ACADEMIC SECTION

VNRVJIET/ACADEMICS/2026–2027/**C052** Date: 24.10.2026

CIRCULAR

Sub: Online selection of Open Elective – II and Professional Elective – II Courses of B.Tech. VI Semester (III Year II Semester) and Open Elective – IV and Professional Elective – V & VI Courses of B.Tech. VIII Semester (IV Year II Semester) through EDUPRIME software – 2026–2027 – Reg.

All the Heads of Departments are requested to inform and direct the following students to complete the **online selection of elective courses through EDUPRIME** as per the schedule given below:

- **B.Tech. V Semester [R22 – 2024 Admitted] students** (for VI Semester electives)
- **B.Tech. VII Semester [R22 – 2023 Admitted] students** (for VIII Semester electives)

Activity	Date & Time
Selection of Open Elective – II and Professional Elective – II courses of **B.Tech. VI Semester** by B.Tech. III Year students	**29.10.2026 (10.30 a.m.) To 30.10.2026 (05.00 p.m.)**
Selection of Open Elective – IV, and Professional Elective – V & VI courses of **B.Tech. VIII Semester** by B.Tech. IV Year students	**30.10.2026 (10.30 a.m.) to 31.10.2026 (05.00 p.m.)**

Students shall complete the above process by logging into their respective EDUPRIME accounts through the following link:

http://automation.vnrvjiet.ac.in

Important Instructions for Students:

- **Ensure that your EDUPRIME account is UNLOCKED and secure it with a valid PASSWORD.**
- **DO NOT SHARE your EDUPRIME login credentials with anyone.**
- **Ensure that your Open Elective Track and Minor Domain selections are DIFFERENT, as per the prescribed selection guidelines.**

A detailed instruction guide, including guidelines for course selection and the **list of courses offered** for **B.Tech. VI** and **VIII Semesters,** is enclosed with this circular. The same will also be made available on the **Institute website.**

K. J. Prakash 24/10/26

Dr. K. Jaya Prakash
Co-ordinator, Academics

VNR Vignana Jyothi Institute of Engineering & Technology, Vignana Jyothi Nagar, Bachupally, Hyderabad, Telangana-500118

24/10/26

Dr. Y. Shivraj Narayan
Dean Academics

Copy to:

- Principal for information
- CAMS
- All HODs – with a request to circulate among B.Tech. V semester and B.Tech. VII semester students and inform students to visit Institute Website for more information

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING & TECHNOLOGY HYDERABAD

INSTRUCTIONS REGARDING OPEN ELECTIVE COURSES

VNRVJIET B.TECH. R22 ACADEMIC REGULATIONS

:: PLEASE READ THE INSTRUCTIONS CAREFULLY ::

1. All the students of B.Tech. programmes under R22 academic regulations are informed that there are a total of **four Open Elective (OE) courses to be studied** by them — **one each in V, VI, VII and VIII semesters respectively**.
2. A student needs to select and pursue one Open Elective course of his/her choice in each semester.
3. These courses are designed and grouped into **specialized tracks based on emerging (Mezzanine) Technologies**".
4. There are a total of **13 OE tracks based on Mezzanine Technologies** in the curriculum i.e.:
   - **i) Smart Cities**
   - **ii) Waste Management**
   - **iii) Green Energy**
   - **iv) 3D Printing & Design**
   - **v) Internet of Things**
   - **vi) Augmented Reality (AR) / Virtual Reality (VR)**
   - **vii) Microelectronics**
   - **viii) Artificial Intelligence**
   - **ix) Blockchain Technologies**
   - **x) Robotics**
   - **xi) Cyber Security**
   - **xii) Data Sciences / Big Data & Analytics**
   - **xiii) Autonomous Vehicles**
5. Each **OE track based on a Mezzanine Technology** shall have **four courses**, one placed in each semester i.e., one each in V, VI, VII and VIII semester as shown below.

	V semester	**VI semester**	**VII semester**	**VIII semester**
Name of the OE Track	Level 1 Course	Level 2 Course	Level 3 Course	Level 4 Course

To pursue a Level 2 course, a student must have completed the corresponding Level 1 course as a prerequisite.

6. Apart from the above-mentioned **13 OE tracks** based on Mezzanine Technologies and the courses in it, there is a '**General Pool**' of Open Elective courses consisting of **mixed and independent courses** without any pre-requisites.
7. **Courses to be offered from 'General Pool' in each semester shall be decided by the Institute** well before the selection of elective courses by the students. **Courses from the 'General Pool' may be offered multiple times depending upon the need.**
8. **Before joining V semester,** a student may **opt to study EITHER Open Elective course that is based on a Mezzanine Technology track OR an Open Elective course from General Pool.**

9. **A student completing all the 4 Open Elective courses (Level 1 to Level 4) from the chosen single Mezzanine Technology track successfully, as mentioned in the R22 Academic Regulation, shall be awarded a separate PROFICIENCY CERTIFICATE IN THAT SPECIALIZED TECHNOLOGY from the Institute.**

Ex. B.Tech. (Mechanical Engineering) with Proficiency in "Internet of Things"

10. By default, an Open Elective course selected by a student in V semester from a specialized OE track shall be treated as **his/her preferred OE track for the remaining 3 semesters.** It shall be deemed that the student intends to continue in the same track for Level 2, Level 3 and Level 4 courses in the subsequent semesters. However, a student may choose to exit the track and opt for another OE track or a course from the General Pool. Students who wish to change their OE track must submit a written request to the Dean, Academics through the concerned HoD well before the start of the online elective selection activity.
11. Students who exit an OE track may **opt to choose and pursue a course either from the General Pool OR from any other OE track, subjected to the offering and availability of the course and seats in semester.**

    a) If a student selecting a course from other OE track for studying in VI or VII semester, it shall be **the responsibility of the student to fulfill the eligibility conditions (pre-requisite courses) to pursue that course.**

    b) The student shall **complete the required pre-requisite courses on his/her own through SWAYAM-NPTEL MOOCS. These courses must be at least 80% equivalent, as determined by the respective Chairman, BoS and Dean, Academics.**

    c) The student must complete these pre-requisites before the commencement of the semester in which the course is to be taken.

    d) Student shall **produce documentary evidence** in support of this claim to the Dean, Academics to become eligible for taking the course**.** In cases where the **required pre-requisite course is not available on MOOC platforms, eligibility shall be determined through a diagnostic test** conducted by the parent department offering the course. Students who qualify in the diagnostic test shall be deemed to have fulfilled the pre-requisite requirements and may be **permitted to change the OE track, subject to the offering and availability of seats in that track.**
12. **Changing of an OE track by a student shall be allowed for pursuing OE courses of VI and VII semesters only i.e.,** a student shall be allowed to change the OE track only twice, i.e., before the start of the VI and VII semesters during the four-semester span. However, **this condition shall not be applicable to the students opting for pursuing courses from General Pool.**
13. **In the event of a STUDENT EXITS THE ALREADY CHOSEN OE track in any semester, for any reason whatsoever, the student shall FORFEIT THE CLAIM TO THE PROFICIENCY CERTIFICATE.**
14. Open Elective courses offered in General Pool may be expanded by adding more courses as and when required at the discretion of the Institute and shall be informed well before the selection of the electives by the students
15. **It is informed that *only a limited number of elective courses shall be offered for selection* at the discretion of the offering department and the Institute which shall be announced well before the start of the next semester.**
16. The list of OE courses under each of the specialized OE tracks is given in next section. For more details, please contact the Institute's Academic Section.

❖ OE TRACKS BASED ON MEZZANINE TECHNOLOGIES:

OE TRACKS (Parent Department)	V SEMESTER	VI SEMESTER	VII SEMESTER	VIII SEMESTER
Smart Cities (CE)	Smart Cities Planning and Development	Green Building Technology	Smart Materials and Structures	Intelligent Transportation System
Waste Management (CE)	Solid Waste Management	Hazardous Waste Management	Waste to Energy	Intelligent Waste Management and Recycling System
Green Energy (EEE)	Renewable Energy Sources	Renewable Energy Technologies	Energy Storage Technologies	Energy Management and Conservation
3D Printing & Design (ME)	Elements of CAD	Introduction to 3D Printing	3D Printing – Machines, Tooling & Systems	Reverse Engineering
Internet of Things (ECE)	Sensors Transducers and Actuators	Introduction to Microcontrollers and Interfacing	Fundamentals of Internet of Things	Wireless Sensor Networks
Augmented Reality (AR) / Virtual Reality (VR) [ECE]	Introduction to C Sharp	Introduction to Signal Processing	Introduction to Image & Video Processing	Fundamentals of Augmented Reality & Virtual Reality
Artificial Intelligence (CSE)	Mathematics for Artificial Intelligence	Fundamentals of Artificial Intelligence	Machine Learning Techniques	Deep Learning
Blockchain Technologies (CSE)	Fundamentals of Computer Networks / Relational Database Management Systems	Distributed Databases	Cryptography and Network Security	Blockchain Technology
Robotics (EIE)	Fundamentals of Robotics	Kinematics and Dynamics of Robots	Drives and Control Systems for Robotics	Robot Programming and Intelligent Control Systems
Cyber Security (IT)	Fundamentals of Computer Networks / Relational Database Management Systems	Cryptography & Network Security	Essentials of Cyber Security	Computer Forensics
Data Sciences / Big Data & Analytics (IT)	Statistical Methods for Data Science	Computational Thinking Using Python	Fundamentals of Data Mining	Data Analysis and Visualization
Autonomous Vehicles (AME)	Principles of Automobile Engineering	Modern Automotive Technologies	Electric, Hybrid and Fuel Cell Vehicles	Connected and Autonomous Vehicles

❖ GENERAL POOL OF OE COURSES:

General-Computing (CSE / IT)	• Programming through Java • Relational Database Management Systems • Computational Thinking Using Python • Introduction to Data Analytics • Fundamentals of Computer Algorithms
General	• Smart Cities • Trends in Energy Sources for Sustainable Development • 3D Printing and Design • Advanced Materials • 5G/6G Technologies • Fundamentals of VLSI • Fundamentals of Augmented Reality and Virtual Reality • AI for Beginners • Blockchain Technology Essentials • Fundamentals of Robotics and Drones • Introduction to Cloud Computing • Fundamentals of Computer Vision • Introduction to Advanced Vehicle Technologies • Introduction to Application Development with C# • Introduction to Application Development with Java • Introduction to Application Development with Python • Numerical Methods and Linear Programming • Optimization Techniques • Nanoscience and Technology for Engineers • Essentials for Quantum Computing • Introduction to Climate Change • Sustainable Chemistry for Engineering • Storytelling for Effective Communication • Film Analysis and Critical Appreciation • Cross-Cultural Communication Through World Literature • Business Communication • Creative Writing • Fundamentals of Management • Human Resource Management • Marketing Management • Personal Finance and Tax Planning • Corporate Finance • Cost and Management Accountancy • Professional Ethics & Human Values • Entrepreneurship • Foreign Language (French / German / Spanish)

NOTE:

(i) **A Student belonging to a Parent Department shall not be permitted to select the OE tracks/courses offered by the Parent (own) Department**

(ii) **Students are NOT ALLOWED TO REPEAT COURSES ALREADY PURSUED through 'Open Elective' and 'Professional Elective' tracks**

(iii) **In case, a student selects a similar course in both Open Elective or Professional Elective baskets, selection of SUCH COURSE SHALL BE TREATED AS NULL AND VOID. In such cases, the student shall then be allotted another course based on availability of courses. The similarity of courses shall be determined by the respective Chairman, Board of Studies.**

(iv) **Courses offered by departments under Humanities and Sciences shall be open for selection to students of all departments, subjected to their offering by the respective departments.**

THE DECISION OF THE INSTITUTE REGARDING THE OFFERING OF OE AND PE COURSES SHALL BE FINAL AND BINDING.

Dean, Academics **Principal**

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

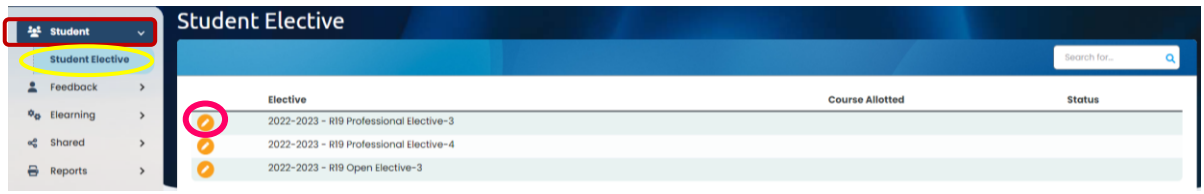
ACADEMIC SECTION

INSTRUCTIONS TO THE STUDENTS REGARDING SELECTION OF ELECTIVE COURSES IN EDUPRIME CAMS SOFTWARE

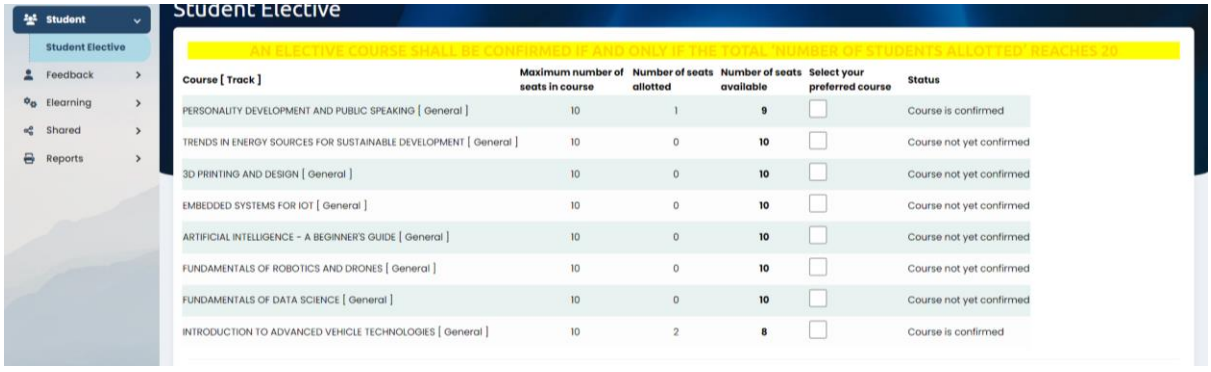
NOTE:
STUDENTS MUST PROTECT THEIR LOGIN ACCOUNTS BY CHANGING THE ACCOUNT PASSWORDS (UNIQUE) AND NOT TO DISCLOSE IT TO ANYONE.

Students must note that the **elective course selection** is based on **'FIRST-COME FIRST- SERVE'** basis.

1. **Students are advised to go through the syllabus of the open elective and professional elective courses available in the Institute website before selecting the elective course.**
2. Students must login to their account by entering **'Username'** and **'Password'** in Eduprime Software through the following link:
   https://automation.vnrvjiet.ac.in/EduPrime3
3. Click on '**Student'** in the left panel followed by '**Student Elective'**. Screen titled '**Elective Course Management**' containing Elective course groups would appear. Click on the **edit** button on the left of elective course group name.



4. Pop-up containing **detailed instructions** would appear. Read the instructions carefully and then click on **'Proceed'.**
5. A screen containing the list of either open elective courses or professional elective courses depending upon the elective group selected will be displayed. This screen consist of **6** columns.



- First column indicates the **names of courses on offer**.
- Second column indicates the **maximum number of seats in each course**.
- Third column indicates the **number of seats already allotted** to the students.
- Fourth column indicates the **number of seats now available**.
- Fifth column provides the option of **selecting your preferred course**. Students are advised that the elective course which they would like to study must be selected by selecting in this column.
- Sixth and last column indicates the **status of course** selected.

6. Status of course: There are 3 statuses for an elective course.

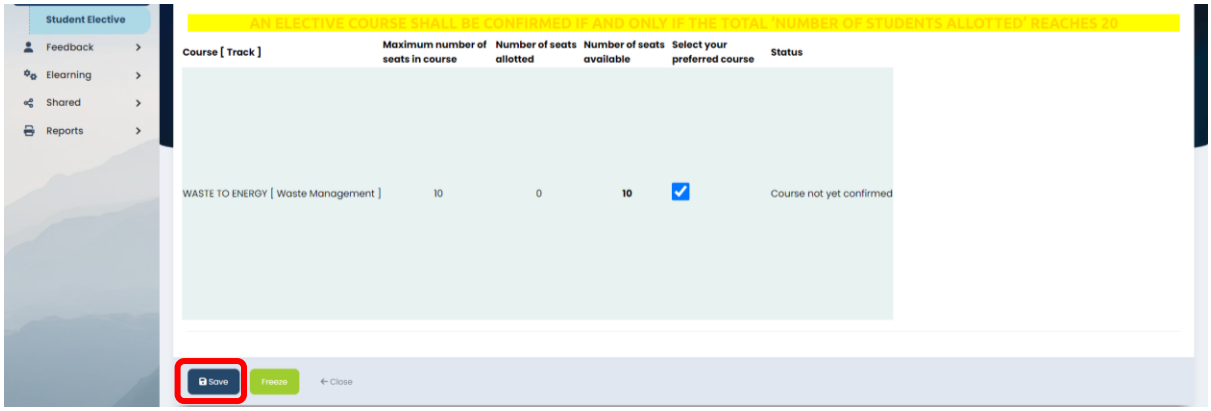
   i) **Course not yet confirmed**: It means the **number of students selecting an elective course is less than 20 hence the course will not be run during the semester**. Such students will have to choose another elective course.

   ii) **Course is confirmed**: It means the **number of students selecting an elective course is equal to or more than 20 hence the course will be run during the semester**.

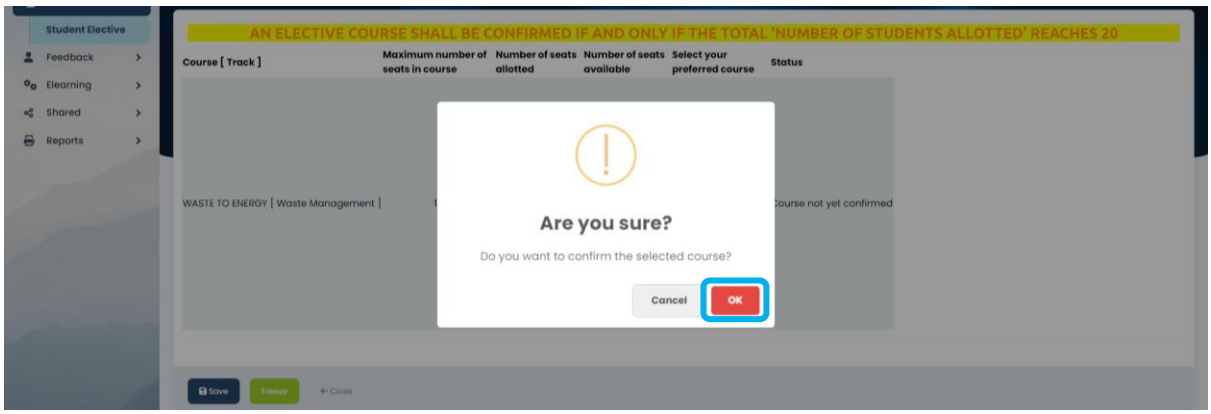
   iii) **Seats are not available**: It means the **maximum number of seats defined for an elective course are exhausted or over**. Students will not be able to choose such courses and shall select another course of their choice.

OPEN ELECTIVE TRACK BASED CATEGORY:

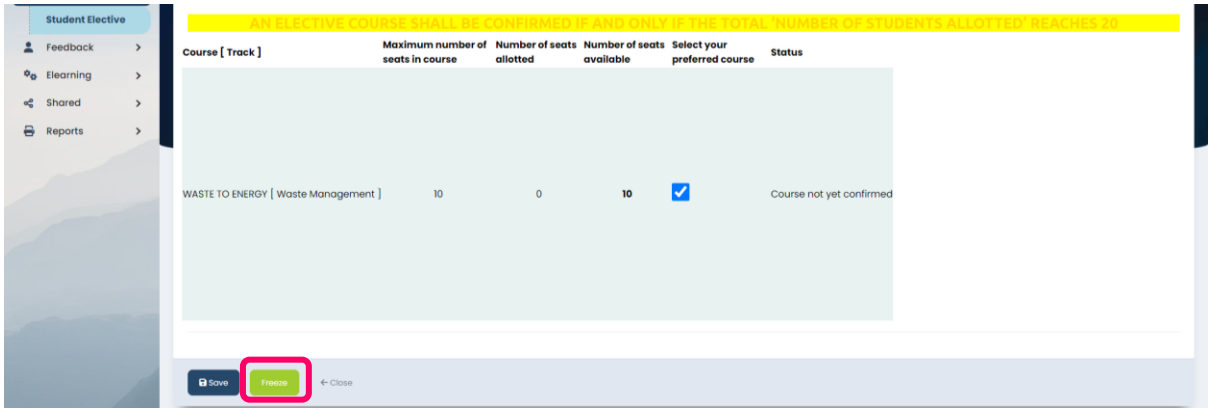
7. Students who **want to pursue an OE Course based on Open Elective Track** in **VII semester** shall be able to see the following screen consisting of **Level-3 course defined in VII semester**. After selection of the displayed open elective course, press **Save**.



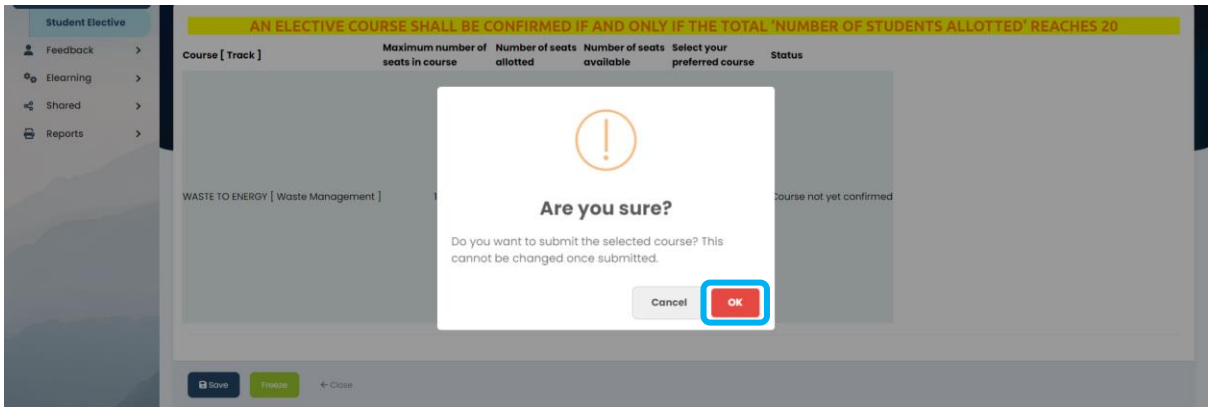
8. A message regarding confirmation of selection would appear on screen. Press **OK**.



