginner's Guide to R' – Zuur, Ieno, Meesters; Springer, 2009
2. 'Introduction to Data Science' – Iglewicz, Segui; Springer, 2017
3. 'Mathematics for Machine Learning' – Duesenroth, Faisal, Ong; Cambridge University Press, 2017
4. 'Machine Learning with R' – Lantz, Packt Publishing, 2018

**Reference Books:**

1. 'Elements of Statistical Learning' - Hastie, Tibshirani, Friedman; Springer; 2011
2. 'Data Science from Scratch' - Grus; Google Books; 2015
3. 'The art of Data Science' - Matsui, Peng; 2016
4. 'Machine Learning for absolute beginners' - Theobald; Google Books; 2017

**Moocs Links and additional reading material:**

1. [www.nptelvideos.in](http://www.nptelvideos.in)
2. <https://www.edx.org/course/machine-learning-fundamentals-2>
3. <https://www.edx.org/course/foundations-of-data-analysis-part-1-statistics-usi>
4. <https://www.coursera.org/learn/statistical-inference/home/welcome>
5. <https://www.coursera.org/learn/data-scientists-tools/home/welcome>

**Course Outcomes:** Upon completion of the course, student will be able to –

1. Apply data processing and data visualization techniques
2. Perform descriptive and inferential statistical analysis
3. Utilize appropriate distance metrics and optimization techniques
4. Implement supervised algorithms for classification and prediction
5. Implement unsupervised classification algorithms
6. Evaluate the performance metrics of supervised and unsupervised algorithms

**Future Courses Mapping:**

1. Deep Learning
2. Reinforcement Learning
3. DBMS
4. Big Data
5. Data Mining
6. Information Retrieval

7. Recommendation Systems
8. Cloud Computing – AWS
9. IOT
10. Artificial Intelligence
11. Pattern Recognition
12. Natural Language Processing
13. Computer Vision
14. Machine Vision
15. Fault Diagnosis
16. Optimization
17. Bioinformatics
18. Computational Biology
19. Econometrics
20. Supply Chain
21. Ergonomics
22. Operations Research
23. Nano-informatics

**Job Mapping:**

1. Data Scientist
2. Data Analyst
3. AI Engineer
4. Data Architect.
5. Data Engineer.
6. Statistician.
7. Database Administrator.
8. Business Analyst
9. Business Intelligence Developer
10. Infrastructure Architect
11. Enterprise Architect
12. Machine Learning Engineering
13. Machine Learning Scientist

## CS2221:: INTERNET OF THINGS

### Course Prerequisites:

Students should have a basic Understanding of the Internet, Cloud, Networking Concepts and Sensors

### Course Objectives:

The student will be able to

1. Understand IoT Architecture and framework.
2. Recognize and differentiate between the various use cases of different sensors, actuators, solenoid valve etc
3. Learn about fundamental concepts of networking and protocols.
4. Understand IoT Physical, Datalink and Higher layer Protocols.
5. Apply theoretical knowledge for Cloud computing.
6. Implement an IoT solution practically

**Credits: 4**

**Teaching Scheme:**

**Theory: 2 Hours/Week**

**Tut: 1 Hours/Week**

**Lab: 2 Hours/Week**

### Course Relevance:

The Internet of Things is transforming our physical world into a complex and dynamic system of connected devices on an unprecedented scale. Internet of Things is a system of interrelated computing and sensing devices and has the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

Advances in technology are making possible a more widespread adoption of IoT, from pill-shaped micro-cameras that can pinpoint thousands of images within the body, to smart sensors that can assess crop conditions on a farm, to the smart home devices that are becoming increasingly popular.

IoT is highly relevant in this growing ecosystem of internet-enabled devices. IoT offers increasing opportunities to collect, exchange, analyse and interpret data in real-time. This robust access to data will result in opportunities to further enhance and improve operations. In a world which is moving towards an increasingly connected future, Internet of Things (IoT) is the next big thing. Right from our homes to our cars to our cities, everything is being connected and the technology of IoT is right in the middle of it.

**Introduction to IoT**

Physical Design of IOT, Logical Design of IOT, IOT Enabling Technologies, IOT Levels & Deployment Templates (4 Hours)

**IOT Platform Design Methodology**

IoT Design Methodology Steps, Home Automation Case Study, Smart Cities, Health Care, Agriculture (4 Hours)

**IoT Devices**

IoT System Design Cycle, Sensors - Terminologies, Calibration, Types, Specification, Use, Actuators - Types and Use, Prototype Development Platform - Arduino / Raspberry pi / Node MCU, Interface with Embedded System. (6 Hours)

**Introduction to Wireless Sensor Network**

Sensor Node, Smart Sensor Network, Wireless Sensor Network, RFID - Principles and Components, Node MCU (4 Hours)

**Connectivity Technologies**

Network Configuration in IoT, IoT Stack and Web Stack, IEEE 802.15.4 Standard, Zigbee, Bluetooth, MQTT, Cloud Architecture and Types, Cloud Service Providers (8 Hours)

**Case Studies (Any Two from following List to be covered)**

Smart lighting, Home Intrusion Detection, Smart Parking, Weather Monitoring System, Weather Report Bot, Air Pollution Monitoring, Forest fire Detection, Smart Irrigation, IoT Printer, IoT in Manufacturing Industry, IoT in Process Industry, IoT in Quality, Control Applications in Industry, IoT in Material Handling System in Industry, IoT in Automobile Industry, Navigation System, Connected Vehicles, Industry 4.0 (4 Hours)

**List of Practical's: (Minimum Six)**

1. Setting up Arduino / Raspberry Pi/ Node MCU ESP8266 : Basic handling, programming
2. LED Interfacing
3. Sensor interface to Node MCU/Arduino / Raspberry Pi Temperature measurement using LM35
4. Actuator interface to Node MCU /Arduino / Raspberry Pi Traffic Signal Control
5. Node MCU /Arduino / Raspberry Pi wireless communication Raspberry Pi as a web server
6. Node MCU/Arduino / Raspberry Pi Cloud interfacing and programming like Thingspeak Email alert using SMTP protocol
7. Sensor data acquisition on Mobile (Mobile APP) / Developing Application (WEB APP) with Django Text transfer using MQTT protocol
8. Home Automation using Cisco Packet Tracer

**List of Course Projects:**

1. Smart Agriculture System
2. Weather Reporting System
3. Home Automation System
4. Face Recognition Bot
5. Smart Garage Door
6. Smart Alarm Clock
7. Air Pollution Monitoring System
8. Smart Parking System
9. Smart Traffic Management System
10. Smart Cradle System
11. Smart Gas Leakage Detector Bot
12. Streetlight Monitoring System
13. Smart Anti-Theft System
14. Liquid Level Monitoring System
15. Night Patrol Robot
16. Health Monitoring System
17. Smart Irrigation System
18. Flood Detection System
19. Mining Worker Safety Helmet
20. Smart Energy Grid

**List of Group Discussion Topics:**

1. Role of Internet of Things in development of India.
2. Manufacturing industries should make efforts to limit contribution to IoT.
3. Should countries put a ban on IoT for children?
4. Should IoT pay more attention to security rather than just expanding its horizon to the extremes?
5. IoT is the next big thing in technology.
6. IoT poses a huge risk to privacy, if they your system is hacked.
7. IoT is the next big thing for hackers trying to have access to your intimate data.
8. Pros and cons of over-usage of IoT at homes and offices.
9. IoT at battlefields will make life of soldiers safer and easier.
10. IoT will make way for robots to rule over humans one day.
11. IoT devices are making people lazier and obese.
12. IoT needs to be regulated before it goes out of limits and poses serious threat.

**Assessment Scheme:**

1. Written ESE:30
2. Course Project:20
3. Laboratory Work:10
4. Group Discussion:20
5. CVV:20

**Text Books:**

1. Arshdeep Bahga and Vijay Madiseti, "Internet of Things: A Hands-on Approach", (Universities Press)
2. PethuruRajandAnupamaC.Raman,"TheInternetofThings:EnablingTechnologies,Platforms,and Use Cases", (CRC Press)

**Reference Books:**

1. Adrian McEwen, Hakim Cassimally "Designing the Internet of Things", Wiley
2. Ovidiu Vermesan & Peter Friess, "Internet of Things Applications-From Research and Innovation to Market Deployment", ISBN:987-87-93102-94-1,RiverPublishers
3. Joe Biron and Jonathan Follett, "Foundational Elements of an IoT Solution," by Joe Biron

**MOOCs Links and additional reading material:**

1. <https://proed.stanford.edu/course/view.php?id=191>
2. <https://nptel.ac.in/courses/106/105/106105166/>
3. <https://create.arduino.cc/projecthub/electropeak/getting-started-w-nodemcu-esp8266-on-arduino-ide-28184f>

**Course Outcomes**

1. Demonstrate fundamental concepts of Internet of Things (CO Attainmentlevel:2)
2. Recognize IoT Design Methodology Steps(COAttainmentlevel:3)
3. Select sensors for different IoT applications (COAttainmentlevel:3)
4. Analyze fundamentals of networking (COAttainmentlevel:4)
5. Apply basic Protocols in IoT (CO Attainmentlevel:4)
6. Provide IoT solutions practically with the help of case study(COAttainmentlevel:5)

**Future Courses Mapping:**

1. Ad-Hoc Networks
2. Cyber Security
3. Wireless Networks
4. Industry 4.0
5. Big Data

**Job Mapping:**

The Internet of Things (IoT) is the most emerging field in today's world. It is revolutionizing every industry, from home appliances to agriculture to space exploration. Since the advent of cloud computing, there has been an exponential growth in the number of sensor-enabled devices connected to the internet and expecting further growth accelerating in the coming years. There are diversified career opportunities in this field. The various career positions available as IoT Research Developer, IoT Design Engineer, IoT Product Manager, IoT Software Developer, IoT Solution Architect, IoT Service Manager and many more.



**CS2218:: OBJECT ORIENTED PROGRAMMING**

**Course Prerequisites:** Basic course on programming

**Course Objectives:**

1. Understand Object Oriented programming concepts
2. Demonstrate Object Oriented programming concepts by writing suitable Java programs
3. Model a given computational problem in Object Oriented fashion
4. To develop problem solving ability using Object Oriented programming constructs like multithreading
5. Develop effective solutions using for real world problems using the concepts such as file handling and GUI
6. Implement applications using Java I/O and event-based GUI handling principles

**Credits: 4**

**Teaching Scheme Theory:** 2 Hours/Week

**Tut:** 1 Hours/Week

**Lab:** 2 Hours/Week

**Course Relevance:**

This is an important course for engineering students. It develops computational problem solving and logic building capability of students. Acquiring programming skills has a high relevance in all branches of Engineering. Once the student gains expertise in coding, this course proves to be beneficial to them to excel in industry demanding coding in specific software.