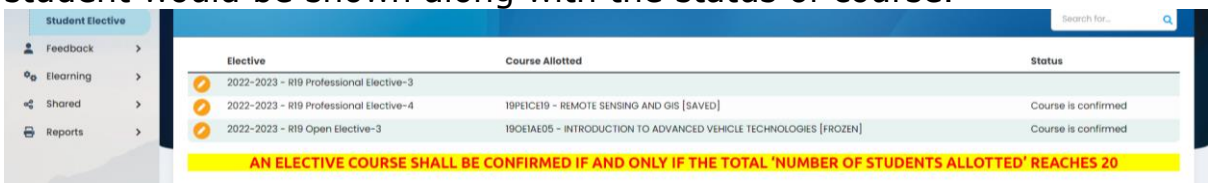
9. Click on **Freeze** button for course confirmation.



10. A message regarding confirmation of selection would appear on screen, then press **OK**.

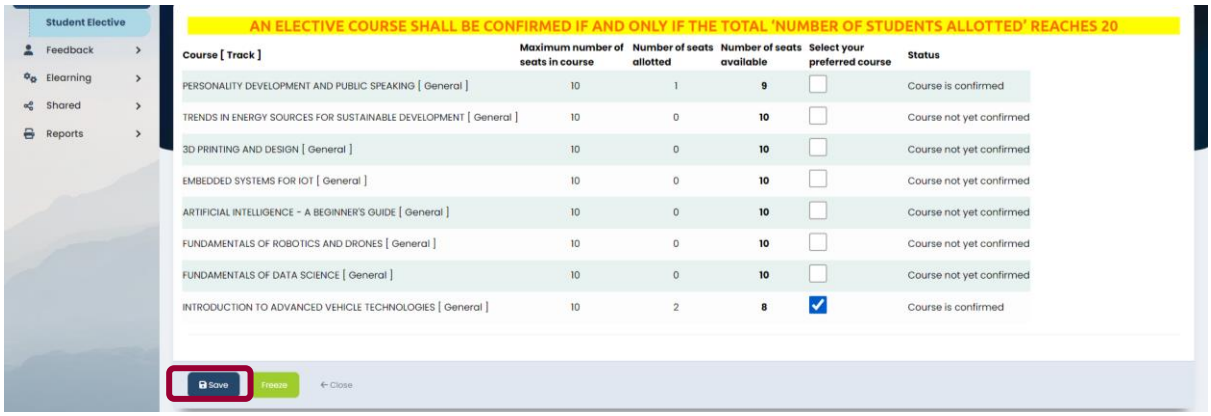


11. Upon pressing '**Close**' button displayed on the screen, student would be taken back to the first screen wherein against the open elective group name, title of the open elective course selected by the student would be shown along with the status of course.

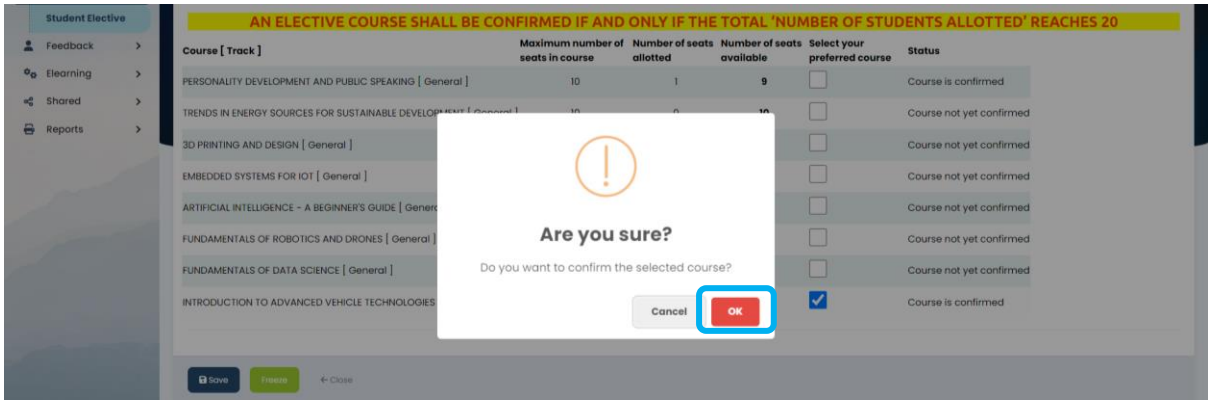


OPEN ELECTIVE GENERAL POOL BASED CATEGORY:

12. Students who **want to pursue an OE Course from General Pool** in **VII semester** shall be able to see the screen consisting of **General Pool Courses offered in VII semester** as shown below. After selection of an open elective course of your choice, press **Save**.



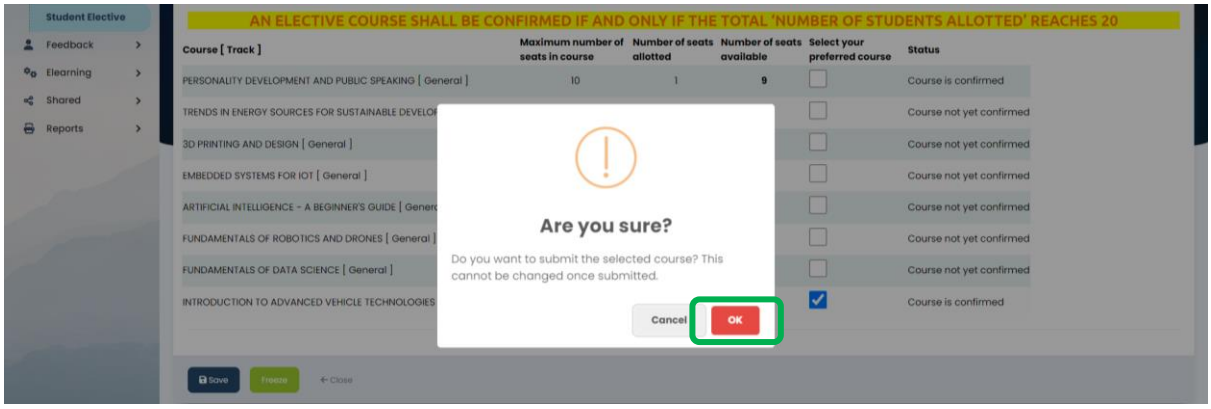
13. A message regarding confirmation of selection would appear on screen. If the student is satisfied with his / her choice, press **OK**, otherwise press **Cancel** and make selection of another open elective course.



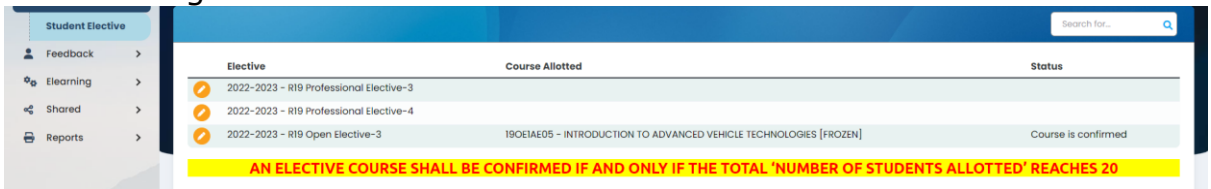
14. If the student is satisfied with the selected open elective course then click on **Freeze** button for course confirmation.



15. A message regarding confirmation of selection would appear on screen. If the student is satisfied with his / her choice, press **OK**, otherwise press **Cancel** and make selection of another open elective course.

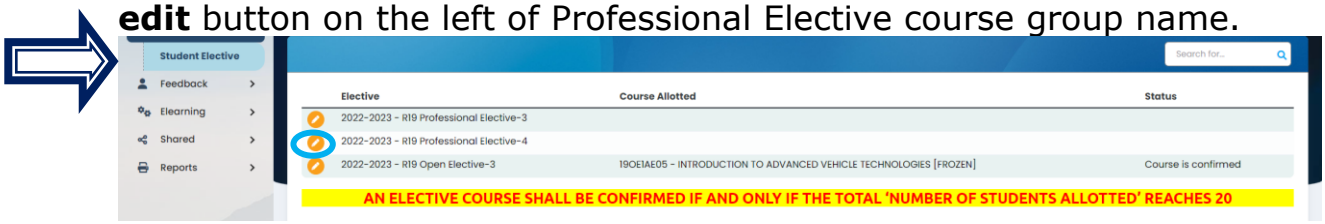


16. Upon pressing **'Close'** button displayed on the screen, student would be taken back to the first screen wherein against the open elective group name, title of the elective course selected by the student would be shown along with the status of course.

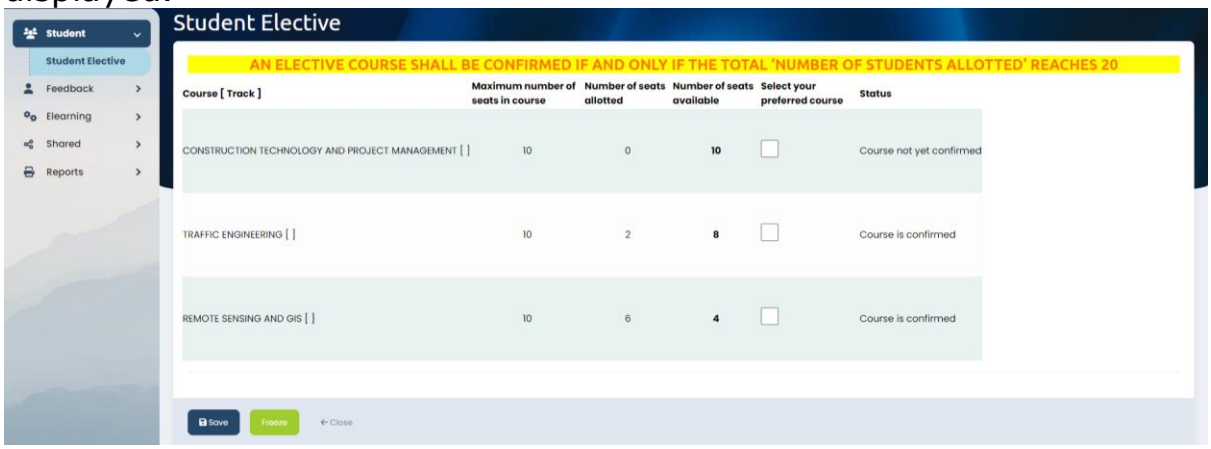


PROFESSIONAL ELECTIVE GROUP:

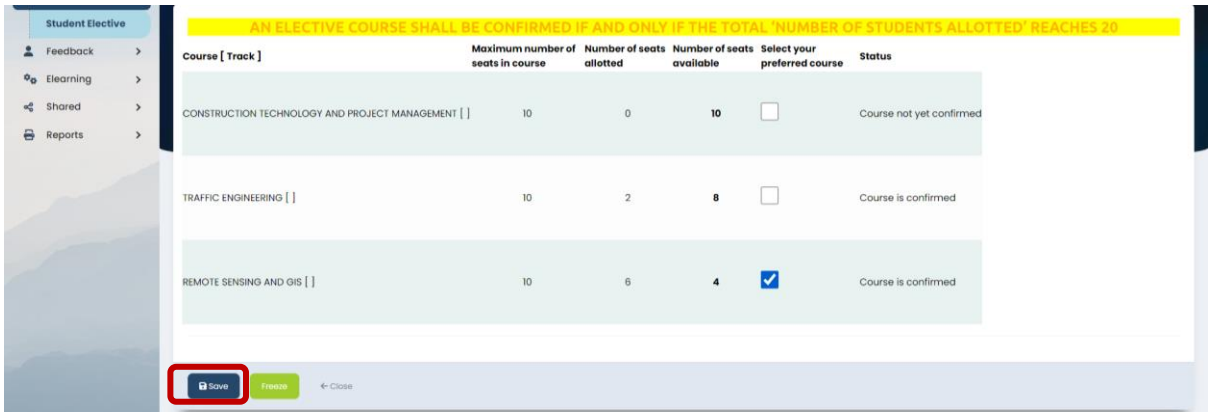
17. In the screen titled '**Elective Course Management**' containing Open Elective and Professional Elective course group, Click on the **edit** button on the left of Professional Elective course group name.



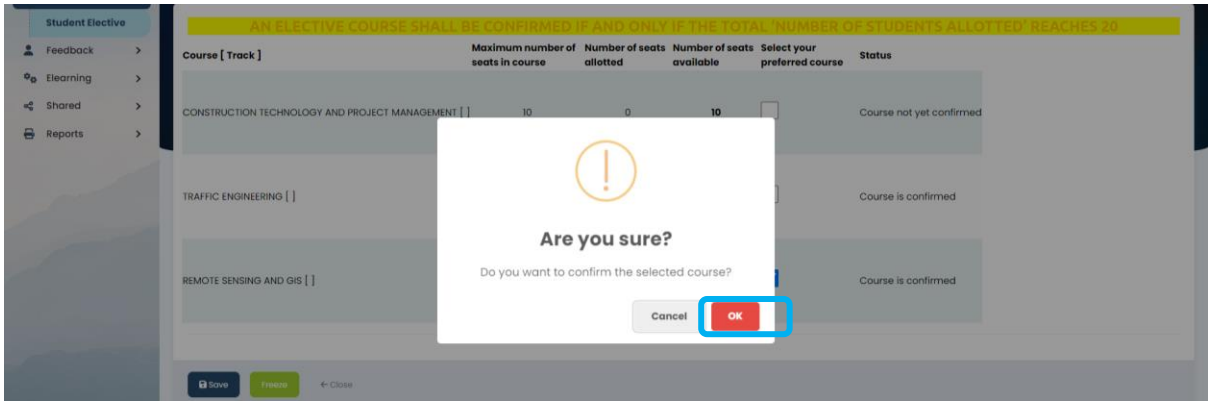
18. Pop-up containing **detailed instructions** would appear. Read the instructions carefully and then click on **'Proceed'.**
19. A screen containing the list of Professional Elective courses will be displayed.



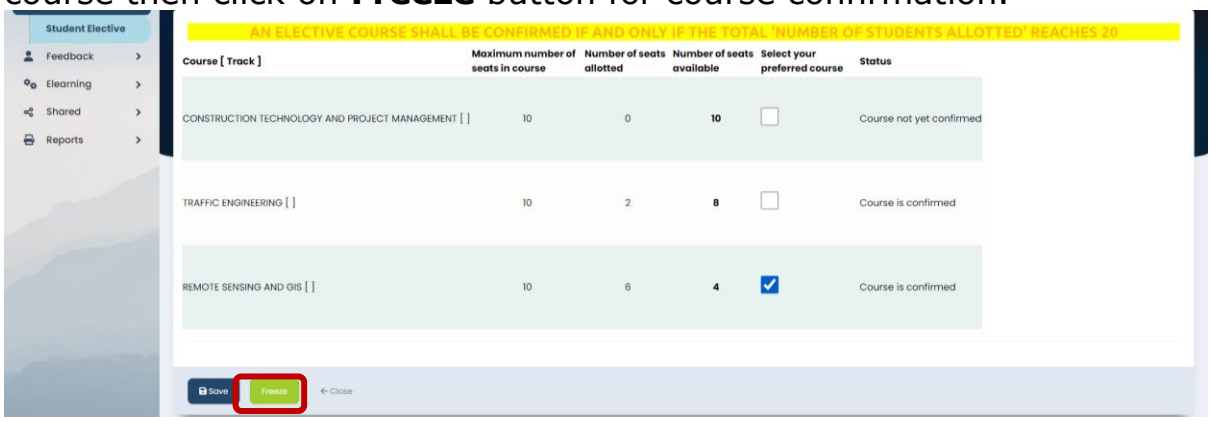
20. After selection of professional elective course of your choice, press **Save**.



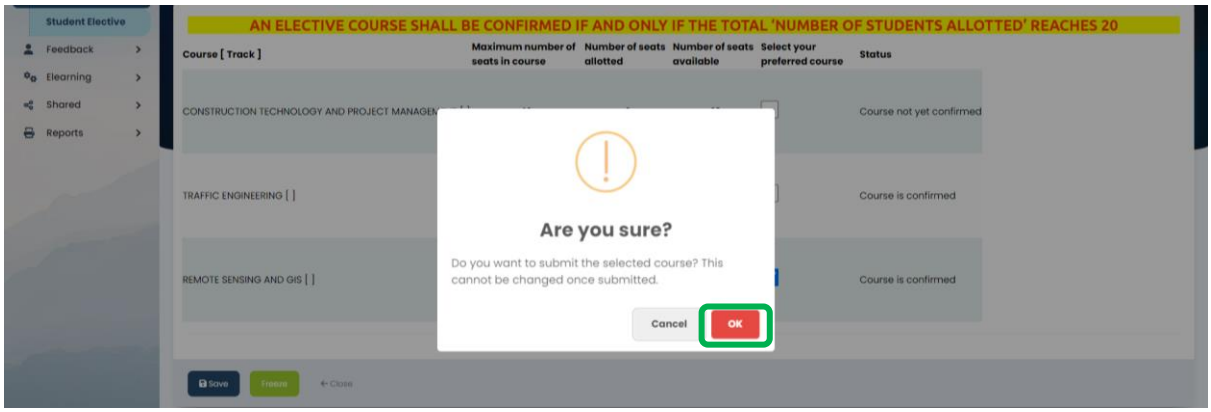
21. A message regarding confirmation of selection would appear on screen. If the student is satisfied with his / her choice, press **OK**, otherwise press **Cancel** and make selection of another professional elective course.



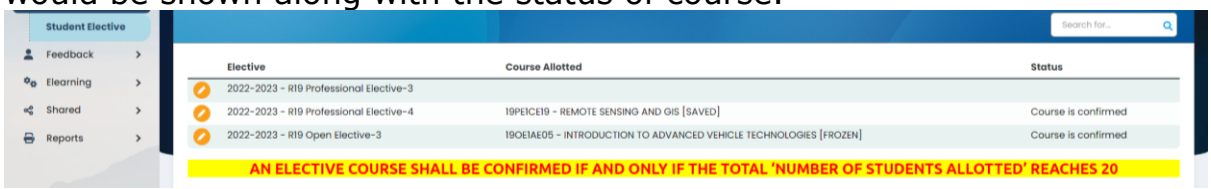
22. If the student is satisfied with the selected professional elective course then click on **Freeze** button for course confirmation.



23. A message regarding confirmation of selection would appear on screen. If the student is satisfied with his / her choice, press **OK**, otherwise press **Cancel** and make selection of another professional elective course.



24. Upon pressing **'Close'** button displayed on the screen, student would be taken back to the first screen wherein against the Professional Elective group name, title of the elective course selected by the student would be shown along with the status of course.



NOTE:

(i) **FOR AN ELECTIVE COURSE TO BE ALLOTTED, IT IS COMPULSORY TO SAVE THE SELECTED COURSE BY PRESSING 'SAVE' AND FOLLOWED BY FREEZING THE CHOICE BY PRESSING 'FREEZE'.**

(ii) **STUDENT WILL NOT BE ABLE TO CHANGE HIS / HER SELECTION OF COURSE(S) UPON PRESSING 'FREEZE' BUTTON.**

IF THE COURSE IS NOT FREEZED, THEN THAT COURSE SHALL NOT BE ALLOTTED.

25. A student can change his/her selection of **Professional Elective course / Open Elective General Pool** course any number of times during the time the elective selection window is open***, provided the student has not freezed his course***. Note that **if the preferred elective course is already FREEZED through 'FREEZE' button, then student will not be able to change his/her selection of course.**
26. As the elective course selection is dynamic in nature, **status of course may change at any point of time** depending upon selection of elective courses by the students. Hence, **STUDENTS ARE ADVISED TO CHECK THE STATUS OF THE ELECTIVE COURSE SELECTED BY THEM ON THE CLOSING DATE OF ELECTIVE SELECTION WINDOW**.
27. **If the status changes from 'confirmed' to 'not confirmed', student may opt for another elective course of his/her choice on the last date**.
28. **If a student does not perform this activity during the elective selection window, then the student shall be allotted an elective course by the concerned HoD**. For such students, a message regarding non-selection of elective course shall be displayed in the student login dashboard.
29. A student may select / change his / her Professional Elective course / Open Elective General Pool course **(only if not freezed)** upto the closing date of the window.
30. **ONLINE SELECTION OF PROFESSIONAL ELECTIVE COURSE IN EDUPRIME SOFTWARE BY A STUDENT WHO HAS OPTED FOR PURSUING PROFESSIONAL ELECTIVE COURSE THROUGH NPTEL-SWAYAM PLATFORM SHALL NOT BE CONSIDERED.**

DO NOT FORGET TO PRESS 'SAVE' &'FREEZE' BUTTONS UPON FINALIZED SELECTION OF ELECTIVE COURSES

OPEN ELECTIVE – II COURSES AVAILABLE FOR SELECTION (A.Y. 2026 – 2027)

OE Track	Name of the Open Elective-II Course & Offering Department	Course code	Number of Sections to be offered in 2026 - 2027	Maximum Seats available for selection	Courses available to B.Tech.
Smart Cities	GREEN BUILDING TECHNOLOGY **(CE)**	22OE1CE302	1	77	**EEE, ME, ECE, CSE, EIE, IT, AE, CSE(AIML), CSE(CYS), CSE(DS), CSE(IOT), AI&DS**
Waste Management	HAZARDOUS WASTE MANAGEMENT **(CE)**	22OE1CE304	2	160	**EEE, ME, ECE, CSE, EIE, IT, AE, CSE(AIML), CSE(CYS), CSE(DS), CSE(IOT), AI&DS**
Green Energy	RENEWABLE ENERGY TECHNOLOGIES **(EEE)**	22OE1EE302	2	157	**CE, ME, ECE, CSE, EIE, IT, AE, CSE(AIML), CSE(CYS), CSE(DS), CSE(IOT), AI&DS**
3D Printing & Design	INTRODUCTION TO 3D PRINTING **(ME)**	22OE1ME302	2	141	**CE, EEE, ECE, CSE, EIE, IT, AE, CSE(AIML), CSE(CYS), CSE(DS), CSE(IOT), AI&DS**
Robotics	KINEMATICS OF ROBOTS **(EIE)**	22OE1EI302	1	52	**CE, EEE, ME, ECE, CSE, IT, AE, CSE(AIML), CSE(CYS), CSE(DS), CSE(IOT), AI&DS**
Data Sciences/ Big Data Analytics	COMPUTATIONAL THINKING USING PYTHON **(IT)**	22OE1IT302	1	51	**CE, EEE, ME, ECE, EIE, AE**
Autonomous Vehicles	MODERN AUTOMOTIVE TECHNOLOGIES **(AE)**	22OE1AE302	1	42	**CE, EEE, ME, ECE, CSE, EIE, IT, CSE(AIML), CSE(CYS), CSE(DS), CSE(IOT), AI&DS**
General	PROFESSIONAL ETHICS AND HUMAN VALUES **(H&S)**	22OE1HS301	2	160	**CE, EEE, ME, ECE, CSE, IT, EIE, AE, CSE(AIML), CSE(CYS), CSE(DS), CSE(IOT), AI&DS**
	ENTREPRENEURSHIP **(H&S)**	22OE1HS302	3	240	**CE, EEE, ME, ECE, CSE, IT, EIE, AE, CSE(AIML), CSE(CYS), CSE(DS), CSE(IOT), AI&DS**
	SMART CITIES **(CE)**	22OE1CE305	1	80	**EEE, ME, ECE, CSE, IT, EIE, AE, CSE(AIML), CSE(CYS), CSE(DS), AI&DS**
	TRENDS IN ENERGY SOURCES FOR SUSTAINABLE DEVELOPMENT **(EEE)**	22OE1EE303	1	80	**CE, ME, ECE, CSE, EIE, IT, AE, CSE(AIML), CSE(CYS), CSE(DS), CSE(IOT), AI&DS**

	3D PRINTING AND DESIGN **(ME)**	22OE1ME303	2	160	**CE, EEE, ECE, CSE, EIE, IT, AE, CSE(AIML), CSE(CYS), CSE(DS), CSE(IOT), AI&DS**
	ADVANCED MATERIALS **(ME)**	22OE1ME304	1	80	**CE, EEE, ECE, CSE, EIE, IT, AE, CSE(AIML), CSE(CYS), CSE(DS), CSE(IOT), AI&DS**
	5G/6G TECHNOLOGIES **(ECE)**	22OE1EC307	1	80	**CE, EEE, ME, CSE, IT, AE, CSE(AIML), CSE(CYS), CSE(DS), AI&DS**
	FUNDAMENTALS OF VLSI **(ECE)**	22OE1EC308	1	80	**CE, EEE, ME, CSE, EIE, IT, AE, CSE(AIML), CSE(CYS), CSE(DS), CSE(IOT), AI&DS**
	AI FOR BEGINNERS **(CSE)**	22OE1CS304	1	80	**CE, EEE, ME, ECE, EIE, AE**
	BLOCKCHAIN TECHNOLOGY ESSENTIALS **(CSE)**	22OE1CS309	1	80	**CE, EEE, ME, ECE, EIE, AE**
	FUNDAMENTALS OF ROBOTICS AND DRONES **(EIE)**	22OE1EI303	1	80	**CE, EEE, ME, ECE, CSE, IT, AE, CSE(AIML), CSE(CYS), CSE(DS), CSE(IOT), AI&DS**
	NUMERICAL METHODS AND LINEAR PROGRAMMING **(H&S)**	22OE1MT304	1	80	**CE, EEE, ME, ECE, CSE, IT, EIE, AE, CSE(AIML), CSE(CYS), CSE(DS), CSE(IOT), AI&DS**
	INTRODUCTION TO CLIMATE CHANGE **(H&S)**	22OE1CH301	1	80	**CE, EEE, ME, ECE, CSE, IT, EIE, AE, CSE(AIML), CSE(CYS), CSE(DS), CSE(IOT), AI&DS**
	SUSTAINABLE CHEMISTRY FOR ENGINEERING **(H&S)**	22OE1CH302	1	80	**CE, EEE, ME, ECE, CSE, IT, EIE, AE, CSE(AIML), CSE(CYS), CSE(DS), CSE(IOT), AI&DS**
	STORYTELLING FOR EFFECTIVE COMMUNICATION **(H&S)**	22OE1EN301	1	80	**CE, EEE, ME, ECE, CSE, IT, EIE, AE, CSE(AIML), CSE(CYS), CSE(DS), CSE(IOT), AI&DS**
	FILM ANALYSIS AND CRITICAL APPRECIATION **(H&S)**	22OE1EN302	1	80	**CE, EEE, ME, ECE, CSE, IT, EIE, AE, CSE(AIML), CSE(CYS), CSE(DS), CSE(IOT), AI&DS**
	CREATIVE WRITING **(H&S)**	22OE1EN305	1	80	**CE, EEE, ME, ECE, CSE, IT, EIE, AE, CSE(AIML), CSE(CYS), CSE(DS), CSE(IOT), AI&DS**
CSBS	BUSINESS STRATEGY **(CSBS)**	22OE1CB304	1	80	**CSBS**
	DISTRIBUTED SYSTEMS **(CSBS)**	22OE1CB305	1	80	**CSBS**
	ADVANCED OPERATING SYSTEMS **(CSBS)**	22OE1CB306	1	80	**CSBS**

Maximum strength of each section in an elective course shall be 80.
Minimum strength required for running an elective course shall be 20.

CIVIL ENGINEERING

R22 - III B.TECH. II SEM - PROFESSIONAL ELECTIVE-II COURSES AVAILABLE FOR SELECTION (A.Y. 2026 – 2027)

S. No.	Elective Group	Name of the Professional Elective	Course Code	Number of Sections to be offered in 2026 - 2027	Maximum Seats available for selection
1	Elective-II	Advanced Structural Analysis	22PE1CE306	2	160

Maximum strength of each section in an elective course shall be 80.

Minimum strength required for running an elective course shall be 20.

ELECTRICAL & ELECTRONICS ENGINEERING

R22 - III B.TECH. II SEM - PROFESSIONAL ELECTIVE-II COURSES AVAILABLE FOR SELECTION (A.Y. 2026 – 2027)

S. No.	Elective Group	Name of the Professional Elective	Course Code	Number of Sections to be offered in 2026 - 2027	Maximum Seats available for selection
1	Elective-II	Electrical Drives	22PE1EE302	1	80
2		Energy Storage Systems	22PE1EE304	1	80

Maximum strength of each section in an elective course shall be 80.

Minimum strength required for running an elective course shall be 20.

MECHANICAL ENGINEERING

R22 - III B.TECH. II SEM - PROFESSIONAL ELECTIVE-II COURSES AVAILABLE FOR SELECTION (A.Y. 2026 – 2027)

S. No.	Elective Group	Name of the Professional Elective	Course Code	Number of Sections to be offered in 2026 - 2027	Maximum Seats available for selection
1	Elective-II	Refrigeration and Air Conditioning	22PE1ME306	1	80
2		Theory of Metal Cutting	22PE1ME310	1	80

Maximum strength of each section in an elective course shall be 80.

Minimum strength required for running an elective course shall be 20.

ELECTRONICS AND COMMUNICATION ENGINEERING

R22 - III B.TECH. II SEM - PROFESSIONAL ELECTIVE-II COURSES AVAILABLE FOR SELECTION (A.Y. 2026 – 2027)

S. No.	Elective Group	Name of the Professional Elective	Course Code	Number of Sections to be offered in 2026 - 2027	Maximum Seats available for selection
1	Elective-II	Digital Image Processing	22PE1EC305	1	80
2		IoT Architectures and Applications	22PE1EC306	1	80
3		Digital System Design with Programmable Devices	22PE1EC307	2	160
4		Fundamentals of Machine Learning	22PE1EC308	1	80

Maximum strength of each section in an elective course shall be 80.

Minimum strength required for running an elective course shall be 20.

COMPUTER SCIENCE AND ENGINEERING

R22 - III B.TECH. II SEM - PROFESSIONAL ELECTIVE-II COURSES AVAILABLE FOR SELECTION (A.Y. 2026 – 2027)

S. No.	Elective Group	Name of the Professional Elective	Course Code	Number of Sections to be offered in 2026 - 2027	Maximum Seats available for selection
1	Elective-II	Cyber Security	22PE1CS304	1	80
2		Fundamentals of Data Science	22PE1DS303	1	80
3		Pattern Recognition	22PE1IT303	1	80
4		Cloud Computing	22PE1CS305	1	80

Maximum strength of each section in an elective course shall be 80.

Minimum strength required for running an elective course shall be 20.

ELECTRONICS & INSTRUMENTATION ENGINEERING

R22 - III B.TECH. II SEM - PROFESSIONAL ELECTIVE-II COURSES AVAILABLE FOR SELECTION (A.Y. 2026 – 2027)

S. No.	Elective Group	Name of the Professional Elective	Course Code	Number of Sections to be offered in 2026 - 2027	Maximum Seats available for selection
1	Elective-II	Kinematics and Dynamics of Robots	22PE1EI304	2	160
2		Instrumentation for Agriculture and Food Processing Industries	22PE1EI305	2	160
3		Computer Communication Networks	22PC1EC305	2	160
4		Bio-Medical Instrumentation	22PE1EI306	2	160

Maximum strength of each section in an elective course shall be 80.

Minimum strength required for running an elective course shall be 20.

INFORMATION TECHNOLOGY

R22 - III B.TECH. II SEM - PROFESSIONAL ELECTIVE-II COURSES AVAILABLE FOR SELECTION (A.Y. 2026 – 2027)

S. No.	Elective Group	Name of the Professional Elective	Course Code	Number of Sections to be offered in 2026 - 2027	Maximum Seats available for selection
1	Elective-II	Software Testing Methodologies	22PE1CS303	1	80
2		Cyber Security	22PE1CS304	1	80
3		Fundamentals of Data Science	22PE1DS303	1	80

Maximum strength of each section in an elective course shall be 80.

Minimum strength required for running an elective course shall be 20.

AUTOMOBILE ENGINEERING

R22 - III B.TECH. II SEM - PROFESSIONAL ELECTIVE-II COURSES AVAILABLE FOR SELECTION (A.Y. 2026 – 2027)

S. No.	Elective Group	Name of the Professional Elective	Course Code	Number of Sections to be offered in 2026 - 2027	Maximum Seats available for selection
1	Elective-II	Fuel Cell Technology	22PE1AE306	1	80
2		Design of Vehicle Components	22PE1AE307	1	80
3		Automotive Control Systems	22PE1AE308	1	80
4		Autonomous Vehicles	22PE1AE309	1	80
5		Vehicle Transport Management	22PE1AE310	1	80

Maximum strength of each section in an elective course shall be 80.

Minimum strength required for running an elective course shall be 20.

COMPUTER SCIENCE AND BUSINESS SYSTEMS

R22 - III B.TECH. II SEM - PROFESSIONAL ELECTIVE-II COURSES AVAILABLE FOR SELECTION (A.Y. 2026 – 2027)

S. No.	Elective Group	Name of the Professional Elective	Course Code	Number of Sections to be offered in 2026 - 2027	Maximum Seats available for selection
1	Elective-II	Modern Day Robotics and Its Industrial Applications	22PE1CB304	1	80
2		Modern Web Applications	22PE1CB305	1	80
3		Natural Language Processing	22PE1CB306	1	80

Maximum strength of each section in an elective course shall be 80.

Minimum strength required for running an elective course shall be 20.

CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

R22 - III B.TECH. II SEM - PROFESSIONAL ELECTIVE-II COURSES AVAILABLE FOR SELECTION (A.Y. 2026 – 2027)

S. No.	Elective Group	Name of the Professional Elective	Course Code	Number of Sections to be offered in 2026 - 2027	Maximum Seats available for selection
1	Elective-II	Cloud Computing	22PE1CS305	3	240

Maximum strength of each section in an elective course shall be 80.

Minimum strength required for running an elective course shall be 20.

CSE (CYBER SECURITY)

R22 - III B.TECH. II SEM - PROFESSIONAL ELECTIVE-II COURSES AVAILABLE FOR SELECTION (A.Y. 2026 – 2027)

S. No.	Elective Group	Name of the Professional Elective	Course Code	Number of Sections to be offered in 2026 - 2027	Maximum Seats available for selection
1	Elective-II	Cloud Security	22PE1CY302	1	80
2		Artificial Intelligence	22PC1AM301	1	80

Maximum strength of each section in an elective course shall be 80.

Minimum strength required for running an elective course shall be 20.

CSE (DATA SCIENCE)

R22 - III B.TECH. II SEM - PROFESSIONAL ELECTIVE-II COURSES AVAILABLE FOR SELECTION (A.Y. 2026 – 2027)

S. No.	Elective Group	Name of the Professional Elective	Course Code	Number of Sections to be offered in 2026 - 2027	Maximum Seats available for selection
1	Elective-II	Ensemble Models and Feature Engineering	22PE1DS302	1	80
2		Pattern Recognition	22PE1IT303	1	80
3		Cyber Security	22PE1CS304	1	80
4		Software Testing Methodologies	22PE1CS303	1	80
5		Fundamentals of Data Science	22PE1DS303	1	80

Maximum strength of each section in an elective course shall be 80.

Minimum strength required for running an elective course shall be 20.

CSE (IOT)

R22 - III B.TECH. II SEM - PROFESSIONAL ELECTIVE-II COURSES AVAILABLE FOR SELECTION (A.Y. 2026 – 2027)

S. No.	Elective Group	Name of the Professional Elective	Course Code	Number of Sections to be offered in 2026 - 2027	Maximum Seats available for selection
1	Elective-II	Cloud Computing	22PE1CS305	1	80

Maximum strength of each section in an elective course shall be 80.

Minimum strength required for running an elective course shall be 20.

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

R22 - III B.TECH. II SEM - PROFESSIONAL ELECTIVE-II COURSES AVAILABLE FOR SELECTION (A.Y. 2026 – 2027)

S. No.	Elective Group	Name of the Professional Elective	Course Code	Number of Sections to be offered in 2026 - 2027	Maximum Seats available for selection
1	Elective-II	Ensemble Models and Feature Engineering	22PE1DS302	1	80
2		Cyber Security	22PE1CS304	1	80

Maximum strength of each section in an elective course shall be 80.

Minimum strength required for running an elective course shall be 20.

OE TRACKS BASED ON MEZZANINE TECHNOLOGIES:

OE TRACKS (Parent Department)	V SEMESTER	VI SEMESTER	VII SEMESTER	VIII SEMESTER
Smart Cities (CE)	Smart Cities Planning and Development **(22OE1CE301)**	Green Building Technology **(22OE1CE302)**	Smart Materials and Structures **(22OE1CE401)**	Intelligent Transportation System **(22OE1CE402)**
Waste Management (CE)	Solid Waste Management **(22OE1CE303)**	Hazardous Waste Management **(22OE1CE304)**	Waste to Energy **(22OE1CE403)**	Intelligent Waste Management and Recycling System **(22OE1CE404)**
Green Energy (EEE)	Renewable Energy sources **(22OE1EE301)**	Renewable Energy Technologies **(22OE1EE302)**	Energy Storage Technologies **(22OE1EE401)**	Energy Management and Conservation **(22OE1EE402)**
3D Printing & Design (ME)	Elements of CAD **(22OE1ME301)**	Introduction to 3D Printing **(22OE1ME302)**	3D Printing - Tooling and Systems **(22OE1ME401)**	Reverse Engineering **(22OE1ME402)**
Internet of Things (ECE)	Sensors Transducers and Actuators **(22OE1EC301)**	Introduction to Microcontrollers and Interfacing **(22OE1EC302)**	Fundamentals of Internet of Things **(22OE1EC401)**	Wireless Sensor Networks **(22OE1EC402)**
Augmented Reality (AR) / Virtual Reality (VR) (ECE)	Introduction to Signal Processing **(22OE1EC303)**	Introduction to Image and Video Processing **(22OE1EC304)**	Fundamentals of Augmented Reality and Virtual Reality **(22OE1EC403)**	Introduction to Metaverse **(22OE1EC404)**
Microelectronics (ECE)	Principles of Microelectronics **(22OE1EC305)**	Programmable Logic Devices for Microelectronics **(22OE1EC306)**	Fundamentals of Physical Design for VLSI **(22OE1EC405)**	Recent Trends in Microelectronics **(22OE1EC406)**
Artificial Intelligence (CSE)	Applied Mathematics in Artificial Intelligence **(22OE1MT301)** / Mathematics for Artificial Intelligence **(22OE1MT302)**	Fundamentals of Artificial Intelligence **(22OE1CS303)**	Machine Learning Techniques **(22OE1CS401)**	Essentials of Deep Learning **(22OE1CS402)**
Blockchain Technologies (CSE)	Fundamentals of Computer Networks **(22OE1CS301)** / Relational Data Base Management Systems **(22OE1CS302)**	Cryptography and Network Security **(22OE1IT301)**	Distributed Data Bases **(22OE1CS403)**	Blockchain Technology **(22OE1CS404)**
Robotics (EIE)	Fundamentals of Robotics **(22OE1EI301)**	Kinematics of Robots **(22OE1EI302)**	Drive Systems for Robots **(22OE1EI401)**	Intelligent Systems for Robots **(22OE1EI402)**
Cyber Security (IT)	Fundamentals of Computer Networks **(22OE1CS301)** / Relational Data Base Management Systems **(22OE1CS302)**	Cryptography and Network Security **(22OE1IT301)**	Essentials of Cyber Security **(22OE1IT401)**	Computer Forensics **(22OE1IT402)**
Data Sciences / Big Data & Analytics (IT)	Statistical Methods for Data Science **(22OE1MT303)**	Computational Thinking using Python **(22OE1IT302)**	Fundamentals of Data Mining **(22OE1IT403)**	Data Analysis and Visualization **(22OE1IT404)**

Autonomous Vehicles (AME)	Principles of Automobile Engineering **(22OE1AE301)**	Modern Automotive Technologies **(22OE1AE302)**	Electric, Hybrid and Fuel Cell Vehicles **(22OE1AE401)**	Connected and Autonomous Vehicles **(22OE1AE402)**

GENERAL POOL OF OE COURSES:

OE TRACKS (Parent Departments)	COURSES
General-Computing (CSE / IT)	• Programming Through JAVA **(22OE1IT303)** • Relational Data Base Management Systems **(22OE1CS302)** • Computational Thinking using Python **(22OE1IT302)** • Introduction to Data Analytics **(22OE1IT304)** • Fundamentals of Computer Algorithms **(22OE1CS305)** • Introduction to Front End Technologies **(22OE1CS306)** • Concepts of Generative AI **(22OE1CS307)**
General (H&S)	• Professional Ethics and Human Values **(22OE1HS301)** • Entrepreneurship **(22OE1HS302)** • Foreign Language-French **(22OE1HS401)**
General	• Smart Cities **(22OE1CE305)** • Trends in Energy Sources for Sustainable Development **(22OE1EE303)** • 3D Printing and Design **(22OE1ME303)** • Advanced Materials **(22OE1ME304)** • 5G/6G Technologies **(22OE1EC307)** • Fundamentals of VLSI **(22OE1EC308)** • AI for Beginners **(22OE1CS304)** • Blockchain Technology Essentials **(22OE1CS309)** • Fundamentals of Robotics and Drones **(22OE1EI303)** • Introduction to Cloud Computing **(22OE1IT305)** • Fundamentals of Computer Vision **(22OE1IT306)** • Introduction to Advanced Vehicle Technologies **(22OE1AE303)** • Introduction to Application Development with C# **(22OE1CS310)** • Introduction to Application Development with Java **(22OE1CS311)** • Introduction to Application Development with Python **(22OE1CS312)** • Nanoscience and Technology for Engineers **(22OE1PH301)** • Essentials For Quantum Computing **(22OE1PH302)** • Introduction to Climate Change **(22OE1CH301)** • Sustainable Chemistry for Engineering **(22OE1CH302)** • Storytelling For Effective Communication **(22OE1ENH301)** • Film Analysis and Critical Appreciation **(22OE1EN302)** • Creative Writing **(22OE1EN303)** • Cross-Cultural Communication Through World Literature **(22OE1EN401)** • Business Communication **(22OE1EN402)** • Fundamentals of Management **(22OE1MG301)** • Personal Finance and Tax Planning **(22OE1MG302)** • Corporate Finance **(22OE1MG303)** • Cost And Management Accountancy **(22OE1MG304)** • Human Resource Management **(22OE1MG305)** • Marketing Management **(22OE1MG306)** • Numerical Methods and Linear Programming **(22OE1MT304)** • Optimization Techniques **(22OE1MT305)**

OPEN ELECTIVE TRACKS

SMART CITIES



Offered by: **CIVIL ENGINEERING**

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Smart Cities	Smart Cities Planning and Development	**Green Building Technology**	Smart Materials and Structures	Intelligent Transportation System

SMART CITIES

In the twenty-first century, engineers are being tasked with solving ever more complex and subtle societal challenges – from climate change to unprecedented urbanisation that is materially affecting the lives of many urban populations. As engineers become ever more interdisciplinary and the boundaries of disciplines soften, they need to reflect as a community as to the appropriateness of the engineering paradigm to address these needs. Currently the engineering community is pointing to the digital technologies and the 'smart city' as a deliverer of efficiency and resilience without fully acknowledging the intricate socio-political context in which it is situated.

The domain of EIE was developed to modernise and automate these operations using the technological advancements in the realm of electronics. Even outside the industry, common household appliances — such as washing machine, air-conditioner, geyser, and microwave oven — cannot attract customers without features such as auto cut-off after certain time or temperature, which is again an example of instrumentation. The field of Instrumentation Engineering is also core to the recent advances such as smart home appliances, smart cities and automobiles. It is thus not far from the truth to claim that the fourth industrial revolution.

The world population is continuously growing and reached a significant evolution of the society, where the number of people living in cities surpassed the number of people in rural areas. This puts national and local governments under pressure because the limited resources, such as water, electricity, and transports, must thus be optimized to cover the needs of the citizens. Therefore, different tools, from sensors to processes, service, and artificial intelligence, are used to coordinate the usage of infrastructures and assets of the cities to build the so-called smart cities.

Different definitions and theoretical models of smart cities are given in literature. However, smart city can usually be modelled by a layered architecture, where communication and networking layer plays a central role. In fact, smart city applications lay on collecting field data from different infrastructures and assets, processing these data, taking some intelligent control actions, and sharing information in a secure way. Thus, a two-way reliable communications layer is the basis of smart cities. This chapter introduces the basic concepts of this field and focuses on the role of communication technologies in smart cities. Potential technologies for smart cities are discussed, especially the recent wireless technologies adapted to smart city requirements.

What is the concept of a smart city?

There is no universally accepted definition for a smart city because people can interpret different meanings for it. Hence, it means different things to different people. Here, you will get a basic definition that captures the essence of what a smart city is and what it does. While the concept varies from area to area depending on the resources, the basic idea behind it remains the same. A smart city aims to bring various components together to live harmoniously and attempts to do with the least environmental damage or impact. In other words, a smart city is a place with high standards of living, which survives and thrives on eco-friendly means. The size and amenities within a smart city vary according to geography, resources available, geopolitical scenario and investment received.