**Course Contents :****Introduction:**

What is Object Oriented Programming (OOP)? The need of OOP, Characteristics of OOP.

**Java overview:** Classes and Objects, Java object storage, Access Modifiers, this reference, main method, Static vs Instance block, Static methods vs Instance methods in Java.

**Constructors:** Constructors in Java, Default constructor, Parameterized constructor.

**Input and Output:** Byte Stream vs Character Stream, use of Scanner Class.

**Arrays in Java:** Arrays in Java, initialization, Default Array values, multi-dimensional array, java.util .Arrays class, string class, string buffer, string builder.

**Methods in Java:** Methods, Parameters passing, Returning Multiple values.

**Inheritance:** Inheritance in Java, Types, Constructor in Inheritance, Using final with Inheritance, Accessing superclass member, Parent and Child classes having same data member, Base vs derived

class reference. Polymorphism: Method Overloading, Overloading main(), Static vs Dynamic Binding, Method Hiding. Private and final methods, Passing and Returning Objects in Java

**Exception Handling:** Exceptions, types, types of handling exception, Checked vs Unchecked Exceptions, Throw and Throws, User-defined Exception.

**Interfaces and Abstract Classes:** Interface and its usage, Abstract Class and its usage, Difference between Abstract Class and Interface, Nested Interface, Nested Class, Inner class, Anonymous

**Collection in Java:** Collections Class, Using Iterators, Iterator vs Foreach, Array List, Vector, Map, Set.

**Multithreading:** Thread life Cycle, Thread Priority, Thread Methods.

**File Handling:** File Processing, Primitive Data Processing, Object Data Processing, Connecting Java with database (JDBC/ODBC).

**Java GUI:** Swing, Components. Layout Manager: Flow, Border, Grid and Card. Label, Button, Choice, List, Event Handling (mouse, key).

#### List of Practical's:

1. Implement Student class using following Concepts
  - All types of Constructors
  - Static variables and instance variables
  - Static blocks and instance blocks
  - Static methods and instance methods
2. There is a class Adder which has two data members of type 1D int array and int variable. It has two functions: getdata and numsum. Function getdata accepts non-empty array of distinct integers from user in 1D int array data member and a targetsum in another data member. The function numsum adds any two elements from an input array which is equal to targetsum and return an array of resulting two elements, in any order. If no two numbers sum up to the target sum, the function should return an empty array. Note that the target sum is to be obtained by summing two different integers in the array; you can't add a single integer to itself in order to obtain the target sum. You can assume that there will be at most one pair of numbers summing up to the target sum. Use constructor. Use extra variables if needed  
Input:  
Array=[3,5,-4,8,11,1,-1,7]    targetsum=15  
Output: [8,7]  
Input:  
Array=[3,5,-4,8,11,1,-1,6]    targetsum=15  
Output: []
3. Write Java program to calculate area of triangle, square & circle using function overloading. Function parameter accept from user (Use function Overloading concepts and Inheritance).

4. Write a program for following exception, develop a suitable scenario in which the following exceptions occur:
  - a. divide by zero
  - b. Array index out of bounds exception
  - c. Null pointer Exception
5. Write a java program to solve producer-consumer problem where there are two producer threads and one consumer thread.
6. Implement various operations using JDBC Connectivity.
7. Display bank account information ( Use interface and inheritance using java)
8. Develop a GUI in java which reads, update the file.

**List of Course Projects:**

1. Airline reservation system
2. Course management system
3. Data visualization software
4. Electricity billing system
5. e-Healthcare management system
6. Email client software
7. Library management system
8. Network packet sniffer
9. Online bank management system
10. Online medical management system
11. Online quiz management system
12. Online Survey System
13. RSS feed reader
14. Smart city project
15. Stock management system
16. Supply chain management system
17. Virtual private network
18. Pocket Tanks Game Java Project
19. Internet Banking
20. Hospital Management Java Project
21. Teachers Feedback Form Java Project
22. Online Job Portal Java Project
23. Online Examination Java Project
24. Alumini Database Java Project
25. Virtual Classroom Java Project
26. Lan Chat and File Sharing Java Project
27. Payroll System Java Project
28. Online Exam Java Project
29. Java Game mini Project
30. Online Shopping Java Project
31. Online Library Management System

32. Feedback Collection System java project
33. Text Editor in Java Project
34. Moving Balls using Java Applet
35. Online Reservation System Project
36. Web skeletonizer service
37. Web Enabled Manufacturing Process Project
38. Album Manager Project
39. Global Communication Network
40. Library System project
41. Link Handler System Project
42. Crypto system Project
43. Scheduling and Dispatching project
44. Intranet Mailing System
45. Online Examination System Project
46. Business to Customer System Project
47. University Admission & Maintenance System
48. Campaign Management System Project
49. Content Management System Project
50. Digital Library System Project
51. Contract Labour Management System Project
52. Pay Roll System Project using Java
53. Revenue Recovery System Project
54. Online medical Booking Store Project
55. Client Management System Project
56. Tele Dormitory System Project
57. Reusable CAPTCHA security engine Project
58. Mobile Service Provider System
59. Forestry Management System
60. Distributed Channel management System
61. Online Tenders Management System
62. Noble Job Portal System
63. Energy Audit Processing System
64. Collector Monthly Review System
65. Grievance Handling System
66. Student Project Allocation and Management Project
67. Web Based Reporting System
68. Vehicle Identification System
69. Diamond Shipping System
70. Visa Processing System
71. Enterprise Fleet Management System
72. Global Communication Media
73. HR Help Desk System
74. SQL Workbench Project
75. Remarketing System project
76. Cargo Express Courier project