Growth in Global population continues to drive citizens from rural areas to cities. With rapid expansion of urban areas, cities need to become intelligent to handle this large scale urbanization. This is driving city operators to look at smarter ways to manage complexities, increase efficiencies and improve quality of life. Today we need cities that monitor& integrate infrastructure to better optimize resources while maximizing service to its citizens. So to meet all the needs we need our cities to be smarter which brings a concept "**Smart cities**" Smart cities optimize the use of technology in the design & operation of infrastructure and buildings in such a way which meets the current and future needs of their citizens. To be truly smart they also require consideration of governance &growth, urban development and infrastructure, the environment & natural resources, society and community.

Smart city programs provide a range of technologies that can be applied to solve infrastructure problems associated with ageing infrastructure and increasing demands. The potential for infrastructure and urban improvement remains unrealized, however, due to technical, financial, and social constraints and criticisms that limit the implementation of smart cities concepts for infrastructure management. The discussion presented here provides a review of smart technologies including sensors, crowdsourcing and citizen science, actuators, data transmission, Internet of Things, big data analytics, data visualization, and blockchain, which can be used for infrastructure management. Smart infrastructure programs are reviewed to explore how enabling technologies have been applied across civil engineering domains, including transportation systems, water systems, air quality, energy infrastructure, solid waste management, construction engineering and management, structures, and geotechnical systems.

Making cities "smarter" by efficient management of resources and infrastructure, greener environment, and smart governance resulting in a better quality of living of its citizens. This can be enabled by the effective use of information and communication technologies (ICTs) tools, which have the ability to provide eco-friendly and economically viable solutions for cities.

Setting up a smart city is more than improving the old system with technology by simply adding sensors, remote supervision, and control to essential city services. It should be a complete shift of a paradigm in daily life when using new technologies, especially new ICT leading to smart outcomes.

Smart solutions

Another important feature of smart cities is that they will provide smart solutions to modern problems. These include:

- Public information systems
- Redressal of grievances
- Electronic service delivery
- Maximum engagement of citizens
- Reduced energy and fuel usage
- Reduces the development of wastes
- Smart water monitoring
- Treatment of wastewater
- Sustainable monitoring water quality



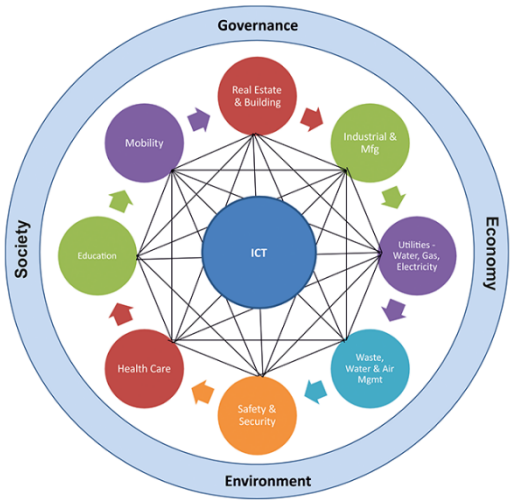
- Maximum utilization of renewable energy sources
- Usage of green building techniques
- Smart parking to reduce clutter
- Intelligent traffic management system.

Advantages of a smart cities,

1. Promotion of mixed land usage resulting in higher efficiency and reduced wastage of land.
2. Expanded housing opportunities.
3. Reduced congestion, air pollution and resource depletion.
4. Helps to boost local economies by promoting localized trade and interactions.
5. Efficient use of public transport to reduce fuel wastage.
6. Safe and secure localities.
7. Preservation of open spaces.
8. Reduction in urban heating.
9. Promotion of transit-oriented development.
10. Making governance more people-friendly and cost-effective.

Here's a look at some projects that have taken inspiration from the concepts used for the design of smart cities. These projects will help you build energy-efficient systems that will help heal the world.

1. **Home Automation using IoT**
2. **Smart Irrigation System**
3. **Smart Building using IoT**
4. **Smart Energy Meter using GSM**
5. **Solar and Smart Energy Systems**
6. **Smart Water Monitoring**
7. **Automated Street Lighting**
8. **Automated Railway Crossing**
9. **Intelligent Transportation Systems**
10. **Smart Sewage Maintenance Systems.**



To develop new smart cities and to transform our cities into smart cities the engineers in particular are stepping up as leaders.

Civil & Environmental Engineers are working to harness the potential of latest technologies and data for our urban infrastructure, which is among the most complex system in the world. They provide sustainable, resilient and advanced means of transportation system, green building, better water management system and better waste management system. This not only develop physical infrastructure but also develop institutional & social infrastructure that enable our societies to function. Modelling these systems of systems will require managing data at an unprecedented scale.

To support them Computer and **Electronics & Communication Engineers** help in creating future cities that are digital, build and operate cities ICT landscape across application and infrastructure like IOT (Internet of Things), e-payment, e-market, the latest communication devices etc which is leveraging next generation technologies.

They create a platform for conveyance of different city services, leverage big data analytics to manage city performance and proactive crisis management.

Electrical Engineers developing new renewable source of energy to meet ever increasing power demands. They also develop methods of effective power transmission with minimum losses which is more economical and safer. They also work on developing microchips to micro sensors which are helping in making our households, institution efficient and safer.

Conclusion

It is clear that dreaming of a smart city without active contribution of engineers is a myth. So, there will always be demand of Engineers and because of which even after crises in the placement scenario still the maximum science students choose Engineering as their first career choice in hope of a better future.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CE301) SMART CITIES PLANNING AND DEVELOPMENT

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To Introduce smart city basic concepts, global standards and Indian context of smart cities
- To understand smart community, smart transportation and smart buildings
- To understand energy demand, green approach to meet energy demand and their capacities
- To identify smart transportation technologies in cities and concepts towards smart city

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Recognize smart city concepts and their international and national standards

CO-2: Recognize smart community, transportation and building concepts

CO-3: Develop and calibrate energy demand and their capacity limits

CO-4: Predict the various smart urban transportation systems and the transition from existing city towards a smart city

UNIT-I:

Introduction to Smart Urban Infrastructures and Smart Cities: Introduction to City Planning - Understanding Smart Cities - Dimensions of Smart Cities - Global Experience of Smart Cities – Global Standards and Performance Benchmarks, Practice Codes - Indian scenario - India "100 Smart Cities" Policy and Mission.

UNIT-II:

Smart Cities Planning and Development: Introduction to Smart Community - Smart community concepts: Concept of Smart Community - Smart Transportation - Smart Building and Home Device - Smart Health - Smart Government - Smart Energy and Water – Cyber Security, Safety, and Privacy - Internet of Things, Blockchain, Artificial Intelligence, Alternate Reality, Virtual Reality.

UNIT-III:

Smart Urban Energy Systems: Conventional vs. Smart, City components, Energy demand, Green approach to meet Energy demand, Index of Indian cities towards smartness – A statistical analysis -Meeting energy demand through direct and indirect solar resources, Effectiveness in responsive environment in smart city; Smart communication using green resources, Introduction to PV technology- Policies of Solar PV in smart domains - Smart Grid- Indian Perspective- Advantage & limitation.

UNIT-IV:

Smart Urban Transportation Systems: Smart Transportation Technologies - Driverless and connected vehicles - Ride sharing solutions - The "improve" pathway - The "shift" pathway – Smart Roads and Pavement systems.

UNIT-V:

Towards Smart Cities: The transition of legacy cities to Smart -. Right transition process- The benefit of citizens, cities to adopt effective management and governance approaches - Factors in the transition phase of legacy cities to smart cities and their managerial implications.

TEXT BOOKS:

1. Internet of Things in Smart Technologies for Sustainable Urban Development, G. R. Kanaga Chidambaresan, R. Maheswar, V. Manikandan, K. Ramakrishnan, Springer, 2020
2. Society 5.0: A People-centric Super-smart Society, Hitachi-U, Tokyo Laboratory (H-U Tokyo Lab), Springer, 2020
3. The Routledge Companion to Smart Cities, Katharine S. Willis, Alessandro Aurigi, Routledge International Handbooks, 2020

REFERENCES:

1. Smart Cities in Asia: Governing Development in the Era of Hyper-Connectivity Yu-min Joo, Yu-Min Joo, Teck-Boon Tan, Edward Elgar Pub, 2020
2. Urban Systems Design: Creating Sustainable Smart Cities in the Internet of Things Era, Yoshiki Yamagata, Perry P. J. Yang, Elsevier, 2020
3. Smart Cities and Artificial Intelligence: Convergent Systems for Planning, Design, and Operations, Christopher Grant Kirwan, Zhiyong Fu, Elsevier, 2020

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1CE302) GREEN BUILDING TECHNOLOGY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Smart Cities Planning and Development

COURSE OBJECTIVES:

- To expose to green buildings, their features and importance in the present context of sustainable development
- To introduce various sustainable building materials for green buildings
- To acquire knowledge on various design concepts and construction aspects of green buildings
- To learn the various policies and incentives for green buildings and also different green building rating systems and codes

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Explain the importance, features and requisites of a green building

CO-2: Identify suitable sustainable building materials for construction of green building

CO-3: Apply the fundamental knowledge on design and construction techniques for green buildings

CO-4: Implement the acquired knowledge of policies and rating systems for green buildings

UNIT-I:

Introduction to Green Buildings: Sustainable Development - Definition and Importance – United Nations Sustainable Development Goals (UN SDG's) - Definition of green buildings - Typical features of green buildings - Benefits of green buildings - Key requisites for constructing green buildings - Important sustainable features for green buildings - Climate responsive buildings - Carbon footprint and Eco footprints of buildings.

UNIT-II:

Green Building Materials: Introduction to sustainable building materials - Sustainable concrete - Partial replacements in concrete - Use of industrial waste such as fly-ash, GGBS, silica fume, rice husk ash, construction & demolition waste - Natural building materials - Bio materials - Mycelium - Engineered wood - Structural Insulated Panels (SIPs) - Natural fiber – Non-toxic materials: low VOC paints, organic paints, coating and adhesives - Use of waste materials such as paper, cellulose, glass bottles, tires, shipping containers.

UNIT-III:

Design of Green Buildings: Indoor environmental quality requirement and management: Thermal comfort - HVAC - Visual perception - Illumination requirement - Auditory requirement - Energy Efficiency - Lighting and day lighting - Steady and non-steady heat transfer through the glazed window and the wall - Indoor air quality - Local climatic conditions - temperature, humidity, wind speed and direction.

UNIT-IV:

Construction of Green Buildings: IoT integrated automated building systems - Synthetic roof underlayment - Green roofs - Grid hybrid system - Passive solar - Greywater plumbing systems - Electrochromic glass - Solar thermal cladding - Structural 3D printing - Self-healing concrete - Bird friendly design - Landscaping for parking lot runoff - Composting toilets - Proactive maintenance - Green cleaning.

UNIT-V:

Green Building Policies and Incentives: Green products and material certification - parameters making products green - products transparency movement - Cradle to cradle certification - Product emission testing - Carbon trust - Carbon credit - Returns on investments - Savings - Policies towards electrical power in India - Tax credits and Grants.

Green Building Rating Systems: Overview of green building rating systems: BREAM, LEED and GRIHA.

TEXT BOOKS:

1. Green Building Handbook: Volume 1, A Guide to Building Products and their Impact on the Environment, Tom Woolley, Sam Kimmins, Rob Harrison, Paul Harrison, Taylor & Francis
2. Sustainable Construction: Green Building Design and Delivery, 5th Edition by Charles J. Kibert, Wiley Publishing

REFERENCES:

1. **Green Building** Fundamentals: A Practical Guide to Understanding and Applying Fundamental Sustainable Construction Practices and the LEED System, Pearson, USA
2. Sustainable Construction and Design-II, Regina Leffers, Pearson / Prentice Hall, 2009

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1CE401) SMART MATERIALS AND STRUCTURES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Smart Cities Planning and Development, Green Building Technology

COURSE OBJECTIVES:

- To introduce various smart materials and their working principles
- To acquire knowledge on different measuring techniques
- To learn about various smart sensors, actuators and their application in structural health monitoring
- To acquire knowledge on different smart composite materials and their modelling concepts
- To learn about the data acquisition and processing and their application in engineering domain

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Explain the different smart materials and their principles

CO-2: Explain and understand different measuring techniques

CO-3: Identify suitable smart sensors and actuators for a specific engineering application

CO-4: Gain the knowledge on data acquisition and processing and advantages in smart materials and smart structures

UNIT-I:

Introduction: Introduction to Smart Materials and Structures – Instrumented structures functions and response – Sensing systems – Self-diagnosis – Signal processing consideration – Actuation systems and effectors.

UNIT-II:

Measuring Techniques: Measuring techniques: Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

UNIT-III:

Sensors & Actuators: Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers – LVDT – Fiber optic Techniques- Application of Smart Sensors for Structural Health Monitoring (SHM), System Identification using Smart Sensors

Actuators: Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magneto structure Material – Shape Memory Alloys –Electro rheological fluids – Electromagnetic actuation – Role of actuators and Actuator Materials - IPMC and Polymeric Actuators, Shape Memory Actuators

UNIT-IV:

Signal Processing and Control Systems: Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non-Linear

UNIT-V:

Advances in Smart Structures & Materials: Self-Sensing Piezoelectric Transducers, Energy Harvesting Materials, Autophagous Materials, Self-Healing Polymers, Intelligent System Design, Emergent System Design

TEXT BOOKS:

1. Smart Materials and Structures, Gandhi M. V. and Thompson B. S., Chapman & Hall, 1992
2. Dynamics and Control of Structures, Meirovitch L., John Wiley, 1992

REFERENCES:

1. Smart Structures: Analysis and Design, A. V. Srinivasan, D. Michael McFarland, Cambridge University Press, 2009
2. Smart Materials and Technologies: For the Architecture and Design Professions, Michelle Addington and Daniel L. Schodek, Routledge, 2004
3. Smart Structures and Materials, Brian Culshaw, Artech House – Borton, 1996

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1CE402) INTELLIGENT TRANSPORTATION SYSTEM

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Smart Cities Planning and Development, Green Building Technology, Smart Materials and Structures

COURSE OBJECTIVES:

- To understand ITS architecture and standards
- To apply appropriate ITS technology depending upon site specific conditions
- To design and implement ITS components
- To understand concept and application of Automated Highway Systems

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Differentiate different ITS user Services
CO-2: Apply ITS for road user safety
CO-3: Interpret importance of AHS in ITS
CO-4: Extend future research and special project

UNIT-I:

Introduction To ITS: System Architecture, Standards, Database – Tracking Database – Commercial Vehicle Operations – Intelligent Vehicle Initiative - Metropolitan ITS – Rural ITS – ITS for Rail network.

UNIT-II:

ITS Travel Management: Autonomous Route Guidance System – Infrastructure based systems – Telecommunications – Vehicle – Roadside communication – Vehicle Positioning System – Electronic Toll Collection – Electronic Car Parking

UNIT-III:

ITS Designs: Modeling and Simulation Techniques - Peer – to – Peer Program – ITS for Road Network – System Design – Mobile Navigation Assistant – Traffic Information Center – Public Safety Program.

UNIT-IV:

Automated Highway Systems: Evolution of AHS and Current Vehicle Trends - Vehicles in Platoons – Aerodynamic Benefits - Integration of Automated Highway Systems – System Configurations - Step by Step to an Automated Highway System- Spacing and Capacity for Different AHS Concepts – Communication Technologies for AHS - The Effects of AHS on the Environment – Regional Mobility - Impact Assessment of Highway Automation.

UNIT-V:

Implementation of ITS: ITS programs globally- overview of ITS in developed countries and developing countries – ITS at Toll Plazas – Parking lots – Highways.

TEXT BOOKS:

1. Intelligent Transport Systems Handbook: Recommendations for World Road Association (PIARC), Kan Paul Chen, John Miles, 2000
2. Intelligent Transport Systems – Cases and Policies, Roger R. Stough, Edward Elgar, 2001
3. Intermodal Freight Transport, David Lowe, Elsevier Butterworth-Heinemann, 2005

REFERENCES:

1. Positioning Systems in Intelligent Transportation Systems, Chris Drane and Chris Rizos, Artech House Publishers, 2000
2. Perspectives on Intelligent Transport Systems, Joseph M. Sussman, Springer, 2000
3. Intelligent Transport System, Intelligent Transportation Primer, 2001

WASTE MANAGEMENT



WASTE MANAGEMENT

Offered by: CIVIL ENGINEERING

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Waste Management	Solid Waste Management	**Hazardous Waste Management**	Waste to Energy	Intelligent Waste Management and Recycling System

WASTE MANAGEMENT

The courses such as solid waste management (SWM), hazardous waste management (HWM), waste to energy (WTE) and intelligent waste management and recycling system (IWM&RS) are the courses available in the waste management track stream which having a potential syllabus content to meet out the industrial and research needs.

Solid waste management is an interesting track course which actual highlights the day-to-day problems where everybody is facing due to the improper management of industrial, domestic and household waste. Further, the enthusiastic aspects involved in the track courses such as: awareness on its impact over on environment, formal or scientific way of handling and management of waste and disposal scenarios.

In hazardous waste management course, handling and management of nuclear waste at national and international level have been highlighted. Further, the content enlightens about the legal process of state, central and industrial responses toward any emergency situations arise by hazardous waste. Finally, it deals about natural resource damage assessment and restoration.

Waste to energy is a pioneering course available in the track; it is one of the interesting and mindboggling course in the track which highlights the importance of converting the waste materials into wealth. It gives enough space to understand the basic process technologies in a theoretical and industrial way such as: thermal, chemical and biological conversion process. From the above, biological conversion process is in its embryonic state and having potential to expands its technological wings in the near future and having enormous scope of industrial applications where students can be benefited. Finally, conversion devices is an innovative module have been framed to explore the young minds in the line of designing and creating a demand based conversion device products which even lays an entrepreneurial pathway to them.

First of its kind, even at both international and national level a dedicated and extensive course for intelligent waste management and recycling system have been framed with conventional and advanced modules. It is really an interesting course where a student can apply his/her innovative creations to solve the existing and futuristic problems in a smart way with the help of smart tools. Optimistic modules such as: life cycle assessment and carbon-footprint-based IWMS, principles of systems engineering and regulatory frameworks have been incorporated to meet out the international requirements.

In the pathway of exploring the fundamentals and basic knowledges about the course, the six units of all the courses have been formulated keeping in the mind that the students can be able to competitive among the international community at the end of semester. In this context, comprehensive theoretical and industrial processes have been incorporated in each and every module of courses. Further, it is highly believed that the framed syllabus modules having 100% industrial applications which can make the students to feel motivated, satisfied and confidence to compete with the international community.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CE303) SOLID WASTE MANAGEMENT

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To learn about different types of solid and hazardous wastes, their sources, classification systems, and regulatory framework for management
- To understand techniques for waste sampling, characterization, and minimization through reduce-reuse-recycle concepts
- To study various storage, collection, and transportation systems for efficient and safe handling of different waste streams
- To impart knowledge on biological, thermal, and other technologies for processing and treatment of solid and hazardous wastes

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Classify different types of wastes and interpret regulatory policies on their handling

CO-2: Select appropriate waste sampling and characterization methods and design waste minimization programs

CO-3: Plan and design efficient storage, collection, and transportation systems for municipal solid wastes

CO-4: Compare applicable biological and thermal waste treatment technologies for energy and resource recovery and disposal

UNIT-I:

Sources, Classification and Regulatory Framework: Types and Sources of solid and hazardous wastes - Need for integrated solid and hazardous waste management – Salient features of Indian legislations on management and handling of municipal solid wastes, hazardous wastes, biomedical wastes, e-wastes, plastic wastes, construction & demolition wastes, nuclear wastes - Elements of circular economy and integrated waste management - Roles and responsibilities of stakeholders – Financing and Public Private Partnerships for waste management.

UNIT-II:

Waste Characterization and Minimization: Waste generation rates and variation - Composition, physical, chemical, and biological properties of solid wastes – Hazardous Characteristics and TCLP tests – tools and software for waste sampling and characterization - Waste minimization techniques - Extended Producer Responsibility - Recycling, recovery, and reuse strategies - Concept of zero waste.

UNIT-III:

Storage, Collection and Transportation of Wastes: Onsite handling, storage, and segregation - Storage and collection of municipal solid wastes – Analysis of collection systems - Transfer stations design, operation, and optimization - Compatibility considerations, labelling, manifest system and safety transportation of hazardous wastes.

UNIT-IV:

Waste Processing Technologies: Objectives of waste processing – material separation and processing technologies – biological and chemical conversion technologies – methods and controls of Composting - thermal conversion technologies and energy recovery – incineration – solidification and stabilization of hazardous wastes.

UNIT-V:

Waste Disposal: Waste disposal options – Disposal in landfills - Landfill Classification, types and methods – site selection - design and operation of sanitary landfills, secure landfills – leachate and landfill gas management – landfill closure and environmental monitoring – Rehabilitation of open dumps – landfill remediation

TEXT BOOKS:

1. Integrated Solid Waste Management, George Tchobanoglous, Hilary Theisen and Samuel A.Vigil, McGraw-Hill International Edition, 1993
2. Handbook of Solid Waste Management, George Techobanoglous and Frank Kreith, McGraw- Hill, 2002
3. Solid Waste Management, K. Sasi Kumar & S. Gopi Krishna, Prentice-Hall, 2009

REFERENCES:

1. Management of Municipal Solid Waste, T. V. Ramachandra, The Energy and Resources Institute, TERI, 2009
2. Municipal Solid Waste Management in India, Subhrabaran Das and Korobi Gogoi, VDM Verlag, 2010
3. Solid Waste Engineering, William A. Worrell and P. Aarne Vesilind, 2nd Edition, Cengage Learning, 2000
4. CPHEEO, Manual on Municipal Solid Waste Management, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1CE304) HAZARDOUS WASTE MANAGEMENT

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Solid Waste Management

COURSE OBJECTIVES:

- To understand the concepts of hazardous waste management
- To understand the principle of waste characterization, storage, transport and processing
- To understand the principles of nuclear waste and Hazardous Management (HM) and emergency Response
- To understand the principle and process of landfills and natural resource Damage Assessment & Restoration

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Apply the fundamental concepts of hazardous waste management

CO-2: Apply the knowledge to resolve the problems on storage, transport and processing

CO-3: Apply the knowledge to resolve the practical problems on nuclear waste and HM & emergency response

CO-4: Impart the gained knowledge and skills to resolve the practical problems on landfills and natural resource damage assessment & restoration on field

UNIT-I:

Introduction to Hazardous waste management: Need for hazardous waste management – Sources of hazardous wastes – Effects on community – classification – Storage and collection of hazardous wastes – Problems in developing countries – Protection of public health and the environment.