77. Automated Sports Club Project
78. Multi Banking System Project
79. Java Application World
80. Cricket Game Java Project
81. Email Program System
82. Employee Information and Payroll System
83. Complete Mailing System
84. Complete Banking System
85. College Library Application System
86. Colleges Enrollment System
87. Car Sales System
88. Bus Booking System
89. Bug Tracking System
90. University Admission Management System Java Project
91. Beat It Game in Java
92. Civilization Game Project
93. Airways Reservation System
94. Airstrike System Game
95. Pong Game Java Project
96. Faculty Book System
97. Bank Application System
98. ATM Database System
99. Advanced Payroll System
100. Virtual Private Network Java Project
101. ISP Automation System
102. Life Insurance Management System
103. Help Desk Management System
104. Datamart Management System
105. Automated Sports Club System
106. University Search Engine Project
107. Online Exam Suite Project
108. Forensic Management System
109. Student Registration System
110. E Mail Scanning Project
111. Criminal Face Detection System
112. Web Server Management System Java Project
113. Stores Management System
114. Bug Tracking System Java Project
115. Career Information Management System Java Project
116. Course Management System Java Project
117. Data Visualization Software Java Project
118. Digital Steganography Java Project
119. E Health Care Management System Java Project
120. Electricity Billing System Java Project
121. Email Client Software Java Project

122. Event Management System Java Project
123. Farmers Buddy Java Project Java Project
124. File Transfer and Chat Java Project
125. Knowledge Evaluator Software Java Project
126. Library Management System Java Project
127. Mail Server Java Project
128. Network Packet Sniffer Java Project
129. Number Guessing Game Java Project
130. Online Attendance Management System Java Project
131. Online Bank Management System Java Project
132. Online Book Store
133. Online Customer Care and Service Center Java Project
134. Online Document Management System Java Project
135. Online Examination Management System Java Project
136. Online Medical Management System Java Project
137. Online Quiz System Java Project
138. Online Survey System Java Project
139. Photo Lab Management System Java Project
140. RSS Feed Reader Java Project
141. Smart City Project Java Project
142. Stock Management System Java Project
143. Student Result Processing System Java Project
144. Supply Chain Management System Java Project
145. Telephone Billing System Java Project
146. Travel Management System Java Project
147. Currency Converter
148. Career Information Management System
149. Digital Steganography
150. Event Management System
151. Farmers Buddy
152. File Transfer and Chat
153. Knowledge Evaluator Software
154. Mail Server
155. Number Guessing Game
156. Online Attendance Management System
157. Online Customer Care and Service Center
158. Online Document Management System
159. Online Examination Management System
160. Online Quiz System
161. Photo Lab Management System
162. Student Result Processing System
163. Travel Management System
164. University Admission Management System
165. Web Server Management System
166. Address Book Management System

167. Affiliate Manager
168. Ajax Browser
169. Application Installer Software
170. Application Re-installer Software
171. ATM Simulator System
172. Automatic File Update
173. Bookmark Sync
174. Bus Ticket Reservation System
175. Calendar Icon Maker Application
176. CSS Color and Image Annotator
177. Cybercafe Management System
178. Data Encryption
179. Database Explorer
180. Directory and File Explorer
181. Domain Search Engine
182. E-Acquisition
183. E-Advertisement
184. E-Learning
185. Enterprise Scheme Planner
186. Face Identification
187. File and Folder Explorer
188. Font Detector/Finder
189. HTML Color Code Finder
190. HTML Spell Checker
191. Image Compressor Application
192. Image to Text Converter
193. Internet Credit Card System
194. Internet Usage Monitoring System
195. Intrusion Detection in Wireless Sensor Network
196. Keyword Finder and Number Calculator
197. Language Emulator
198. Mac Ethernet Address
199. Malware Scanner
200. MP4 Video Converter
201. Online Auction
202. Online Magazine
203. Password Protector and Reminder
204. PDF Converter
205. Pharmacy Management System
206. Port Scanner
207. Process Analysis in Asynchronous System
208. Remote Desktop Administrator
209. Resource Planner and Organizer
210. Search Engine
211. Security System for DNS using Cryptography

212. SmartFTP Uploads
213. Synchronous Conferencing System
214. Text to HTML Converter
215. Unicode Font
216. Voice Chatting and Video Conferencing
217. Voice Compressor Software
218. Windows Fixer
219. XML Compactor

**Text Books:**

*Herbert Schildt, "JAVA- The Complete Reference", , 11th Edition, McGraw Hill Education*

**Reference Books:**

1. *Bruce Eckel, "Thinking In Java – The Definitive Introduction to Object-Oriented Programming in the Language of the World-Wide Web", Fourth Edition, Pearson Education, Inc.*
2. *R. Morelli and R. Walde, "Java, java, Java – Object-Oriented Problem Solving", 3<sup>rd</sup> edition, Pearson Education, Inc.*