UNIT-II:

Waste Characterization, Storage, Transport and Processing: Hazardous Waste Characterization– Hazardous waste inventory- Source reduction of hazardous wastes - Handling and storage of Hazardous wastes –Waste Compatibility Chart –

– Hazardous waste treatment technologies – Physical, chemical and thermal treatment of hazardous waste – Solidification – Chemical fixation – Encapsulation – Incineration.

UNIT-III:

Nuclear Waste: Characteristics – Types – Nuclear waste – Uranium mining and processing – Power reactors – Refinery and fuel fabrication wastes – spent fuel –

Management of nuclear wastes – Decommissioning of Nuclear power reactors – Health and environmental effects.

UNIT-IV:

Management of Hazardous Wastes: Identifying a hazardous waste – methods – Quantities of hazardous waste generated – Components of a hazardous waste management plan – Hazardous waste minimization – Disposal practices in Indian Industries – Future challenges - Emergency Response - National Response Team and Regional Response Teams; National Contingency Plan and Regional Contingency Plans; National Response Center; State, Local and Industry Response Systems, Secured Landfill.

UNIT-V:

Natural Resource Damage Assessment and Restoration: Natural Resource Damage Assessment Laws and Regulations - Central and State government agencies - Damage Assessment and Restoration Procedures - Groundwater Hydrology and Contamination Processes - Groundwater Contamination Detection, Analysis and Monitoring - Hazard Ranking System - Remedial Investigations and Feasibility Studies.

TEXT BOOKS:

1. Hazardous Waste Management, Charles A. Wentz., 2nd Edition, McGraw-Hill International, 1995
2. Standard Handbook of Hazardous Waste Treatment and Disposal, Harry M. Freeman, McGraw-Hill, 1997

REFERENCES:

1. Hazardous Waste (Management and Transboundary Movement) Rules, Ministry of Environment and Forests, Government of India
2. Guidelines and Criteria for Hazardous Waste Landfills and Hazardous Waste Treatment Disposal Facilities, Central Pollution Control Board, 2010
3. Hazardous Waste Management, Prof. Anjaneyulu
4. Hazardous Waste Management, M. LaGrega and others, McGraw-Hill Publication

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1CE403) WASTE TO ENERGY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Solid Waste Management, Hazardous Waste Management

COURSE OBJECTIVES:

- To learn about different types of waste as potential fuel and related conversion technologies for energy recovery
- To understand fundamental principles and systems involved in thermal waste processing methods like incineration, gasification etc.
- To study various chemical processes and technologies for conversion of biomass and waste to fuel and other products
- To impart knowledge on biological waste treatment methods and biomass energy technologies

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Ability to identify and characterize suitable waste derived fuels and assess environmental impacts of waste-to-energy systems

CO-2: Ability to analyze key parameters and design considerations for thermal waste processing systems

CO-3: Ability to select appropriate chemical conversion methods for production of hydrocarbons, biodiesel etc. from biomass waste

CO-4: Ability to understand kinetics and design bio-digestion systems for organic waste treatment and energy recovery

UNIT-I:

Introduction to Energy from Waste: Classification of waste as fuel – Agro based, forest residue, industrial waste, MSW – conversion devices – incinerators, gasifiers, digesters, Environmental monitoring system for land fill gases, Environmental impacts; Measures to mitigate environmental effects due to incineration.

UNIT-II:

Thermal Conversion Technologies: Fundamentals of thermal processing – combustion system – pyrolysis system – gasification system – environmental control system – energy recovery system – incineration. Briquetting technology: Production of RDF and briquetted fuel.

UNIT-III:

Chemical Conversion Technologies: Acid & Alkaline hydrolysis – hydrogenation; solvent extraction of hydrocarbons; solvolysis of wood; biocrude; biodiesel production via chemical process; catalytic distillation; transesterification methods; Fischer Tropsch

diesel: chemicals from biomass - various chemical conversion processes for oil, gas, cellulose acetate.

UNIT-IV:

Biological Conversion Technologies: Nutritional requirement for microbial growth – types of microbial metabolism – types of microorganisms – environmental requirements – aerobic biological transformation – anaerobic biological transformation – aerobic composting – low solid anaerobic digestion – high solid anaerobic digestion – development of anaerobic digestion processes and technologies for treatment of the organic fraction of MSW – Biodegradation and biodegradability of substrate; biochemistry and process parameters of bio methanation - other biological transformation processes.

UNIT-V:

Biomass Energy Technologies: Biomass energy resources – types and potential; Energy crops - Biomass characterization (proximate and ultimate analysis); Biomass pyrolysis and gasification; Biofuels – biodiesel, bioethanol, Biobutanol; Algae and biofuels; Pellets and bricks of biomass; Biomass as boiler fuel; Social, economic, and ecological implications of biomass energy.

TEXT BOOKS:

1. Integrated Solid Waste Management, George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, McGraw-Hill International Edition, 1993
2. Energy from Waste - An Evaluation of Conversion Technologies, C. Parker and T. Roberts, Elsevier Applied Science, London, 1985

REFERENCES:

1. Introduction to Biomass Energy Conversion, Capareda S., CRC Press, 2013
2. Thermo-chemical Processing of Biomass: Conversion into Fuels, Chemicals and Power, Brown RC and Stevens C, Wiley and Sons, 2011
3. Biomass Conversion Processes for Energy and Fuels, Sofer, Samir S. (Ed.), Zaborsky, R. (Ed.), Plenum Press, 1981
4. Energy Recovery from Municipal Solid Waste Thermal Conversion Technologies, P. Jayarama Reddy, CRC Press, Taylor & Francis Group, 2016

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1CE404) INTELLIGENT WASTE MANAGEMENT SYSTEM AND RECYCLING SYSTEM

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Solid Waste Management, Hazardous Waste Management, Waste to Energy

COURSE OBJECTIVES:

- To understand the concepts of IWMS Tools
- To understand applications of IWMS Tools in SWM
- To Understand the concepts of Life Cycle Assessment and Carbon-Footprint-Based IWMS
- To understand the applications of IoT, ML, DL, BC and LCA & Carbon Foot Print (CFP) based SWM

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the concepts of IWMS tools
CO-2: Acquire the knowledge to resolve the practical problems with the help of IWMS Tools.
CO-3: To analyze Life Cycle Assessment and Carbon-Footprint-Based IWMS
CO-4: Apply the knowledge of IoT, ML, DL, BC and LCA & CFP to resolve the practical problems in SWM

UNIT-I:
Introduction to IWMS Tools: Introduction – Need of the IWMS – functional elements of IWMS – Ultrasonic Sensor, Arduino Board, GSM Module, Bread Board, Power Supply (Battery) – Jump Wires - Navigation system – Cloud Services - Zero Waste Principle.

UNIT-II:
Applications of IOT in Intelligent Waste Management System: Introductory Applications of IoT, Machine Learning, Deep Learning and Block Chain Technology in Waste Characterization and Source Reduction, Storage, Collection and Transport of Wastes, Waste Processing Technologies and Waste Disposal.

UNIT-III:
Life Cycle Assessment and Carbon-Footprint-Based IWMS: Phases of Life Cycle Assessment: Goal and Scope Definition - Life Cycle Inventory - Life Cycle Impact Assessment – Interpretation - LCA Waste Management Software - Umberto Software.

UNIT-IV:
Sima Pro Software - LCA Assessment Methodology: Life Cycle Inventory Analysis - Life Cycle Impact Assessment – Interpretation - Sensitivity Analysis - Carbon-Footprint-

Based SWM - The Global-Warming Potential Impact - GHG Accounting - GWP Assessment for Solid Waste Management.

UNIT-V:

Engineering Principles and Tools for SWM: Systems Engineering Principles and Tools for SWM - Planning Regional Material Recovery Facilities - Optimal Planning for Solid Waste Collection, Recycling, and Vehicle Routing – Multi attribute Decision Making with Sustainability Considerations - Decision Analysis for Optimal Balance between Solid Waste Incineration and Recycling Programs - Environmental Informatics for Integrated Solid Waste Management - Future Perspectives.

TEXT BOOKS:

1. Sustainable Solid Waste Management - A Systems Engineering Approach, Ni-Bin Chang and Ana Pires, IEEE & John Wiley, Hoboken, 2015
2. Integrated Solid Waste Management, George Tchobanoglous, Hilary Theisen and Samuel A. Vigil, McGraw-Hill International Edition, 1993

REFERENCES:

1. Manual on Municipal Solid Waste Management, CPHEEO, Central Public Health and Environmental Engineering Organization, Government of India, 2014
2. Smart Waste Management- Nutshell, Vishal Gupta, Amazon.com Services LLC, 2017
3. Recyclable Household Waste Management System for Smart Home in IOT, Manpreet Kaur & Dr. Kamaljit Singh Saini, Independently, 2018
4. GoI, Ministry of Environment and Forest and Climate Change, Various Recent Laws and Rules of Solid Waste Management

GREEN ENERGY



Offered by: **ELECTRICAL AND ELECTRONICS ENGINEERING**

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Green Energy	Renewable Energy Sources	**Renewable Energy Technologies**	Energy Storage Technologies	Energy Management and Conservation

1. RENEWABLE ENERGY SOURCES

What we are studying?

The climate landscape is changing rapidly, and new technologies and solutions keep arising to respond to global and local challenges.

Renewable energy sources course makes you discover how Solar Thermal Energy conversion system works. It makes you understand how a Solar Photo voltaic generation system generates electricity. Scope of the course also includes wind energy generation. It also navigates you through Biomass and geo thermal energy generation systems.

Job opportunities:

When it comes to the hottest and most buzzing careers in the 21st century, the majority of people think of hardcore technical domains such as data science, machine learning & artificial intelligence. Few people might also come up with biotechnology (or biosciences). But, quite often people forget about one of the dark horses – the Renewable Energy sector. Even Bill Gates lobbied for the Energy sector as one of the top three career choices for making an impactful career.

Reference:

https://www.stoodnt.com/blog/careers-in-renewable-energy-job-opportunities-fields-of-study-and-top-universities/

2. RENEWABLE ENERGY TECHNOLOGIES

Within Crisis, there are seeds of opportunity..! We are at the wedge of fossil fuel end. After few years you can witness fuel crisis all over the world, as an engineer one must aware of the solution. To design sustainable systems those last for decades, one must use renewable energy as main or auxiliary source of energy. The application may be electrical or mechanical or chemical, one must convert energy from renewable source into electricity for ease of use.

Renewable Energy Technologies course will introduce you to Different types of Solar PV systems and their characteristics. Students will know the functionality of Power Converters such as Inverters etc., through block diagram approach. Fuel cell technology, which is one of the solutions for energy crisis will be discussed in detail. Course will conclude by discussing impact of PV panel production on environment and disposal of it.

Job Opportunities:

Green jobs in the renewable energy sector are expected to touch new figures with 6 digit monthly income. Following link may describe the interesting interdisciplinary careers for budding engineers.

Reference:

https://www.businessinsider.in/slideshows/miscellaneous/21-high-paying-careers-for-people-who-want-to-save-the-planet-and-also-have-job-security/slidelist/70677782.cms#slideid=70677804

3. ENERGY STORAGE TECHNOLOGIES

Battery technology is an essential skill for every engineer in present scenario. Course on energy storage technologies will enable student to, Design storage system Residential loads integrated to Renewable and storage systems for Electric Vehicles. It will make student to understand various electrochemical storages such as Lead acid, Li Ion cell etc. and their characteristics. The course enables student to compare non-electric, electric storage systems and analyze application of them to various domains.

Job opportunities:

Upon successful completion of course student will enhance the chances of getting into EV industry, which almost open fact. Job Profiles include

i. Battery algorithms engineer
ii. Battery management engineer
iii. Battery modeling expert
iv. Design engineer – EV

4. ENERGY MANAGEMENT AND CONSERVATION

Energy Management And Conservation course is mainly intended to monitor Energy consumption of industries and to manage energy systems. This course also deals with methods of improving efficiency of electric machinery and to design a good illumination system. It also teaches student calculate pay back periods for energy saving equipment.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EE301) RENEWABLE ENERGY SOURCES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the role of various renewable energy sources
- To know the solar thermal & PV system conversions
- To understand the energy conversion principles of wind & biomass
- To learn energy extraction process of ocean & geo thermal resources

COURSE OUT COMES: After completion of the course, the student should be able to
CO-1: Understand Solar Thermal Energy conversion principles
CO-2: Understand Solar Photo voltaic system
CO-3: Analyze wind & biomass energy conversion system
CO-4: Understand the geo thermal & ocean energy conversion principles

UNIT-I:

Principles of Solar Radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, The apparent motion of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sunshine, solar radiation data.

UNIT-II:

Solar Thermal Energy Conversion: Types of solar thermal collectors-Evaluation of the performance of solar collectors- Selective coatings for collectors and glazing, Solar heating systems -Individual and collective solar water heaters.
Concentric Solar Power Plants- Concentrating systems- Components for production of heat and conversion into electricity.

UNIT-III:

Solar PV Conversion: The PV Cell-Crystalline Solar cells-Thin film solar cell, Module, Array, Equivalent Electrical circuit, Open circuit voltage and Short circuit current, I-V, P-V Corves, Array design- Sun angle- effect of Temperature-Sun tracking, PV system components

UNIT-IV:

Wind & Bio-Mass Energy: Basic Principle of wind energy conversion, Nature of wind. Wind turbine types & construction. Power in the wind- Betz criteria, performance characteristics. Speed Control strategies of wind turbine-Yaw control & Pitch control. working of Induction generator (Principle only).

Sources of Biomass & usable forms, Principles of Bio-Conversion-Photosynthesis, Biomass conversion - Anaerobic Fermentation & various stages of digestion process. Bio-gas plants-Floating drum, Fixed dome types.

UNIT-V:

Geothermal & Ocean Energy: Resources, types of wells, methods of harnessing the energy-Dry steam, wet steam-single Flashed steam-binary cycle power plants. OTEC-conversion technology-Claude cycle, Andreson cycle. Tidal energy-Origin and nature, tidal energy conversion schemes- single basin, double basin. wave energy: wave conversion devices-Heaving float type, pitching type, oscillating water column. Micro-hydro power generation-Layout.

TEXT BOOKS:

1. Non-Conventional Energy Sources, B. H. Khan, Mc Graw Hill Publishers
2. Renewable Energies, John Claude Sabbonedere, ISTE & John Wiley, 2007
3. Renewable Energy Resources, Twidell & Wier, CRC Press (Taylor & Francis), 2016

REFERENCE:

1. Wind & Solar Power Systems, Mukund R. Patel, CRC Press, 2003

ONLINE RESOURCES:

1. https://archive.nptel.ac.in/courses/121/106/121106014/
2. https://onlinecourses.nptel.ac.in/noc21_ch11/preview

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1EE302) RENEWABLE ENERGY TECHNOLOGIES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Renewable Energy Sources

COURSE OBJECTIVES:

- To provide necessary knowledge about the modeling, design and analysis of various PV systems
- To show that PV is an economically viable, environmentally sustainable alternative to the world's energy supplies
- To understand the power conditioning of PV and WEC system's power output

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Model, analyze and design various photovoltaic systems
CO-2: Know the feasibility of PV systems as an alternative to the fossil fuels
CO-3: Design efficient stand alone and grid connected PV and WEC power systems

UNIT-I:

Behavior of Solar Cells-Basic Structure and Characteristics: Types - equivalent circuit-modeling of solar cells including the effects of temperature, irradiation and series/shunt resistances on the open-circuit voltage and short-circuit current-Solar cell arrays- PV modules-PV generators- shadow effects and bypass diodes- hot spot problem in a PV module and safe operating area.

UNIT-II:

Types of PV Systems: Grid connected PV systems- Net-metering- Estimation of actual a.c. output power from PV systems.
Stand-alone system- Approach to designing an off-grid PV system with battery- with battery and diesel generator- Stand-alone solar water pumping system- Sizing/designing PV water pumping system- Procedure for decommissioning of PV plant.

UNIT-III:

Power Converters for PV and Wind: Basic switching devices, AC-DC Rectifier, DC-AC inverter (Basic operation), DC DC converter - Buck, Boost converters Basic operation, Battery charger (Basic operation), grid interface requirements in Renewable energy integration

UNIT-IV:

Maximum Power Point Tracking: Various Sources of Losses is PV system, Charge Control in Battery Backed PV Systems, Maximum Power Point Tracking (MPPT)- Role of DC-DC

converter in MPP tracking- Perturb and Observe Method-pseudo program for P&O method, Advanced Issues & Algorithms- search steps-variable step size algorithm.

UNIT-V:

Fuel Cell Technology: History of Fuel cells, Fuel Cell Vehicle Emissions, Hydrogen safety factors, Principle of Operation- Fuel cell Model- cell voltage, Power and efficiency of fuel cell, Various types of fuel cells, Various storage systems for Hydrogen, Applications.

TEXT BOOKS:

1. Handbook of Renewable Energy Technology, Ahmed F. Zobaa, World Scientific Publishing Company, 2011
2. Wind and Solar Power Systems Design, Analysis, and Operation, Patel M. R., 2nd Edition, CRC Press, New York, 2005
3. Practical Handbook of Photovoltaics - Fundamentals and Applications, Augustin McEvoy, Tom Markvart, T. Markvart, L. Castaner, Elsevier Science, 2003

REFERENCE:

1. Electric Powertrain - Energy Systems, Power Electronics & Drives for Hybrid, Electric & Fuel Cell Vehicles, Goodarzi, Gordon A., Hayes, John G., John Wiley & Sons, 20

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1EE401) ENERGY STORAGE TECHNOLOGIES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Renewable Energy Sources, Renewable Energy Technologies

COURSE OBJECTIVES:

- To understand Techno economic analysis of various storage systems
- To know Feasibility of different storage technologies
- To learn operation of several electrochemical storage systems
- To understand Functionality of non-electric storage systems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Design storage system Residential loads integrated to Renewable and storage systems for Electric Vehicles
CO-2: Understand various electrochemical storage system
CO-3: Understand terminology and characteristics of Electro chemical systems
CO-4: Compare non-electric and electric storage system
CO-5: Analyze application of storage systems to various domains

UNIT-I:

Techno-economic Analysis of Various Energy Storage Technologies: Electrical Energy Storage (EES)-Definition-Role, Energy storage components, Applications and Technical support, Financial Benefits of EES, Techno economic analysis, Classification of Energy Storage systems, Comparison

UNIT-II:

Estimation of Energy Storage and Feasibility Analysis: Background-Solar Power-Wind Power (Brief discussion), Estimation-daily residential load-daily available solar energy-daily available wind energy-Importance, Estimation of Storage sizing- Steps for Storage sizing- Grid connected residential PV-grid connected residential Wind-hybrid system, Feasibility analysis of Storage systems- Various Terms involved- Case study of comparison between Off grid and grid connected systems

UNIT-III:

Electro Chemical Storage: Standard Batteries- Lead Acid- VRLA - Ni-cd, Modern Batteries- Ni MH- Li Ion, Flow Batteries – Br2 Zn-Vanadium Redox, Battery composition, construction, Principle of operation, Types, Advantages and disadvantages to above batteries.

UNIT-IV:

Terminology & Characteristics: Battery Terminology, Capacities, Definitions of various characteristics, Different States of charge-DOD-SOC-SOE-SOH-SOF, Resistance, Battery Design, Battery Charging, Charge Regulators, Battery Management, General Equivalent Electrical Circuit, Performance Characteristics

UNIT-V:

Non-Electric Storage Technologies: Flywheel, Energy Relations, Flywheel System Components, Benefits of Flywheel over Battery, Superconducting Magnet Energy Storage, Compressed Air Energy storage, Overview Thermal Energy Storage. Capacitor bank storage, Comparison of storage Technologies

Applications: Domains of applications of Energy storage- Starter-Traction-stationary-mobile or nomadic, Review of storage requirements, Storage for Electric Vehicle application, Storage for hybrid vehicle-Regenerative Braking-Super capacitor-hybrid capacitor

TEXT BOOKS:

1. Energy Storage Technologies and Applications, Ahmed Faheem Zobaa, InTech Publishers, 2013
2. Lithium Batteries and Other Electrochemical Storage Systems, Christian Glaize, Sylvie Geniès, ISTE & John Wiley, 2013
3. Wind and Solar Power Systems, Mukund R. Patel, 2nd Edition, CRC Press, 2006

REFERENCE:

1. Rechargeable Batteries Applications Handbook, EDN Series for Design Engineers, Elsevier

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1EE402) ENERGY MANAGEMENT AND CONSERVATION

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Renewable Energy sources, Renewable Energy Technologies, Energy Storage Technologies

COURSE OBJECTIVES:

- To understand the necessity of conservation of Energy
- To Know the methods of Energy management
- To identity the factors to increase the efficiency of electrical equipment
- To know the benefits of carrying out energy Audits

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Conduct Energy Audit of industries
CO-2: Manage energy Systems
CO-3: Specify the methods of improving efficiency of electric motor
CO-4: Improve power factor and to design a good illumination system
CO-5: Calculate pay back periods for energy saving equipment

UNIT-I:

Basic Principles of Energy Audit: Energy audit- definitions, concept, types of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes- Energy audit of industries- energy saving potential, energy audit of process industry, thermal power station, building energy audit

UNIT-II:

Energy Management: Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting- Energy manager, Qualities and functions, language, Questionnaire - check list for top management

UNIT-III:

Energy Efficient Motors: Energy efficient motors, factors affecting efficiency, loss distribution, constructional details, characteristics - variable speed, variable duty cycle systems, RMS hp- voltage variation-voltage unbalance- over motoring- motor energy audit

UNIT-IV:

Power Factor Improvement, Lighting and Energy Instruments: Power factor – methods of improvement, location of capacitors, p.f with non-linear loads, effect of harmonics on p.f., p.f motor controllers – simple problems

Lighting Energy Audit and Energy Instruments: Good lighting system design and practice, lighting control, lighting energy audit - Energy Instruments- watt meter, data loggers, thermocouples, pyrometers, flux meters, tongue testers, application of PLC's

UNIT-V:

Economic Aspects and Analysis: Economics Analysis-Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis.

Analysis of Energy Efficient Motor: Energy efficient motors- calculation of simple payback method, net present worth method- Power factor correction, lighting - Applications of life cycle costing analysis, return on investment.

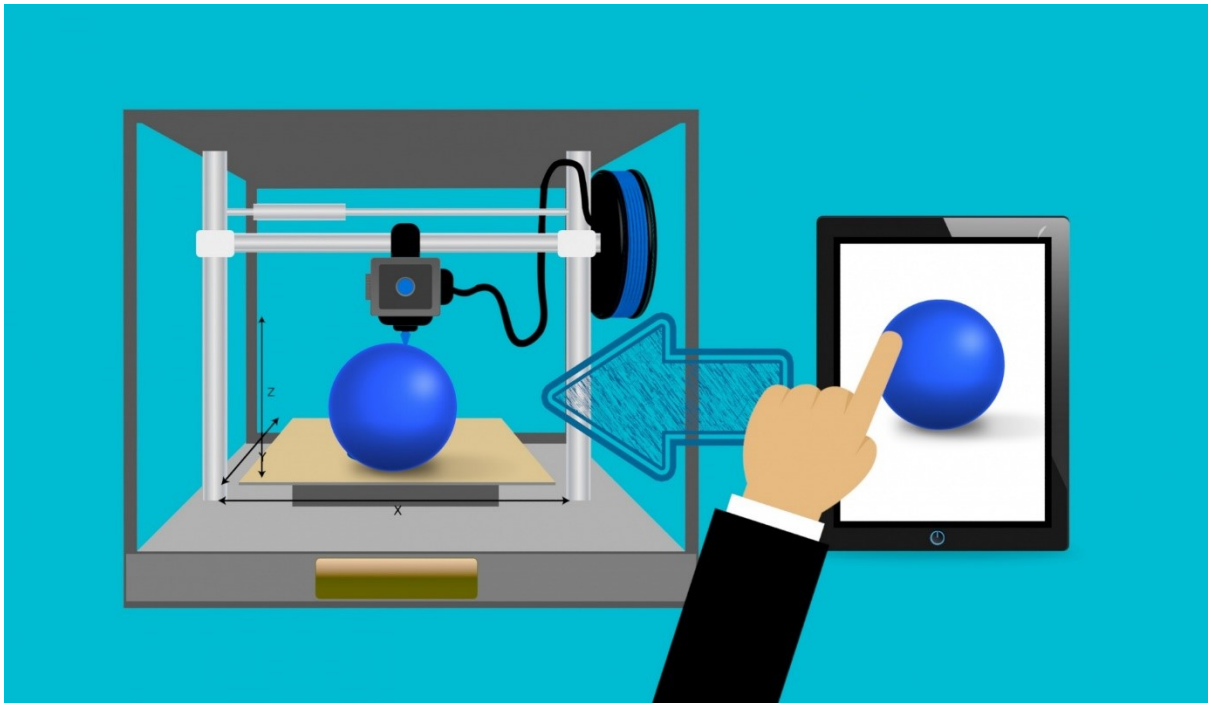
TEXT BOOKS:

1. Energy Management, W. R. Murphy & G. Mckay, Butterworth-Heinemann Publications
2. Energy Management, Paul o' Callaghan, 1st Edition, McGraw Hill Book Company, 1998

REFERENCES:

1. Energy Efficient Electric Motors, John C. Andreas, 2nd Edition, Marcel Dekker Inc. Ltd., 1995
2. Energy Management Handbook, W. C. Turner, John Wiley and Sons
3. Energy Management and Good Lighting Practice: Fuel Efficiency Booklet12-EEO

3D PRINTING AND DESIGN



3D PRINTING AND DESIGN

Offered by: **MECHANICAL ENGINEERING**

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
3D Printing and Design	Elements of CAD	**Introduction to 3D Printing**	3D Printing - Machines, Tooling & Systems	Reverse Engineering

3D PRINTING AND DESIGN

3D Printing is a process for making a physical object from a three-dimensional digital model by laying down many successive thin layers of a material. It brings a digital CAD model into its physical form by adding layer by layer of materials. Thus called 'Additive Manufacturing'. It is the opposite of subtractive manufacturing i.e., removing material from an object using a mechanical machine. It enables to produce complex shapes using less material than traditional manufacturing methods. There are several different techniques to 3D print an object. It saves time through prototyping and is also responsible for manufacturing impossible shapes. Due to these, it has many applications in different fields like consumer products (eyewear, footwear, design, furniture, industrial products (manufacturing tools, prototypes, functional end-use parts, dental products, prosthetics, architectural scale models, reconstructing fossils, replicating ancient artefacts, reconstructing evidence in forensic pathology etc.

3D printing has good prospects from career perspective. Various positions that could be available are CAD designers, engineers, technical developers, software developers, electronics engineers, etc.

This OE track consists of 04 courses and is designed with an objective to provide an overview of all the constituents of 3D Printing starting from elements of CAD that are needed to create CAD models, followed by basics of 3D Printing required for setting the parameters, then the machines and tools used in 3D Printing for thorough understanding of systems and processes and finally the reverse engineering of 3D printing models from actual objects.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1ME301) ELEMENTS OF CAD

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the basics of CAD and the devices used
- To know the various types of modeling used in CAD
- To appreciate the concept of feature-based modeling and geometric transformations
- To comprehend the assembly modeling procedure and data exchange formats

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Use the fundamentals of CAD and its devices in design applications

CO-2: Identify the types of CAD modeling techniques and utilize them

CO-3: Evaluate the objects or models using geometric transformations and manipulations

CO-4: Perform the assembly modeling and asses the various data exchange formats

UNIT-I:

Fundamentals of CAD: Introduction to Computer-Aided Design (CAD), Design process, Application of Computers for Design and Manufacturing, Benefits of CAD, Overview of CAD / CAM Hardware, Display devices, Hard copy devices. Design Cycle, Raster scan graphics, coordinate systems.

UNIT-II:

Geometric Modeling: Introduction to Geometric Model, Types of modeling, Curve representation.

Wireframe Modeling: Introduction, advantages, limitations and applications, Wireframe entities-analytic and synthetic, Basic definitions of Cubic, Bezier, and B-spline curves.

UNIT-III:

Surface Modeling: Introduction, advantages, limitations and applications, surface entities, Basic definitions of analytic surfaces - planar surface, ruled surface, tabulated cylinder, surface of revolution; Basic definitions of synthetic surfaces - Bezier surface, B-spline surface.

UNIT-IV:

Solid Modeling: Introduction, advantages, limitations and applications, Solid Entities, Solid Representation schemes – Boundary Representation (B-Rep) scheme, Constructive Solid Geometry (CSG) scheme. Feature-based Modeling: Introduction,

Feature entities, Feature representation, 3D Sketching, Parameter, Relations and Constraints.

Product Data Exchange: Introduction, Graphics Standards, Types of translators, Importance of formats in 3D Printing, Data exchange formats - IGES, STEP and STL.

UNIT-V: Geometric Transformations: Introduction to 2D & 3D transformations, Brief treatment on Translation, Scaling, Reflection, and Rotation using Homogeneous and concatenated transformations Manipulations: Displaying, Segmentation, Trimming, Intersection, Projection. Assembly Modeling: Introduction, Assembly modeling, Assembly Tree, Mating Conditions, Bottom-up and Top-down approach.

TEXT BOOKS:

1. CAD/CAM Theory and Practice, Ibrahim Zeid, Tata McGraw-Hill. 2009
2. CAD/CAM: Concepts and Applications, Alavala, Prentice Hall International, 2018
3. Mastering CAD/CAM, Ibrahim Zeid, Tata McGraw-Hill.2018

REFERENCES:

1. CAD/CAM-Computer Aided Design and Manufacturing, Mikell P. Groover, E. W. Zimmers, Pearson Education/Prentice Hall.2018
2. CAD/CAM Principles and Applications, P. N. Rao, Tata McGraw-Hill, 2017
3. CAD / CAM / CIM, Radhakrishnan and Subramanian, Pearson Education, 2000

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1ME302) INTRODUCTION TO 3D PRINTING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Elements of CAD

COURSE OBJECTIVES:

- To understand the need of 3D Printing
- To understand about the process chain involved in 3D Printing
- To know about the Material extrusion, sheet lamination, Liquid and jetting based techniques
- To know about the data formats and post processing methods involved in 3D Printing

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Summarize the importance of 3D Printing

CO-2: Explain the process chain involved in 3D Printing

CO-3: Explain about Material extrusion, sheet lamination, Liquid and jetting based techniques

CO-4: Apply the knowledge gained in data formats and post-processing methods

UNIT-I:

Introduction to 3D Printing: Introduction to 3D Printing, 3D Printing evolution, Classification of 3D Printing, Distinction between 3D Printing & CNC Machining, Advantages of 3D Printing, Artificial Intelligence and IOT in 3D Printing.

UNIT-II:

Generalized 3D Printing Process Chain: Process chain, Materials for 3D Printing, Design for 3D Printing and Overview of Medical Modeling & Reverse Engineering.

UNIT-III:

Material Extrusion and Sheet Lamination Techniques: Introduction, basic principles, Fused Deposition Modeling, Laminated Object Manufacturing (LOM), Advantages and Applications

UNIT-IV:

Liquid and Three-Dimensional Jetting Techniques: Stereolithography (SLA), Material Jetting, Binder Jetting, Advantages and Applications.

UNIT-V:

3D Printing Data Formats and Post Processing: STL Format, STL File Problems, Brief Overview of other translations - IGES File, HP/GL File and CT data.

Post-Processing: Introduction, Support Material Removal, Surface Texture Improvements, Accuracy Improvements, Aesthetic Improvements.

TEXT BOOKS:

1. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Ian Gibson, David W Rosen, Brent Stucker, Springer, 2010
2. Rapid Prototyping: Principles & Applications, Chuaa Chee Kai, Leong Kah Fai, World Scientific, 2010

REFERENCES:

1. Rapid Prototyping: Theory and Practice, Ali K. Karmani, Emand Abouel Nasr, Springer, 2006
2. Understanding Additive Manufacture: Rapid Prototyping, Rapid Tooling and Rapid Manufacture, Andreas Gebhardt, Hanser Publishers, 2013
3. Rapid Manufacturing: Advanced Research in Virtual and Rapid Prototyping, Hopkinson, N. Haque, and Dickens, Taylor and Francis, 2007

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1ME401) 3D PRINTING - TOOLING AND SYSTEMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Elements of CAD, Introduction to 3D Printing

COURSE OBJECTIVES:

- To understand the need of prototyping
- To understand about the liquid and solid based 3D printing systems
- To know about the Laser based 3D Printing Systems
- To know about the Rapid Tooling and applications of 3D Printing

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Summarize the importance of Prototyping
CO-2: Explain the process involved in liquid and solid based 3D printing systems
CO-3: Explain the laser-based 3D Printing Systems
CO-4: Adapt the knowledge gained in rapid tooling and applications of 3D Printing

UNIT-I:
Introduction: Prototype Fundamentals, Types of Prototypes, Roles of Prototypes, Phases of Development Leading to Rapid Prototyping, Fundamentals of Rapid Prototyping.

UNIT-II:
Liquid Based 3D Printing Systems: Introduction, Principles, Processes and Applications of Solid Ground Curing, Material Jetting & Binder Jetting

UNIT-III:
Solid Based 3D Printing Systems: Introduction, Principles, Processes and Applications of Fused Deposition Modelling (FDM), Paper Lamination Technology (PLT) and Laminated Object Manufacturing (LOM)

UNIT-IV:
Laser Based 3D Printing Systems: Selective Laser Sintering (SLS)-Principle, Process and Applications, Three-Dimensional Printing- Principle, Process and Applications, Laser Engineered Net Shaping (LENS)- Principle, Process and Applications, Overview of Direct Energy Deposition.

UNIT-V:
Rapid Tooling and Applications of 3D Printing: Introduction and need for Rapid Tooling, Overview of Indirect and Direct Processes, Applications

Applications of 3D Printing: Brief overview of Applications in Design, Engineering, Aerospace Industry, Automotive Industry and Biomedical Industry

TEXT BOOKS:

1. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Ian Gibson, David W Rosen, Brent Stucker, Springer, 2010
2. Rapid Prototyping: Principles & Applications, Chuaa Chee Kai, Leong Kah Fai, World Scientific, 2010

REFERENCES:

1. Rapid Prototyping: Theory and Practice, Ali K. Karmani, Emand Abouel Nasr, Springer, 2006
2. Understanding Additive Manufacture: Rapid Prototyping, Rapid Tooling and Rapid Manufacture, Andreas Gebhardt, Hanser Publishers, 2013
3. Rapid Manufacturing: Advanced Research in Virtual and Rapid Prototyping, Hopkinson, N. Haque, and Dickens, Taylor and Francis, 2007

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1ME402) REVERSE ENGINEERING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Elements of CAD, Introduction to 3D Printing, 3D Printing Machines, Tooling & Systems

COURSE OBJECTIVES:

- To understand the Reverse Engineering (RE) and its methodologies
- To comprehend Data Acquisition Techniques for Reverse Engineering
- To understand Integration Between Reverse Engineering and Additive manufacturing
- To know the applications of reverse engineering

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Basic understanding of Reverse Engineering and its methodologies

CO-2: Understanding the data acquisition techniques for reverse engineering

CO-3: Understanding of amalgamation Between Reverse Engineering and Additive manufacturing

CO-4: Adapt the knowledge gained in reverse engineering for various applications

UNIT-I:

Introduction to Reverse Engineering: Scope and tasks of RE, Process of duplicating, Definition and use of RE, The Generic Process, History of Reverse Engineering, Overview of Applications

UNIT-II:

Methodologies and Techniques: Potential for Automation with 3-D Laser Scanners, Computer-aided (Forward) Engineering, Computer-aided Reverse Engineering, Computer Vision and Reverse Engineering

UNIT-III:

Data Acquisition Techniques: Contact Methods: Point-to-point sensing with touch-trigger probes, analogue sensing with scanning probes, Coordinate Measurement Machine (CMM)-CNC machines and CMM- Articulated Arms, Noncontact Methods: Triangulation, Structured Light, and Destructive Method

UNIT-IV:

Integration Between Reverse Engineering and Additive manufacturing: Modeling Cloud Data, Integration of RE and AM for Layer-based Model Generation, Adaptive Slicing Approach for Cloud Data Modeling.

UNIT-V:

Applications:

Automotive: Workflow for Automotive Body Design, Reverse Engineering for Better Quality

Aerospace: RE in Aerospace–A Work in Progress, Reducing Costs of Hard Tooling

Medical: Orthodontics, Hearing Instruments, Knee Replacement

TEXT BOOKS:

1. Reverse Engineering: An Industrial Perspective, V. Raja and K. Fernandes, Springer-Verlag
2. Reverse Engineering, K. A. Ingle, McGraw-Hill
3. Rapid Prototyping, Ali Kamrani, Emad Nasr, Springer, 2006

REFERENCES:

1. Smart Product Engineering, Michael Abramovici, Rainer stark, Springer Berlin Heidelberg
2. Product Design: Techniques in Reverse Engineering and New Product Development, K. Otto and K. Wood, Prentice Hall, 2001

INTERNET OF THINGS



INTERNET OF THINGS

Offered by:

ELECTRONICS AND COMMUNICATION ENGINEERING

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Internet of Things	Sensors Transducers and Actuators	**Introduction to Microcontrollers and Interfacing**	Fundamentals of Internet of Things	Wireless Sensor Networks

INTERNET OF THINGS

Internet of Things: The IoT creates opportunities for more direct integration of the physical world into computer-based systems, resulting in efficiency improvements, economic benefits, and reduced human exertions. *IoT* **is changing how we live, work, travel, and do business. It is even the basis of a new industrial transformation, known as** Industry 4.0**, and key in the** digital transformation **of organizations, cities, and society overall.** The IoT track helps students to learn about how to

- Learn different protocols and connectivity technologies used in IOT.
- Expose the various sensors and transducers for measuring mechanical quantities.
- Develop simple applications using 8051 microcontrollers.
- Understand the key routing protocols for sensor networks and their design issues.

Some of the more common career paths in the Internet of Things path are

- IoT Developer. ...
- IoT Architect…
- IoT Embedded Systems Designer…
- IoT Solutions Engineer…
- Professional in Sensors and Actuators…
- Embedded Programs Engineer…
- Safety Engineer…

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EC301) SENSORS TRANSDUCERS AND ACTUATORS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To expose the students to various sensors and transducers for measuring mechanical quantities
- To make the students familiar with the specifications of sensors and transducers
- To make the students identify for various sensors and transducers for various applications
- To expose the students to various actuators

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Familiar with classification and characteristics of various sensors and transducers

CO-2: Familiar with the principle and working of various sensors and transducers

CO-3: Familiar with the principle and working of various actuators

CO-4: Able to select proper Transducer / Sensor for a specific measurement application

CO-5: Able to select proper Actuator for a specific measurement application

UNIT-I:

Primary Sensing Elements and Transducers: Mechanical devices as primary detectors, mechanical spring devices, pressure sensitive primary devices, flow rate sensing elements, Transducers-electrical Transducers, classification of Transducers, characteristics and choice of Transducers, factors influencing the choice of Transducers.

UNIT-II:

Electric Transducers: Resistive transducers, Potentiometers, Strain gauges, Types of Strain gauges, Resistance thermometers, Thermistors, Thermocouples, variable Inductance Transducers, Linear Variable Differential Transformer, Synchros, Resolvers, Capacitive Transducers, Piezo electric Transducers.

UNIT-III:

Magnetic & Optical Transducers: Hall Effect Transducers, Magneto resistors, Magneto-Elastic and Magneto-Strictive Transducers, Opto electronic Transducers, Digital Encoding Transducers, Photo Optic Transducers.

UNIT-IV:

Smart Sensors & Applications: Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing, Data Communication, Standards for Smart Sensor Interface, the Automation. Sensors

Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing, Sensors for environmental Monitoring.

UNIT-V:

Pneumatic and Hydraulic Actuators: Pneumatic and Hydraulic Actuation Systems-Actuation systems, Pneumatic and hydraulic systems, Rotary actuators.

Mechanical and Electrical Actuators: Mechanical Actuation Systems-Types of motion, Kinematic chains, Cams, Gears, Ratchet and pawl, Belt and chain drives, Electrical Actuation Systems, Electrical systems, Mechanical switches, Solid-state switches, Solenoids, D.C. Motors, A.C. Motors, Stepper motors.

TEXT BOOKS:

1. A Course in Electrical and Electronic Measurements and Instrumentation, A. K. Sawhney, Puneet Sawhney,19th Edition, 2011
2. Sensors and Transducers, D. Patranabis, 2nd Edition, PHI Learning Private Limited, 2013
3. Mechatronics, W. Bolton, 7th Edition, Pearson Education Limited, 2018

REFERENCES:

1. Sensors and Actuators, Patranabis, 2nd Edition, PHI, 2013

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1EC302) INTRODUCTION TO MICROCONTROLLERS AND INTERFACING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Sensors Transducers and Actuators

COURSE OBJECTIVES:
- To familiarize fundamental concepts of digital systems
- To understand programming concepts
- To develop simple applications using microcontrollers

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand basic computing concepts
CO-2: Know the architecture and internal peripherals of 8051 microcontroller
CO-3: Develop knowledge for programming 8051 microcontroller
CO-4: Interface peripherals to ATMEGA328 microcontroller
CO-5: Understand the basic principles and techniques of embedded system design

UNIT-I:
Introduction to Computing: Numbering and Coding Systems: Binary, Decimal, Octal, Hexadecimal and conversions, Binary and Hexadecimal Arithmetic, Complements, Binary codes, Alphanumeric codes, Inside the Computer

UNIT-II:
8051 Microcontroller: Microprocessors Vs Microcontrollers, Architecture and Programming Model of 8051, Special Function Register formats, Memory Organization, Timers and Counters- Operating modes, Serial port, Interrupts

UNIT-III:
8051 Programming in C: Data types, software delay generation, Logical operations, Accessing code and data space in 8051, I/O port programming, Timer/counter programming.
Serial IO modes and their programming in C, interrupts programming in C: serial, timer and external interrupts.

UNIT-IV:
Introduction to Arduino: Features of Arduino, Arduino components and IDE, Pin Configuration of ATMEGA328 microcontroller.
Interfacing: Seven Segment Display, Pulse Width Modulation, Analog to Digital Converter, Stepper Motor, Wireless connectivity to Arduino. Case study: From BT To WiFi: Creating WiFi Controlled Arduino Robot Car.

UNIT-V:

Embedded System Design: Embedded system - Definition, Characteristics of embedded computing applications, Design challenges, Requirements, Specification, Architecture design, Designing hardware and software components, system integration, Design example: Model train controller.

TEXT BOOKS:

1. The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, 2nd Edition, 2005.
2. Computers as Components: Principles of Embedded Computing System Design, Wayne Wolf, Morgan kaufmann Publishers, 2001

REFERENCES:

1. Digital Design, Morris Mano, PHI, 3rd Edition, 2006
2. The 8051 Microcontroller: Programming, Architecture, Ayala & Gadre, 3rd Edition, Cengage Publications, 2008
3. Embedded Systems: Architecture, Programming and Design, 2nd Edition, TMH

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1EC401) FUNDAMENTALS OF INTERNET OF THINGS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Sensors Transducers and Actuators, Introduction to Microcontrollers and Interfacing

COURSE OBJECTIVES:
- To understand the basics of Internet of Things
- To learn about IOT and M2M
- To understand Cloud of things
- To learn different applications with IoT

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the concepts of Internet of Things
CO-2: Understand the IoT, M2M
CO-3: Understand the concepts Cloud of things
CO-4: Apply IOT to different applications in the real world
CO-5: Understand the role of IoT in various domains of Industry

UNIT-I:
Introduction to Internet of Things: Definition and Characteristics of IoT, Physical Design of IoT, Logical Design of IoT-IoT Functional Blocks, IoT Communication Models, IoT Communication API's.

UNIT-II:
IoT enabling Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Deployment Templates.

UNIT-III:
IoT Platforms Design Methodology: Introduction, IoT Design Methodology- Purpose & Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specification, IoT Level Specifications, Functional view Specification, Operational View Specification, Device & component Integration, Application Development

UNIT-IV:
IoT and M2M: Introduction, M2M, Difference between IoT and M2M – Communication Protocols, Machines in M2M Vs things in IoT, Hardware Vs Software emphasis, Data collection and analysis, applications, SDN and NFV for IoT

UNIT-V:

Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture.

Domain specific applications of IoT: Applications of IoT– Home, Health, Environment, Energy, Agriculture, Industry and Smart City.

TEXT BOOKS:

1. Internet of Things: A Hands-On Approach, Vijay Madisetti, ArshdeepBahga, Universities Press, 2015
2. The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi, Wiley, 2012
3. The Internet of Things in the Cloud: A Middleware Perspective, Honbo Zhou, CRC Press, 2012

REFERENCES:

1. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, River Publishers, 2013
2. Menno Huisman, Building the Internet of Things, Sara Cordoba, Wimer Hazenberg, BIS Publishers. 2011
3. Designing the Internet of Things, Adrian Mcewen, Hakin Cassimally, John Wiley and Sons, 2015

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1EC402) WIRELESS SENSOR NETWORKS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Sensors Transducers and Actuators, Introduction to Microcontrollers and Interfacing, IoT Protocols and its applications

COURSE OBJECTIVES:

- To expose basic concepts of wireless sensor network technology
- To study medium access control protocols and various issues in a physical layer
- To understand the key routing protocols for sensor networks and their design issues
- To understand sensor management in networks and design requirements

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Appreciate various design issues of wireless sensor networks

CO-2: To understand the fundamentals of wireless sensor networks and its application to critical real time scenarios.