**Assessment Scheme:**

1. Practical ESE:50
2. Course Project:20
3. Laboratory Work:10
4. CVV:20

**Moocs Links and additional reading material:**

1. Programming using Java| Java Tutorial | By Infosys Technology  
[https://infyspringboard.onwingspan.com/en/app/toc/lex\\_auth\\_01304972186110361645\\_shared/overview](https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01304972186110361645_shared/overview)
2. An Introduction to Programming through C++ – Prof A.G. Ranade- NPTEL- computer science and engineering – NOC <https://nptel.ac.in/courses/106/101/106101208/#>

**Course Outcomes:**

The student will be able to –

1. Understand object-oriented programming features
2. Develop real world applications using class, inheritance and polymorphism
3. Adapt Best Practices of Class Design by using Standard Templates Library
4. Solve computing problems by applying the knowledge of Exception handling and Multithreading
5. Design solutions by choosing suitable data structures such as Array, Vector, Map etc
6. Implement applications using Java I/O and event-based GUI handling principles

**Future Courses Mapping:**

Advanced Data Structures, Advanced Java, Spring Frame Work, Grails Frame Work

**Job Mapping:** Java Programmer, Application Developer, Design Engineer, Senior Software Developer.



**CS2227:: DATABASE MANAGEMENT SYSTEMS****Course Prerequisites:**

Data structures, Discrete Mathematics

**Course Objectives:**

1. Learn the fundamentals of different data modeling techniques.
2. Design and development of relational database management systems.
3. Study the theory behind database systems, the issues that affect their functionality and performance
4. Design of query languages and the use of semantics for query optimization.
5. Understand the latest trends of data management systems.

**Credits: 4****Teaching Scheme Theory: 2 Hours/Week****Tut: 1 Hours/Week****Lab: 2 Hours/Week****Course Relevance:**

The course emphasizes on the fundamentals of database modelling and design, the languages and models provided by the database management systems, and database system implementation techniques. The goal is to provide an in-depth and up-to-date presentation of the most important aspects of database systems and applications, and related technologies.

**SECTION-I****Topics and Contents**

**Introduction:** Need of Database Management Systems, Evolution, Database System Concepts and Architecture, Database Design Process

**Data Modeling:** Entity Relationship (ER) Model, keys, Extended ER Model, , Relational Model, Codd's Rules;

**Database Design:** Need of Normalization, Functional Dependencies, Inference Rules, Functional Dependency Closure, Minimal Cover, Decomposition Properties, Normal Forms: 1NF, 2NF, 3NF and BCNF, Multi-valued Dependency, 4NF

**Query Languages:** Relational Algebra, SQL: DDL, DML, Select Queries, Set, String, Date and Numerical Functions, Aggregate Functions ,Group by and Having Clause, Join Queries, Nested queries, DCL, TCL, PL/SQL: Procedure, Function, Trigger, Mapping of Relational Algebra to SQL

**SECTION-II****Topics and Contents**

**Storage and Querying:** Storage and File structures, Indexed Files, Single Level and Multi Level Indexes; Query Processing, Query Optimization

**Transaction Management:** Basic concept of a Transaction, ACID Properties, State diagram, Concept of Schedule, Serializability – Conflict and View, Concurrency Control Protocols, Recovery techniques

**Parallel and Distributed Databases:** Architecture, I/O Parallelism, Interquery, Intraquery, Intraoperation and Interoperation Parallelism, Types of **Distributed** Database Systems, Distributed Data Storage, Distributed Query Processing

**NOSQL Databases and Big Data Storage Systems:** Introduction to NOSQL Databases, Types of NOSQL Databases, BASE properties, CAP theorem, Introduction to Big Data

**Data Warehousing:** Architecture and Components of Data Warehouse, OLAP and OLTP

**List of Practical: (Any Six)**

- 1) Choose a database application; you propose to work on throughout the course. Perform requirement analysis in detail for the same. Draw an entity-relationship diagram for the proposed database.
- 2) Create a database with appropriate constraints using DDL and populate/modify it with the help of DML.
- 3) Design and Execute "SELECT" queries using conditional, logical, like/not like, in/not in, between...and, is null/is not null operators in where clause, order by, group by, aggregate functions, having clause, and set operators. Use SQL single row functions for date, time, string etc.
- 4) Write equijoin, non equijoin, self join and outer join queries. Write queries containing single row / multiple row / correlated sub queries using operators like =, in, any, all, exists etc. Write DML queries containing sub queries. Study a set of query processing strategies.
- 5) Write PL/SQL blocks to implement all types of cursor.
- 6) Write useful stored procedures and functions in PL/SQL to perform complex computation.
- 7) Write and execute all types of database triggers in PL/SQL.
- 8) Execute DDL statements which demonstrate the use of views. Try to update the base table using its corresponding view. Also consider restrictions on updatable views and perform view creation from multiple tables.
- 9) Create a database with suitable example using MongoDB and implement Inserting and saving document, Removing document, Updating document
- 10) Execute at least 10 queries on any suitable MongoDB database that demonstrates following querying techniques: find and findOne, Query criteria, Type-specific queries
- 11) Implement Map Reduce operation with suitable example using MongoDB.

**List of indicative project areas: (Any 1)**

Following is the indicative list of projects but is not limited to. Student and teacher can also jointly decide project area other than specified in the list.