CO-3: Understand the hardware details of different types of sensors and select the application specific sensor

CO-4: Understand radio standards and communication protocols to be used for wireless sensor networks

UNIT-I:

Introduction: Overview of sensor network architecture and its applications, sensor network comparison with Ad Hoc Networks, Sensor node architecture with hardware and software details.

UNIT-II:

Hardware: Examples like mica2, micaZ, telosB, cricket, Imote2, tmote, btnode, and Sun SPOT, Software (Operating Systems): TinyOS, MANTIS, Contiki, and RetOS.

UNIT-III:

Programming Tools: C, nesC. Performance comparison of wireless sensor networks simulation and experimental platforms like open source (ns-2) and commercial (QualNet, Opnet, NetSim)

UNIT-IV:

Overview of Sensor Network Protocols (Details of at least 2 important protocol per layer): Physical, MAC and routing/ Network layer protocols, node discovery protocols, multi- hop and cluster-based protocols, Fundamentals of 802.15.4, Bluetooth, BLE (Bluetooth low energy), UWB.

UNIT-V:

Data Dissemination and Processing: Differences compared with other database management systems, Query models, In-network data aggregation, data storage; query processing.

Specialized Features: Energy preservation and efficiency; security challenges; Fault tolerance, Issues related to Localization, connectivity and topology, Sensor deployment mechanisms; coverage issues; sensor Web; sensor Grid, Open issues for future research, and Enabling technologies in wireless sensor network.

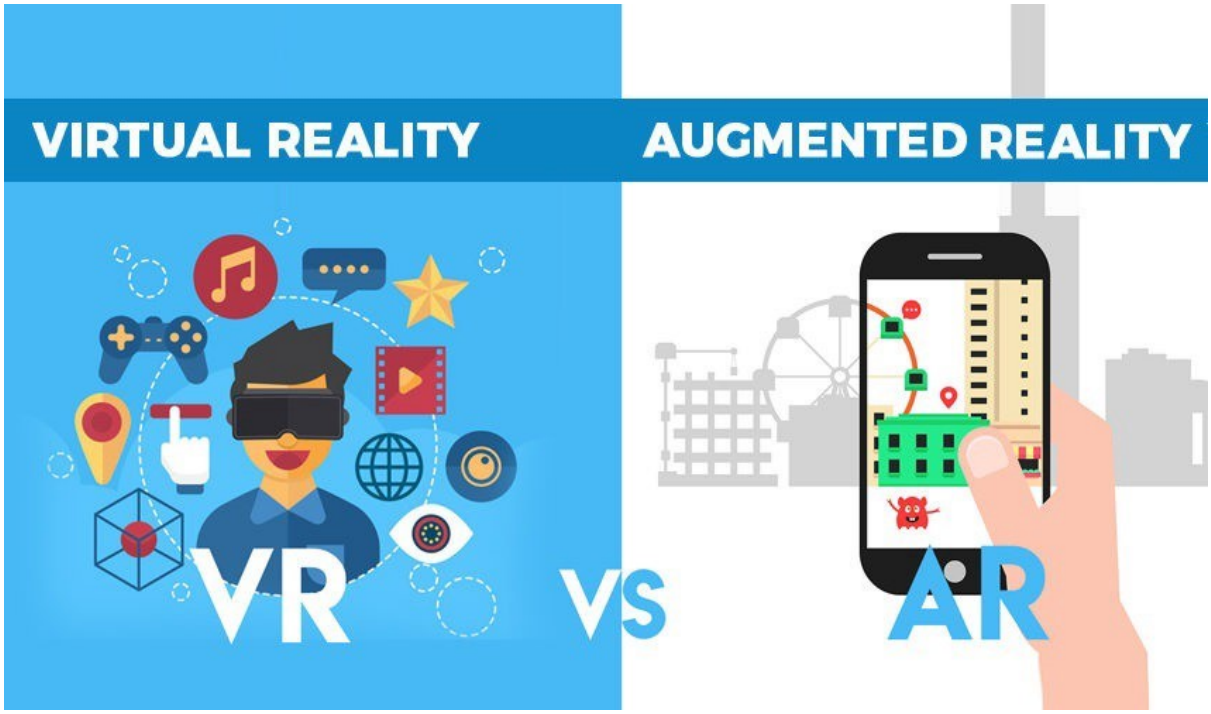
TEXT BOOKS:

1. Wireless Sensor Networks Technology, Protocols, and Applications, Kazem Sohraby, Daniel Minoli, Taieb Znati, John Wiley & Sons, 2007
2. Protocols and Architectures for Wireless Sensor Networks, H. Karl and A. Willig, John Wiley & Sons, India, 2012
3. Wireless Sensor Networks, C. S. Raghavendra, K. M. Sivalingam, and T. Znati, Editors, 1st Indian Reprint, Springer Verlag, 2010

REFERENCES:

1. Wireless Sensor Networks: An Information Processing Approach, F. Zhao and L. Guibas, Morgan Kaufmann, 1st Indian Reprint, 2013
2. Wireless Sensor Network and Applications, Yingshu Li, My T. Thai, Weili Wu, Springer Series on Signals and Communication Technology, 2008
3. Principles of Mobile Communications, Gordon L. Stuber, 2nd Edition, Springer International, 2001

AUGMENTED REALITY (AR)/VIRTUAL REALITY (VR)



AUGMENTED REALITY (AR)/VIRTUAL REALITY (VR)

Offered by: **ELECTRONICS AND COMMUNICATION ENGINEERING**

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Augmented Reality (AR)/ Virtual Reality (VR)	Introduction to C Sharp	**Introduction to Signal Processing**	Introduction to Image & Video Processing	Fundamentals of Augmented Reality & Virtual Reality

OE TRACK :: AUGMENTED REALITY (AR) / VIRTUAL REALITY (VR)

Augmented reality (AR) and Virtual Reality (VR) bridge the digital and physical worlds. They allow you to take in information and content visually, in the same way you take in the world. AR dramatically expands the ways our devices can help with everyday activities like searching for information, shopping, and expressing yourself. VR lets you experience what it's like to go anywhere from the front row of a concert to distant planets in outer space.

Job Roles in Augmented reality and virtual reality (AR & VR) Track

- Design Architect. ...
- Software Designer. ...
- System Validation Engineers. ...
- Software Developer. ...
- 3D Artist…

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EC303) INTRODUCTION TO SIGNAL PROCESSING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand various fundamental characteristics of signals and systems
- To analyze signals in frequency domain
- To know principles of signal transmission through systems
- To understand fundamentals of digital signal

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Classify and Analyze signals and Systems
CO-2: Convert the signals from continuous-time to discrete-time
CO-3: Transform signals from one-domain to another domain
CO-4: Apply the transformation tools on signals and systems and analyze their significance and applications
CO-5: Design the structures of different types of digital filters

UNIT-I:

Representation of Signals: Continuous time and Discrete Time signals, Classification of Signals – Periodic and aperiodic, even and odd, energy and power signals, deterministic and random signals, causal and non-causal signals, complex exponential and sinusoidal signals. Concepts of standard signals. Various operations on Signals.

UNIT-II:

Representation of Systems: Classification of discrete time Systems, impulse response, Concept of convolution in time domain and frequency domain, response of a linear system, System function, Signal bandwidth, system bandwidth. Ideal filter characteristics.

UNIT-III:

Sampling Theorem: Representation of continuous time signals by its samples - Sampling theorem – Reconstruction of a Signal from its samples, aliasing
Z –Transform: Basic principles of z-transform, region of convergence, properties of ROC, Inverse z-transform using Partial fraction.

UNIT-IV:

Introduction to Digital Signal Processing: Applications of Z-Transforms- Solution of Linear Constant Coefficient Difference equations (LCCD), System function, Frequency Response of the system.

Discrete Fourier Transforms: Circular convolution, Comparison between linear and circular convolution, Computation of DFT.

UNIT-V:

IIR Digital Filters: Design of IIR Digital filters (H(s) to be given) - Impulse invariance transformation techniques, Bilinear transformation method.

FIR Digital Filters: Characteristics of linear phase FIR filters and its frequency response, Comparison of IIR and FIR filters. Design of FIR filters using Fourier Method and Windowing Technique (only Hanning).

Realization of IIR and FIR Filters: Direct and Cascade forms.

TEXT BOOKS:

1. Signals, Systems and Communications, B.P. Lathi, BS Publications, 2009
2. Signals and Systems, Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, 2nd Edition, PHI
3. Digital Signal Processing: Principles, Algorithms and Applications, John G. Proakis, D.G. Manolakis, 4th Edition, Perason/PHI, 2009

REFERENCES:

1. Signals and Systems, Simon Haykin and Barry Van Veen, 2nd Edition, John Wiley
2. Signals, Systems and Transforms, C.L. Philips, J. M Parr and Eve A. Riskin, 3rd Edition, Pearson, 2004
3. Signals and Systems, Schaum's Outlines, Hwei P. Hsu, Tata Mc Graw Hill, 2004
4. Digital Signal Processing – A Practical Approach, Emmanuel C. Ifeacher, Barrie W. Jervis, 2nd Edition, Pearson Education

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1EC304) INTRODUCTION TO IMAGE AND VIDEO PROCESSING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Introduction to Signal Processing

COURSE OBJECTIVES:

- To introduce fundamentals of digital image and video processing
- To demonstrate digital signal processing techniques in spatial and frequency domains
- To study and compare various image and video compression algorithms
- To study applications of motion estimation in video processing

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Acquire, represent the digital image and transforms
CO-2: Apply various pixel position and intensity-based image processing techniques
CO-3: Understand and analyze the performance of block matching algorithms in MPEG video coding standards

UNIT-I:

Fundamentals of Image Processing and Image Transforms: Basic steps of Image processing system sampling and quantization of an Image – Basic relationship between pixels, 2 – D Discrete Fourier Transform, Discrete Cosine Transform, Introduction to Wavelet transforms

UNIT-II:

Image Enhancement-Spatial Domain Methods: Point Processing, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial filters, Sharpening Spatial filters.

UNIT-III:

Image Enhancement-Frequency Domain Methods: Basics of filtering in frequency domain, Image Smoothing, Image Sharpening, Selective Filtering.
Image Segmentation: Segmentation Concepts, Point, Line and Edge Detection, Thresholding, Region Based Segmentation.

UNIT-IV:

Image Compression: Image compression fundamentals – coding Redundancy, spatial and temporal redundancy.
Compression Models: Lossy and Lossless, Huffmann coding, Arithmetic coding, LZW coding, run length coding, Bit Plane coding, transform coding.

UNIT-V:

Basic Steps of Video Processing: Analog video, Digital Video, Time varying Image Formation models: 3D motion models, Geometric Image formation, Photometric Image formation, sampling of video signals.

2-D Motion Estimation: Optical flow, pixel-based motion estimation, Block matching algorithm, Mesh based motion Estimation, global Motion Estimation, Region based motion estimation, multi resolution motion estimation. Application of motion estimation in video coding.

TEXT BOOKS:

1. Digital Image Processing, Gonzaleze and Woods, 3rd Edition, Pearson
2. Video Processing and Communication, Yao Wang, Joem Ostarmann and Ya – Quin Zhang, 1st Edition, PHI

REFERENCES:

1. Digital Video Processing, M. Tekalp, Prentice Hall International
2. Image Acquisition and Processing with LabVIEW, Relf, Christopher G., CRC Press
3. Inverse Synthetic Aperture Radar Imaging with MATLAB Algorithms, Aner Ozdemi R, John Wiley & Sons
4. Fundamentals of Digital Image Processing, A Practical Approach with Examples in Matlab, Chris Solomon, Toby Breckon, John Wiley & Sons

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1EC403) FUNDAMENTALS OF AUGMENTED REALITY AND VIRTUAL REALITY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Introduction to Signal Processing, Introduction to Image & Video Processing

COURSE OBJECTIVES: Throughout the course, Students will be expected to develop AR VR applications by being able to do each of the following:

- To a review of current Virtual Reality (VR) and Augmented Reality (AR) technologies
- To the fundamentals of VR/AR modeling and programming
- To provides a detailed analysis of engineering scientific and functional aspects of VR/AR

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Acquire knowledge in main applications VR / AR technologies
CO-2: Analyze different tools for VR/AR applications
CO-3: Developing VR/AR applications

UNIT-I:
Augmented Reality and Virtual Reality:
Augmented Reality: Introduction to Augmented Reality (AR), Fundamentals, Chronicle order of AR, features
Virtual Reality: Introduction to Virtual Reality (VR), Features of VR and Chronicle order of VR; Difference between AR and VR.

UNIT-II:
Types of Augmented Reality: Marker based AR, Marker less AR, Projection based AR, Super Imposition based AR, Applications of AR.

UNIT-III:
Types of Virtual Reality: Non- immersive simulation, Semi-immersive simulations, Fully immersive simulations; Applications VR.

UNIT-IV:
Making an AR App with Simple CUBE: Introduction to Unity, Installation steps, Fundamentals while implementing Project, importing a cube, Create an account in Vuforia, license manager, target manager, downloading database and uploading target database in unity.

UNIT-V:
AR App with Interaction: Introduction to C#, Scripting interactive objects, implementation C# Script using unity, uploading target object, deploying application into ANDROID Device.

Creating an Virtual Reality: Creating an Virtual Reality Scene in unity, adding colliders, Settings of Unity to make the application compatible with Google cardboard.

TEXT BOOKS:

1. Augmented Reality for Developers: Build Practical Augmented Reality Applications with Unity, AR Core, AR Kit, and Vuforia. Linowes, J., Babilinski, K (2017).United Kingdom: Packt Publishing
2. Building Virtual Reality with Unity and Steam VR, Murray, J. W. United Kingdom: CRC Press, 2020

REFERENCES:

1. Virtual Reality & Augmented Reality in Industry, Ma, D., Gausemeier, J., Fan, X., Grafe, M. (Eds.) Springer, 2011
2. Linowes, J. (2020). Unity 2020 Virtual Reality Projects: Learn VR Development by Building Immersive Applications and Games with Unity 2019.4 and Later Versions, 3rd Edition. United Kingdom: Packt Publishing

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1EC404) INTRODUCTION TO METAVERSE

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To examine the role of architecture and design in the making of the metaverse
- To discuss the potential and future of the design disciplines in the metaverse era
- To explore metaverse constituent elements and their relation to virtual environments
- To demonstrate key design concepts, theories and industry practices applicable to creating spaces for the metaverse
- To explain voxel graphics, polygon graphics and gaming development environments and utilize them to create 3d content for the metaverse

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Demonstrate a comprehensive understanding of Metaverse and Architecture

CO-2: Use key tools and workflows needed for creating designs in Metaverse

CO-3: Explain Metaverse design principles

CO-4: Create designs in Metaverse, including voxel and polygon pipelines, virtual materiality, interactivity, and animations

UNIT-I:

Introduction to Metaverse and Architecture, Precedents, Gateways- Uses and Activities (Museums, Galleries, Event Spaces, etc.), Key Centralized Platforms, Key Decentralized Platforms, Architectural Metaverse Case Studies.

UNIT-II:

Pillars: User Interfaces and Immersion, Avatars and Identities (Avatar builders), Economy (Currencies, Wallets, Marketplace's, NFTs, Play-to-Earn), Land (Parcels, Mapping and Cartography), Assets (Digital Twins, Urban Scales, Communities, Landmarks), Artificial Intelligence.

Designing for the Metaverse: Narrative and Storytelling, User Experience/Perception/ Interaction, Systems Design and Interoperability, Lessons from other disciplines (Programming, Gaming, etc), Design Rules and Constraints (Gravity, Navigation, etc), Aesthetics of the Metaverse

UNIT-III:

Tools and Workflows: 3D Modelling Software (Blender, Rhino), Gaming Engines and Templates (Unity, Unreal), Native Platform Builders, Predominant File Types (*.vox, *.glb, *.gltf), Computer Graphics (Polygonal and Voxel Graphics), Textures / Transformations

/ Meshes (vertices, edges, faces), Optimising and Exporting 3D Models (constrains/limitations/considerations)

Voxel Pipeline: Voxel Graphics and Applications, Tools, and UIs (Overview, Navigation, Uses, etc), Basic Voxel Modelling and Editing, Workflow Example (Blender or Rhino to Sandbox or CryptoVoxels), Assets and Colliders

UNIT-IV:

Polygon Pipeline: Polygon Graphics and applications, Tools and UIs (Overview, Navigation, Uses, etc), Basic Polygon Modelling and Editing, Workflow Example (Blender or Rhino to Decentraland), Assets and Colliders.

Game Engines Pipeline: Tools and UIs (Overview, Navigation, Uses, etc), Unity SDK Templates, Workflow Example (Unity or Unreal to MONA), Assets and Colliders.

UNIT-V:

Virtual Materiality: Standard and Physically based rendering (PBR) Materials, Shaders (diffuse, specular, transparency, emissiveness, etc.), Textures, Lights.

Interactivity and Animations: Interactivity (Adding Media, Audio, Links, NFTs), Animations (Creating and Testing), SDK Intro – Create by writing code.

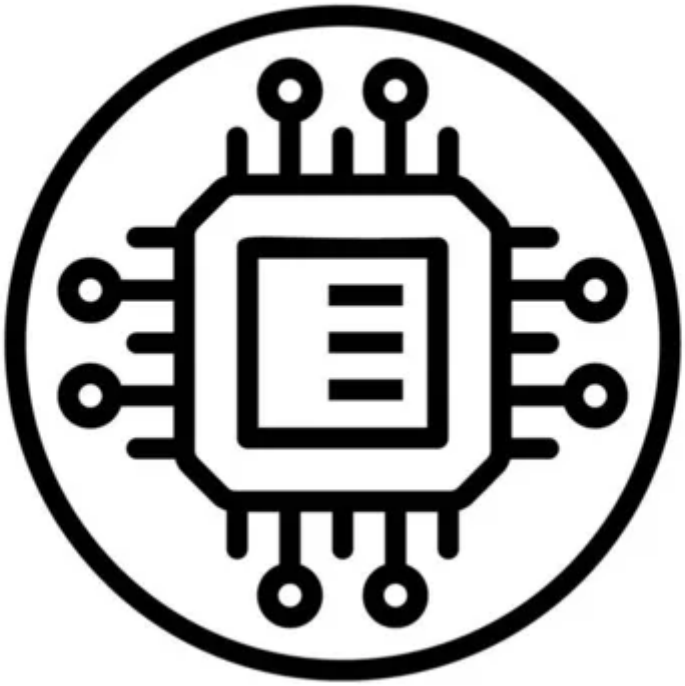
TEXT BOOKS:

1. The Metaverse Primer, Ball, M., 2021
2. Designing the Metaverse, Chen, H., 2021
3. Architecting the Metaverse, Chen, C., 2021

REFERENCES:

1. Why Architecture Matters in the Metaverse, Cowdrey, R., 2021
2. Avatars: Exploring and Building Virtual Worlds on the Internet, Damer, B., Peachpit Pr, 1997
3. Virtual Cities: An Atlas & Exploration of Video Game Cities, Dimopoulos, K., 1st edition, Countryman Press, 2020
4. The geographies of Cyberspace, Dodge, M., Working paper series, CASA, UCL, 1999
5. Introduction to Computer Graphics, Eck, D. J., Hobart and W. S. Colleges, 2016

MICROELECTRONICS



MICROELECTRONICS

Offered by:

ELECTRONICS AND COMMUNICATION ENGINEERING

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Augmented Reality (AR)/ Virtual Reality (VR)	Principles of Microelectronics	**Programmable Logic Devices for Microelectronics**	Fundamentals of Physical Design For VLSI	Recent Trends in Microelectronics

MICROELECTRONICS

The microelectronics open elective track covers various aspects of microelectronics and Very Large Scale Integration (VLSI) design.

Principles of Microelectronics course covers the fundamental principles and concepts of microelectronics, including digital electronics, electronic devices and basic circuit design.

Programmable Logic Devices for Microelectronics course focuses on the design and application of programmable logic devices (PLDs) in microelectronics, emphasizing Field Programmable Gate Arrays (FPGAs) and Complex Programmable Logic Devices (CPLDs).

Fundamentals of Physical Design for VLSI course covers the physical design process in VLSI, including placement, routing, and design rules.

Recent Trends in Microelectronics course explores the latest advancements and emerging trends in the field of microelectronics like nanotechnology, Micro-Electro-Mechanical Systems (MEMS), 3D ICs etc,

These courses collectively provide a comprehensive understanding of microelectronics and VLSI design, equipping students with the knowledge and skills to tackle contemporary challenges and innovations in the field.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EC305) PRINCIPLES OF MICROELECTRONICS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the concepts of Diode and BJT
- To study the fundamentals of combinational circuits
- To learn electrical properties of MOS transistors
- To learn the basic principles of VLSI and fabrication steps
- To know the design of digital circuits using MOS logic

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Acquire knowledge of PN Junction diode and BJT
CO-2: Realize combinational logic circuits using Boolean algebra and Karnaugh maps
CO-3: Interpret the electrical properties of MOS transistors
CO-4: Understand the fabrication steps of integrated circuits
CO-5: Realize Boolean expressions using MOS logic

UNIT-I:

Electronic Devices: PN junction diode and its operation, V-I characteristics of PN Junction Diode, Operation of Half wave and full wave rectifiers. BJT structure and operation, BJT configurations.

UNIT-II:

Digital Fundamentals: Types of number representations and conversions, Boolean Algebra, Canonical and Standard forms, Karnaugh maps (Three and Four Variables, Digital Logic gates, realization of Boolean functions, NAND and NOR implementations.

UNIT-III:

Basic Electrical Properties of MOS Transistors: MOSFET types, MOSFET structure and operation, I-V characteristics of MOSFETs, IDS versus VDS relationship, MOS transistor threshold voltage, Transconductance and Output conductance (Qualitative analysis only).

UNIT-IV:

Microelectronics: Introduction to Microelectronics and Integrated Circuit Technology, Evolution of Integrated Circuits, Moore's Law, VLSI design flow, NMOS, PMOS and CMOS fabrication steps.

UNIT-V:

MOS Logic Circuits: CMOS Inverter, CMOS logic gates design, Realizing Boolean expressions using NMOS and CMOS logic, Pass transistor logic, CMOS transmission gates.