1. University/Educational institute database
2. Railway reservation/Show booking system
3. Finance management system
4. Travel/Tours management system
5. Blood bank management system
7. Sales management
8. Online retailer/payment systems
9. Hospital management system
10. Human resource management
11. Manufacturing/production management
12. Matrimonial databases for finding matches.
13. Online appointment booking

**List of Course Seminar Topics:**

1. Object and Object-Relational Databases
2. XML data model, XML documents and associated languages
3. Database Security
4. Modern Storage Architectures
5. Google Cloud- SQL Databases
6. Google Cloud- NOSQL Databases
7. Amazon Databases
8. Oracle NoSQL Database
9. Cassandra DB
10. Data Center Engineering
11. Google File System (GFS)

**Assessment Scheme:**

1. Written ESE:30
2. Course Project:20
3. Laboratory Work:10
4. Seminar Presentation:20
5. CVV:20

**Text Books:**

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan; "Database System Concepts"; 6<sup>th</sup> Edition, McGraw-Hill Education
2. Ramez Elmasri, Shamkant B. Navathe; "Fundamentals of Database Systems"; 7<sup>th</sup> Edition, Pearson

**Reference Books:**

1. Thomas M. Connolly, Carolyn E. Begg, "Database Systems: A Practical Approach to Design, Implementation, and Management, 6th Edition ;Pearson
2. Raghu Ramakrishnan, Johannes Gehrke; "Database Management Systems", 3rd Edition; McGraw Hill Education
3. Kristina Chodorow, MongoDB The definitive guide, O'Reilly Publications, ISBN: 978-93-5110-269-4, 2nd Edition.
4. Dr. P. S. Deshpande, SQL and PL/SQL for Oracle 10g Black Book, DreamTech.
5. Ivan Bayross, SQL, PL/SQL: The Programming Language of Oracle, BPB Publication.
6. Reese G., Yarger R., King T., Williams H, Managing and Using MySQL, Shroff Publishers and Distributors Pvt. Ltd., ISBN: 81 - 7366 - 465 - X, 2nd Edition.
7. Dalton Patrik, SQL Server – Black Book, DreamTech Press.
8. Eric Redmond, Jim Wilson, Seven databases in seven weeks, SPD, ISBN: 978-93-5023-918-6.
9. Jay Kreibich, Using SQLite, SPD, ISBN: 978-93-5110-934-1, 1st edition.

**Moocs Links and additional reading material:**

<https://nptel.ac.in/courses/106/105/106105175/>  
[https://onlinecourses.nptel.ac.in/noc21\\_cs04/preview](https://onlinecourses.nptel.ac.in/noc21_cs04/preview)  
<https://www.datacamp.com/courses/introduction-to-sql>  
Oracle MOOC: PL/SQL Fundamentals - Oracle APEX

**Course Outcomes:**

The student will be able to –

1. Design data models as per data requirements of an organization
2. Synthesize a relational data model up to a suitable normal form
3. Develop a database system using relational queries and PL/SQL objects
4. Apply indexing techniques and query optimization strategies
5. Understand importance of concurrency control and recovery techniques
6. Adapt to emerging trends considering societal requirements

**Future Courses Mapping:**

Advanced databases  
Big Data Management  
Cloud Databases  
Database Administrator

**Job Mapping:**

Database Engineer  
SQL developer  
PL/SQL developer

**IC2223:: APLIED ELECTRONICS**

**Course Prerequisites:** Concepts of modern physics and basic electrical engineering.

**Course Relevance:** Almost in all modern measurement and control systems, electronic devices and components are employed. Therefore, fundamental knowledge of electronics is necessary for understanding the functioning of electronic devices and circuits to make the engineer capable of designing electronic systems and maintenance, troubleshooting of measurement and control systems in which electronic system is present.

**Course Objectives:**

1. To familiarize with characteristics and working of discrete electronic devices.
2. To design electronic circuits using discrete electronic components/devices.
3. To impart knowledge of operational amplifier and op-amp. Circuit design.
4. To know basics of voltage regulators and design voltage regulator circuits.
5. To design basic digital circuits and understand their applications.
6. To understand the concepts of ADCs and DACs and their selection.

**Credits:** 04

**Teaching Scheme:** Theory: 2 Hours/Week

**Section 1:****Unit-1: Discrete Electronic Components**

**(4 Hours)**

Introduction to various types of electronics components. SMD electronic components. Different types of diodes. Characteristics, specifications and applications. Diode circuits such as rectifiers, clipping, clamping zener shunt regulator etc.

**Unit-2: Transistors and Applications.**

**(6 Hours)**

Introduction to various types of transistors. BJT types, characteristics and need of biasing. BJTC C B , CC, CB configuration. CC and CE BJT amplifiers, BJT Darlington and push pull amplifier. BJT constant current source. BJT switching applications, astable multi-vibrator, zener series regulators. Application of FET and MOSFETs. Zener series regulator.

**Unit-3: Operational Amplifier and Circuits**

**(6 Hours)**

Introduction to operational amplifier, block diagram and working. Operational amplifiers datasheet interpretation and selection. Inverting and non-inverting amplifier configurations. Adder, differential and summing amplifiers. Schmitt trigger, sample and hold, precision rectifiers, I-V and V-I converter, instrumentation amplifier, active filters, Oscillators: wein bridge and phase shift oscillators etc.

**Section 2 :****Unit-4: Voltage regulators and references.**

**(4 Hours)**

Fundamental of voltage regulator circuit. Various voltage regulators and voltage reference ICs. Three pin fixed voltage regulator ICs. Variable regulators ICs. Datasheet interpretation of voltage regulator ICs. Design of fixed and variable voltage regulator circuits for a DC power supply.

**Unit-5: Digital Logic circuits.****(4 Hours)**

Various types of logic ICs families. Various types of digital logic families. Boolean algebra, combinational logic. Karnaugh map and application. multiplexers, de-multiplexers, encoders etc. BCD to seven segment decoder/driver ICs. Interfacing of seven segments LED display. Design of combinational logic circuits for various applications.

**Unit-6: ADC and DAC converters****(4 Hours)**

Digital –to-Analog converters: Types, working and selection. Analog-to-Digital converters: Types, working and Selection, ADC and DAC ICs, Specifications and selection of ADCs and DACs.

**Text Books**

1. Albert Malvino; Electronic Principles by Albert Malvino; Tata McGraw Hill.
2. Ramakant A. Gayakwad; Op-Amps and Linear Integrated Circuits; 4<sup>th</sup> Edition, PHI
3. H.S.Kalsi; Electronic Instrumentation; Tata McGrawHill

**Reference Books**

1. Leach, Malvino,Saha; Digital Principles and Applications; 8<sup>th</sup> Edition,McGraw Hill
2. R.P.Jain; Modern Digital Electronics;4<sup>th</sup> Edition, McGraw Hill

**Course Outcomes**

The student will be able to –

1. IC2223\_CO1: Identify and select discrete electronic components for circuit design.
2. IC2223\_CO2: Design electronic circuits using discrete electronic components.
3. IC2223\_CO3: Interpret the specification of op-amps and design op-amp circuits.
4. IC2223\_CO4: Select suitable voltage regulator ICs and design voltage regulator circuits.
5. IC2223\_CO5: Select digital logic ICs and design digital logic circuits.
6. IC2223\_CO5: Demonstrate working of various types of ADCs and DACs and select them.

**CO-PO map**

CO	PO -1	PO-2	PO -3	PO -4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO -1	PSO -2	PSO -3
1	3	1	2	1	1	-	-	-	-	-	-	2	2	1	2
2	3	1	2	1	1	-	-	-	-	-	-	2	2	1	2
3	3	2	2	1	2	-	-	-	-	-	-	2	2	1	2
4	3	1	1	1	1	-	-	-	-	-	-	2	1	0	1
5	3	1	2	1	1	-	-	-	-	-	-	2	1	1	1
6	1	1	2	1	1	-	-	-	-	-	-	1	1	2	2

**CO attainment levels**

<b>CO No.</b>	<b>IC2023_CO1</b>	<b>IC2023_CO2</b>	<b>IC2023_CO3</b>	<b>IC2023_CO4</b>	<b>IC2023_CO5</b>	<b>IC2023_6</b>
<b>Attainment Level</b>	2	5	4	3	4	4

**IC2236:: DESIGN THINKING -3****Course Objectives:**

To provide ecosystem for students and faculty for paper publication and patent filing.

**Credits: 1**

**Teaching Scheme Tut: 1 Hours/Week**

**Topics and Contents:**

- Structure of The paper
- Journal List (Top 50 Journals)
- Selection of the journal
- Use of various online journal selection tools
- Plagiarism checking
- Improving contents of the paper
- Patent drafting
- Patent search
- Filing of patent
- Writing answers to reviewer questions
- Modification in manuscript
- Checking of publication draft

**Course Outcomes:**

The student will be able to

1. IC2236\_CO1 : Understand the importance of doing Research
2. IC2236\_CO2 : Interpret and distinguish different fundamental terms related to Research
3. IC2236\_CO3 : Apply the methodology of doing research and mode of its publication
4. IC2236\_CO4 : Write a Research Paper based on project work
5. IC2236\_CO5 : Understand Intellectual property rights
6. IC2236\_CO6 : Use the concepts of Ethics in Research
7. IC2236\_CO7 : Understand the Entrepreneurship and Business Planning

**CO-PO Mapping :**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	0	0	0	0	0	0	1	0	1	1
CO2	1	1	1	1	1	0	0	0	0	0	0	1	0	1	1
CO3	2	2	3	3	2	2	1	2	2	3	0	1	1	1	1
CO4	3	3	3	3	3	2	1	2	2	3	1	1	1	1	1
CO5	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1
CO6	2	2	2	2	2	2	1	3	2	3	0	1	0	0	1
CO7	1	1	1	1	1	0	0	0	0	0	0	1	0	0	1



**CO attainment levels**

CO No.	IC2236_CO1	IC2236_CO2	IC2236_CO3	IC2236_CO4	IC2236_CO5	IC2236_CO6	IC2236_CO7
Attainment Level	2	2	3	6	2	3	2

**IC2240:: ENGINEERING DESIGN AND INNOVATION-3**

**Course Prerequisites:** Electronic design, simulation, MATLAB, Labview, PCB design

**Course Objectives:** The student will be able to

1. Understand the importance of choosing socially relevant areas for project work
2. Understand the importance of Project centric learning
3. Plan and execute systematic strategy to complete the Project work
4. Document and present the completed project work in proper scientific format
5. To Evaluate alternative approaches, and justify the use of selected tools and methods
6. To provide every student the opportunity to get involved either individually or as a group so as to develop team skills and learn professionalism.
7. To develop an ecosystem to promote entrepreneurship and research culture among the students

**Credits: 4**

**Teaching Scheme : Lab: 8 Hours/Week**

**Course Relevance:** This course will develop

1. Awareness about project centric learning will be quite useful in professional work in future
2. Self learning ability to up skill and upgrade once knowledge continuously
3. Ability to work in a Team and Team leadership which will be useful while doing B.Tech Major projects

**Topics and Contents**

**It is based on Real time project implementation in the chosen specific defined area.**

Agriculture Healthcare Automotive Process Control IoT

**Basics for Projects**

Importance of Project Centric Learning, Concept of Domains, Tools and Technology, Socially Relevant Project Areas

**Domain Project Areas:** Awareness and identification of appropriate areas for project work such as: Agriculture, Defense, Healthcare, Smart city, Smart energy, Security Systems, Automobile, Space, Green Earth, Automobiles, Assistive Aid, Water Management, Swachh Bharat (any other socially relevant research area)

**Tools: Self learning Activity** Learn and use latest engineering tools as per the project need. A few are listed below

**Tools in Computer Engineering:**

**Programming / Coding Tools :-** JavaScript, Python, Java, C#, C++, PHP, **Computer Vision Tools :-** OPENCV, MATLAB), **Single board computers:** Raspberry Pi, **Neural network simulators Tools:-** Neural Lab, NEST , **Machine Learning Tools:-** Torch, TensorFlow, **Data Science Tools :-** R language programming, SQL,

**Tools in Electronics and Electronics & Telecommunication Engineering:**

**Electronic Design Simulation Integrated Circuit Tools:-** VHDL, Xilinx, Modelsim , Cadence learn, **Embedded System Tools:-** AVR Studio, Arduino ,Kiel  $\mu$ vision, **Circuit Simulation**

**Tools:-** Pspice, Simulink, Workbench, Tinkercad, ThingSpeak, Proteus, CircuitPro ,**Processor based integrated circuits** :Microcontroller, electronic prototype platforms: Arduino,**Networking Tools** :- Wired / Wireless and Ad-hoc Networking NS-2 , Packet Tracer, **Signal Processing Tools:-** Code Composer Studio along with Integrated circuits

**Tools in Instrumentation and Control Engineering:-**

**System Automation Tools** :- PLC , SCADA , PADS, ORCAD ,Eagle, Kicad,

**Tools in Mechanical, Industrial, Production, Engineering:-**

**Engineering Design Tools:-** AutoCAD, CATIA,COMSOL Multiphysics, Solidworks, Inventor, PTC Creo

**Fluid Dynamics:-** Fluent, HyperWorks, **Finite Element/ Structural Analysis:-**

Ansy's, Ansy's Free Student software **Thermal Simulation:-** FlowTherm, Ansys Icepak

**Tools in Chemical Engineering :-**

Chemical process simulator:- DWSIM - Open Source Process Simulator, **chemical simulation software:-** Schrödinger,

(any other suitable tool as per the project requirement)

**Technology:** Map the appropriate technology:

**Emerging Technologies :-** Artificial Intelligence, 5G networks, IoT, Serverless Computing, Blockchain , Virtual reality (VR)/Augmented reality (AR), Drone, Quantum Computing, Robotics

**Interdisciplinary Technologies:-** Nanotechnology, Nanomaterials, Nanoelectronics, Quantum Computing , Spintronics

**Computer Technologies:-** Big Data, Cloud Computing, Human Machine Interface (HMI),Cyber Security

**Medical and Healthcare Technologies:-** Biomedical Technology,

**Energy Technologies :-** Solar Energy Based Technologies, Wind energy, Green energy Technologies, Energy Storage

**Electronics, Communication Technologies:-** Wireless, GPS, Bluetooth, Mobile/social Internet Automation, Mobile Technologies, Voice Assistants, signal processing, image processing, Machine vision, Sensors, Optoelectronics,

Other imp Technologies:- Automobile ,3 D printing

(any other technology as per the project requirement)

**Project Implementation:** Selection of the domain area, Literature review, Identify and finalize the Problem Statement (student in consultation with Guide), Understand and select and use the appropriate tools, Map the technologies learned with the project needs (refer available online offline Resources, books, soft materials, relevant MOOCs, consult with domain expertise) Self Learning:- learn the required tools, skill sets, acquire knowledge to do the project

**Designing & Testing:** Designing of project prototype based on domain areas by incorporating appropriate tools and technology, validation and Testing of the prototype to give the best possible solution

**Documentation and Final Assessment :** Develop and demonstrate the optimized prototype /working model of project , Documentation of project report in stipulated standard format as per the preset norms i.e. IEEE Research paper format, Present Project work at final viva voce

**Course Outcomes:**

1. Design solutions for given engineering problem [1]
2. Demonstrate practical knowledge by constructing models/algorithms for real time applications [1]
3. Express effectively in written and oral communication [2]
4. Exhibit the skills to work in a team or individually [2]
5. Prepare a time chart and financial record for execution of the project [3]
6. Choose and compare alternative approaches to select most feasible one [2]

**CO-PO Mapping:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3	2	2	2	2	1	1	2	2	1	1	3
CO2	2	2	2	2	3	1	2	1	1	0	2	1	2	2	3
CO3	1	1	1	1	0	2	1	3	1	3	1	1	1	1	1
CO4	1	0	0	2	0	1	1	2	3	2	1	1	0	1	0
CO5	1	0	0	1	0	2	1	1	2	2	3	2	0	2	2
CO6	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0