TEXT BOOKS:

1. Essentials of VLSI Circuits and Systems, Kamran Eshraghian, Dougles and A. Pucknell, PHI, 2005
2. Electronic Devices and Circuit Theory, Robert L. Boylestad and Louis Nashelsky
3. Digital Design, M. Morris Mano, 3rd Edition, Pearson Education/PHI, 2003

REFERENCES:

1. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, , 3rd Edition, TMH, 2011
2. CMOS VLSI design: A Circuits and Systems Perspective, N.H.E. Weste and D.M. Harris, 4th Edition, Pearson Education India, 2011
3. The Design and Analysis of VLSI Circuits, L. Glaser and D. Dobberpuhl, Addison Wesley, 1985

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1EC306) PROGRAMMABLE LOGIC DEVICES FOR MICROELECTRONICS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Principles of Microelectronics

COURSE OBJECTIVES:

- To introduce digital design concepts of combinational and Sequential Circuits
- To learn digital design concepts through Programmable Logic Devices
- To understand the design flow of digital circuits
- To learn physical design steps of FPGA
- To know the architectures of CPLD and FPGAs

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the basics of digital circuits
CO-2: Realize digital circuits using PLDs
CO-3: Simulate and synthesize digital circuits
CO-4: Analyze physical design flow of FPGA
CO-5: Implement digital circuits using PLDs

UNIT-I:
Digital Design: Binary adders and subtractors, multiplexers, demultiplexers, Realization of logic expressions using Multiplexers, decoders, encoders, Latches and flip-flops, shift registers, synchronous binary counter and Up-Down Counter (Qualitative analysis only).

UNIT-II:
Programmable Logic Devices: Classification of memories, PROM, Programmable Logic Arrays and Programmable Array Logic.

UNIT-III:
Simulation and Synthesis: Simulation, Simulation types, Synthesis, Synthesis Methodologies, Translation, Mapping, Optimization.
Introduction to FPGA: Features and Applications of FPGAs, Advantages of FPGA, General Architecture of FPGA, Programming Technologies.

UNIT-IV:
Physical Design flow of FPGAs: FPGA Design flow, Physical Design cycle for FPGAs, Partitioning, placement, Segmented and Non-Segmented Routing techniques.

UNIT-V:

CPLD and FPGA Architectures: CPLD architecture- Altera series – Max 7000, General Design Issues, Commercially Available FPGAs, XILINX FPGA- Artix-7, Actel ACT1, ACT2 and ACT3 FPGA architectures.

Case study: Full adder implementation using FPGA.

TEXT BOOKS:

1. Modern Digital Electronics, R. P. Jain, 4th Edition, Tata McGraw-Hill, 2009
2. Digital Design, M. Morris Mano, 3rd Edition, Pearson Education/PHI
3. Application Specific Integrated Circuits, M.J.S .Smith, Pearson Education, 2004

REFERENCES:

1. Field-Programmable Gate Arrays, Stephen D. Brown, Springer, 1992
2. Algorithms for VLSI Physical Design Automation, Naveed Sherwani, 3rd Edition, Springer International Edition, 2005
3. Field Programmable Gate Array Technology, Stephen M. Trimberger, Springer International Edition, 1994

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1EC405) FUNDAMENTALS OF PHYSICAL DESIGN FOR VLSI

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Principles of Microelectronics

COURSE OBJECTIVES:

- To know VLSI Physical Design Automation
- To learn concepts related to physical design like floor planning, partitioning and placement
- To learn concepts related to physical design like routing and different routing techniques and compaction algorithms

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Learn the automation process for VLSI System design
CO-2: Understanding of fundamentals for various physical design CAD tools
CO-3: Develop and enhance the existing algorithms and computational techniques for Physical design process of VLSI systems
CO-4: Design the systems using
CO-5: Understanding of various Routing process and algorithms

UNIT-I:
Introduction to Physical Design: VLSI Design Cycle, New Trends in VLSI Design Cycle - Design Representation- Y- Chart, VLSI Design Styles - Full-Custom, Standard Cell, Gate Arrays, Field Programmable Gate Arrays Sea of Gates.

UNIT-II:
System Packaging Styles: Die Packaging and Attachment Styles, Die Package Styles, Package and Die Attachment Styles, Printed Circuit Boards, Multichip Modules, Wafer Scale Integration, Comparison of Different Packaging Styles.

UNIT-III:
Partitioning: Introduction, constraints and objectives of the partitioning process - System Level Partitioning, Board Level Partitioning, Chip Level Partitioning, Problem Formulation, Classification of Partitioning Algorithms.

UNIT-IV:
Floor planning: Introduction, Factors to be considered for floor planning, Problem Formulation, Classification of Floor planning Algorithms. Introduction to Pin Assignment and placement.

UNIT-V:

Global Routing: Introduction to Global Routing, general routing problem, objective of the routing problem, Problem Formulation- Grid Graph Model, Checker Board Model, Channel Intersection Graph Model, Classification of Global Routing Algorithms.

Detailed Routing: Introduction to detailed Routing, Routing Considerations, Routing Models, Channel Routing Problems, Switchbox Routing Problems.

TEXT BOOKS:

1. Algorithms for VLSI Physical Design Automation, Naveed Sherwani, 3rd Edition, 2005
2. Algorithms for VLSI Design Automation, S. H. Gerez, Wiley Student Edition, John Wiley & Sons (Asia) Pvt. Ltd., 1999
3. VLSI Physical Design Automation, Sait, Sadiq M.; IEEE, Published by Institute of Electrical & Electronics Enginee, 1995

REFERENCES:

1. Computer Aided Logical Design with Emphasis on VLSI, Hill & Peterson, Wiley, 1993
2. Modern VLSI Design: Systems on Silicon, Wayne Wolf, 2nd Edition, Pearson Education Asia, 1998
3. Physical Design Automation of VLSI Systems, Bryan, Lorenzetti, Michael T
4. CMOS VLSI Design: A Circuits and Systems Perspective, Weste, Neil H. E.; Harris, David, 2004
5. Digital VLSI Design, Ajay Kumar Singh, Published by PHI Learning, 2011

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1EC406) RECENT TRENDS IN MICROELECTRONICS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the concepts of semiconductor devices
- To study the fundamental digital design
- To learn the basic principles of VLSI and fabrication process
- To learn the electrical properties of MOS transistors
- To gain the knowledge about MOS designs

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply the concepts of PN Junction diode to design an application
CO-2: Apply the concepts of MOSFET by considering its practical design constraints to solve digital design applications
CO-3: Acquire a knowledge on fabrication process of integrated circuits
CO-4: Analyse the electrical properties of MOS transistors
CO-5: Design Combinational circuits using different logic style

UNIT-I:
Introduction to Verilog: Introduction, chip design flow, Verilog syntax, data types, constant, parameters, Continuous assignment, Procedural assignment, Operator types, Functions, Tasks.

UNIT-II:
Verilog modelling: Gate level modelling, behavioural modelling Conditional statements, looping, dataflow modelling. Design of basic gates using three modelling techniques

UNIT-III:
Introduction to System Verilog: Introduction, testbench, functional verification approaches, role of verification plan, design for verification, code coverage

UNIT-IV:
System Verilog Coding Guidelines: Literal values, data types, data declaration, packed/unpacked arrays, dynamic/associative arrays, operators, procedural statements, classes.

UNIT-V:
Scripting Languages of VLSI: Linux architecture, shells, files and directories, file system, system calls for the file I/O operations, file permissions & ownership, basic Linux commands, grep. SED, AWK.

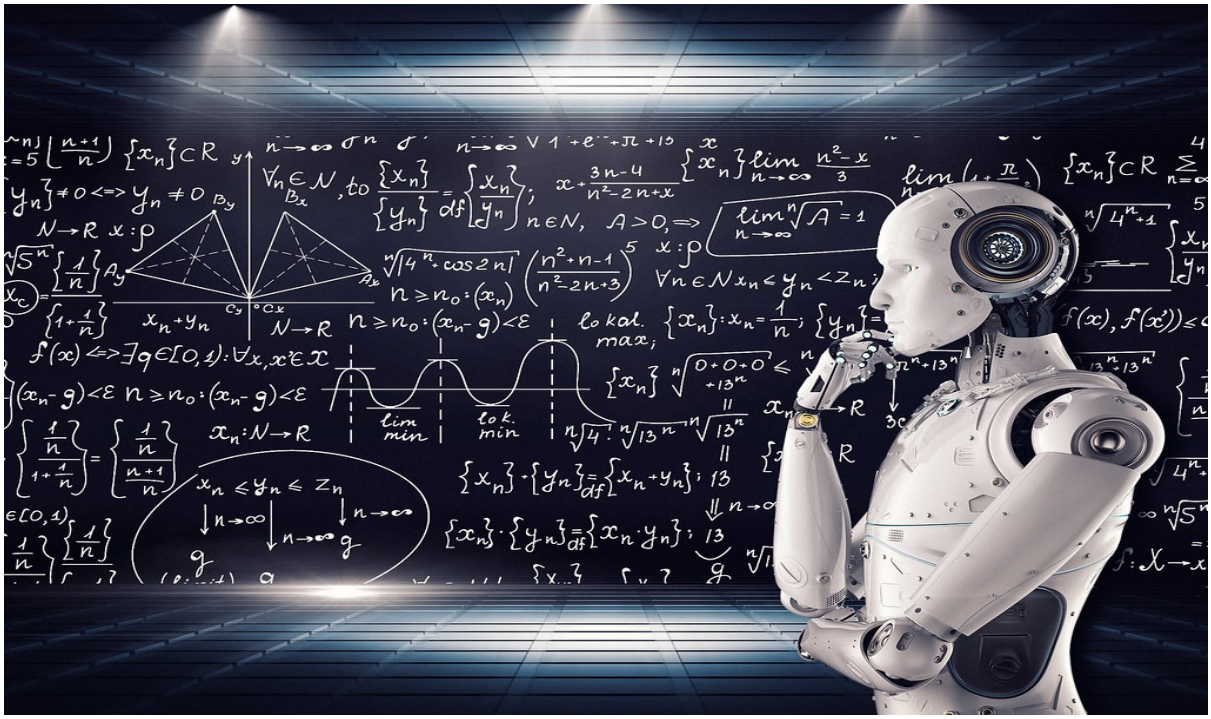
TEXT BOOKS:

1. Verilog HDL synthesis: a practical primer, Bhasker, J., Star Galaxy Publishing, 1998
2. Verilog HDL: a guide to digital design and synthesis (Vol. 1), Palnitkar, S., Prentice Hall Professional, 2003
3. Writing testbenches using System Verilog, Bergeron, J., Springer Science & Business Media, 2007

REFERENCES:

1. System Verilog for Design: A Guide to Using System Verilog for Hardware Design and Modeling, Stuart Sutherland, Simon Davidmann, Peter Flake, 2nd Edition, Springer, 2006.
2. Linux: The complete reference, Petersen, R., McGraw-Hill, Inc., 2007
3. Operating System Concepts and Basic Linux Commands, Shital, V.G., 2011

ARTIFICIAL INTELLIGENCE



ARTIFICIAL INTELLIGENCE

Offered by: **COMPUTER SCIENCE AND ENGINEERING**

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Artificial Intelligence	Mathematics for Artificial Intelligence	**Fundamentals of Artificial Intelligence**	Machine Learning Techniques	Deep Learning

ARTIFICIAL INTELLIGENCE

Artificial Intelligence (AI) is a cognitive science with highly research activities in the major areas like Machine Learning, Robotics, Natural Language Processing and image processing. This track will cover basic foundations of artificial intelligence it will make the students industry-ready for artificial intelligence and data science job roles. Artificial intelligence is used in wide range of industrial applications such as healthcare, transportation, entertainment, insurance, transport and logistics, and customer service.

Future applications of AI would be utilized in automated transportation, cyborg technology, solving problems associated with climate change, deep-sea and space exploration.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1MT301) APPLIED MATHEMATICS IN ARTIFICIAL INTELLIGENCE
(CE, ME & AE)

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic knowledge of probability, regression and Calculus

COURSE OBJECTIVES:

- To learn multi-dimensional generalization of a univariate normal random variable
- To learn concept of multivariable linear regression model
- To applying knowledge of vectors, inner products, and linear transformations for solving real world situations
- To constructing mathematical models for solving real-world problems
- To understanding optimization techniques like convex and constrained optimization

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Model the linear relationship between the explanatory (independent) Variables and response(dependent)variables

CO-2: Make better decisions using linear regression techniques

CO-3: Recognize and use basic properties of subspaces and vector spaces

CO-4: Identify the use of matrix theory to solve the system of linear equations and apply in various engineering problems

CO-5: Analyze and solve the complexity of a given problem with suitable optimization techniques

UNIT–I:

Multivariate Normal Distribution & Linear Regression Model: Multivariate Normal Distribution Functions, Conditional Distribution and its relation to regression model, Standard multiple regression models with emphasis on detection of collinearity, outliers.

UNIT–II:

Multivariate Regression: Assumptions of Multivariate Regression Models, Parameter estimation, Multivariate Analysis of variance and covariance

UNIT-III:

Vector Space: Orthogonal vectors, normal and orthonormal vectors, linear combination, linear span, linear independence of vectors, Vector space; Subspace, Dimension; Basis; Orthogonality; Projections; Gram-Schmidt orthogonalization and QR decomposition.

UNIT-IV:

Applications of Matrices: Solution of Tri-diagonal system of equations using LU decomposition Method; Applications of linear systems- Network Flows and Mechanical Systems.

Review of eigen values and eigen vectors, intuition, significance, Principal component analysis-concept, properties, applications, Singular value decomposition-concept, properties, applications

UNIT-V:

Multivariate Calculus: Review of gradient and its properties. Hessian, Gradient of vector valued function, Gradient of matrices. Local/global maxima and minima, convex sets, convex functions, gradient descent algorithms- Learning rate, momentum, stochastic. Constrained optimization (Lagrange Multiplier method), convex optimization.

TEXTBOOKS:

1. An introduction to Multivariate Statistical Analysis, T.W.Anderson
2. Mathematics for Machine Learning, Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong, Published by Cambridge University Press., 2020
3. Linear algebra and it's applications, David C. Lay, third edition, Pearson publications

REFERENCES:

1. Math for Machine Learning: Open Doors to Data Science and Artificial Intelligence, Richard Han, Paperback–2018
2. Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning by James V Stone
3. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1MT302) MATHEMATICS FOR ARTIFICIAL INTELLIGENCE
(EEE & EIE)

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Permutations, Combinations, Differentiation & Integration

COURSE OBJECTIVES:
- To understanding elementary ideas in basic probability, distribution functions
- To demonstrating various statistical methods and linear relationship between the given variables
- To applying knowledge of vectors, inner products, and linear transformations for solving real world situations
- To constructing mathematical models for solving real-world problems
- To understanding optimization techniques like convex and constrained optimization

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Explore and demonstrate practical approaches related to implementation of the AI algorithms using probability concepts and distributions
CO-2: Use and fit a linear regression model to data and use it for prediction
CO-3: Recognize and use basic properties of subspaces and vector spaces
CO-4: Identify the use of matrix theory to solve the system of linear equations and apply in various engineering problems
CO-5: Analyze and solve the complexity of a given problem with suitable optimization techniques

UNIT–I:
Probability: Basic rules and axioms, events, sample space, frequentist approach, dependent and independent events, conditional probability, Random variables, continuous and discrete, expectation, variance, distributions- joint and conditional, Bayes' Theorem, Popular distributions- Bernoulli, binomial, Poisson, Normal.

UNIT–II:
Descriptive Statistics & Linear Regression: Classification and tabulation of univariate data, graphical representation, Frequency curves. Descriptive measures - Central tendency and Dispersion. Bivariate data, Summarization, marginal and conditional distribution. Correlation and Regression, Simple Linear Regression Models.

UNIT-III:
Vector Space: Orthogonal vectors, normal and orthonormal vectors, linear combination, linear span, linear independence of vectors, Vector space; Subspace,

Dimension; Basis; Orthogonality; Projections; Gram-Schmidt orthogonalization and QR decomposition.

UNIT-IV:

Applications of Matrices: Solution of Tri-diagonal system of equations using LU decomposition Method; Applications of linear systems- Network Flows and Mechanical Systems.

Review of eigen values and eigen vectors, intuition, significance, Principal component analysis-concept, properties, applications, Singular value decomposition-concept, properties, applications

UNIT-V:

Multivariate Calculus: Review of gradient and its properties. Hessian, Gradient of vector valued function, Gradient of matrices. Local/global maxima and minima, convex sets, convex functions, gradient descent algorithms- Learning rate, momentum, stochastic. Constrained optimization (Lagrange Multiplier method), convex optimization.

TEXTBOOKS:

1. Mathematics for Machine Learning, Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong, Published by Cambridge University Press., 2020
2. Linear algebra and it's applications, David C. Lay, third edition, Pearson publications
3. 3. Probability and Statistics for Engineers, Richard. A.Johanson, 5th Edition, Prentice-Hall, 1995

REFERENCES:

1. Math for Machine Learning: Open Doors to Data Science and Artificial Intelligence, Richard Han, Paperback–2018
2. Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning by James V Stone
3. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1CS303) FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Mathematics for Artificial Intelligence

COURSE OBJECTIVES:

- To understand and analyze the importance and basic concepts of artificial intelligence and the use of agents
- To identify, explore the complex problem-solving strategies and approaches
- To analyze the concepts of basic concepts of neural networks and learning process
- To explore and analyze the methodology used in machine learning

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the basic concepts of artificial intelligence and the use of agents into the real-world scenario

CO-2: Design and formulate complex problem solutions with the use of various searching techniques

CO-3: Estimate the skill for representing knowledge using the appropriate technique for a given problem

CO-4: Apply AI techniques to solve problems of game playing, and machine learning

UNIT-I:

Introduction to AI: Foundations of AI – History of AI - Applications of AI, Intelligent Agents – Agents and Environments – Nature of Environments – Structure of Agents – Problem solving Agents – Problem formulation – Example Problems.

UNIT-II:

Searching Techniques: Uninformed Search Strategies – Breadth first search – Depth first search – Depth limited search - Bidirectional search – comparison – Search with partial information - Heuristic search – Greedy best first search – A* search – Memory bounded heuristic search - Heuristic functions - Local search- Hill climbing – Simulated annealing search - Local beam search, Genetic algorithms.

UNIT-III:

Constraint Satisfaction Problems: Backtracking search for CSP's - local search for constraint satisfaction problem. Adversarial search – Games - Minimax algorithm, Alpha beta pruning, cutting-off search.

UNIT-IV:

Knowledge Representation and Reasoning: Propositional Logic, Rules of Inference, First Order Logic (FOL) Syntax, Semantics, Entailment.

Classical Planning: Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

UNIT-V:

Planning and Acting in the Real World: Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

TEXT BOOKS:

1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Prentice Hall, 2010
2. Machine Learning, Tom M. Mitchell, McGraw Hill Publications
3. Neural Networks A Comprehensive Foundation, Simon Haykin, Pearson Education, 2nd Edition, 2004

REFERENCES:

1. Artificial Intelligence, Elaine Rich & Kevin Knight, 2nd Edition, TMH
2. Artificial Intelligence-A New Synthesis, Nils J. Nilsson, Elsevier
3. Artificial Neural Networks, Yegnanarayana B., PHI

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1CS401) MACHINE LEARNING TECHNIQUES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Mathematics for Artificial Intelligence, Fundamentals of Artificial Intelligence

COURSE OBJECTIVES:

- To understand applications in computational learning theory
- To analyse the pattern comparison techniques

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand and Familiarize the basics concept, notations used in machine learning and mathematics behind machine learning algorithms

CO-2: Demonstrate different types of machine learning algorithms

CO-3: Apply the suitable machine learning techniques and construct a machine learning model to solve real world applications

CO-4: Evaluate model accuracy and familiarize with advanced learning algorithms

UNIT-I:

Introduction to Machine Learning: Perspectives and issues in machine learning, Goals and applications of machine learning. Aspects of developing a learning system: training data, concept representation, function approximation.

Regression: Regression types, gradient descent; features of Over fitting and complexity; training, validation, test data, Logistic regression and applications.

UNIT-II:

Supervised Learning: Classification, decision boundaries; nearest neighbor methods, Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, Linear classifiers Bayes' Rule and Naive Baye's classification.

Instance-Based Learning: Introduction, k-nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

UNIT -III:

Unsupervised Learning: Clustering, k-means, hierarchical, partition-based clustering, overlapping clustering, Support vector machines, Support vector regression.

UNIT -IV:

Reinforcement Learning: Introduction to Reinforcement learning, the learning task, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

UNIT-V:

Neural Networks: Introduction to neural networks, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and Convolution neural networks.

TEXT BOOKS:

1. Machine Learning, Tom M. Mitchell, McGraw-Hill
2. Neural Networks and Learning Machines, S. Haykin, Pearson, 2008

REFERENCES:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis
2. Machine Learning: The Art and Science of Algorithms that make Sense of Data, Peter Flash, Cambridge, University Press
3. Machine Learning: A Probabilistic Perspective, Kevin P. Murphy, MIT Press, 2012

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1CS402) ESSENTIALS OF DEEP LEARNING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Mathematics for Artificial Intelligence, Fundamentals of Artificial Intelligence, Machine Learning Techniques

COURSE OBJECTIVES:

- To introduce the foundations of deep learning
- To acquire the knowledge on Deep Learning Concepts

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Identify and select appropriate learning network models required for real world problems

CO-2: Design an efficient model with various deep learning techniques

CO-3: Implement deep learning algorithms and solve real-world problems

CO-4: Apply optimization strategies necessary for problem solving required for large scale applications

UNIT-I:

Introduction to Deep Learning: History of Deep Learning, Deep Learning Success Stories, Biological Neuron, Idea of computational units, McCulloch Pitts Neuron, Thresholding Logic, Perceptrons, Perceptron Learning Algorithm and Convergence.

UNIT-II:

Feedforward Networks: Multilayer Perceptron, Gradient Descent, Back-propagation, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks.

UNIT-III:

Regularization for Deep Learning: Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier.

UNIT-IV:

Optimization for Training Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithm.

UNIT-V:

Convolutional Neural Networks: LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Markov Networks, Object Detection, RCNN, Fast RCNN, Faster RCNN, YOLO,Auto-Encoders: Regularization in auto-encoders, De-noising auto-encoders, Sparse auto-encoders, Contractive auto-encoders,

TEXT BOOKS:

1. Deep Learning: An MIT Press Book, Ian Goodfellow and Yoshua Bengio and Aaron Courville
2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall

REFERENCES:

1. Neural Networks: A Systematic Introduction, Raúl Rojas, 1996
2. Pattern Recognition and Machine Learning, Christopher Bishop, 2007

BLOCKCHAIN TECHNOLOGIES



BLOCKCHAIN TECHNOLOGIES

Offered by: COMPUTER SCIENCE AND ENGINEERING

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Blockchain Technologies	Fundamentals of Computer Networks / Relational Database Management Systems	**Distributed Data Bases**	Cryptography and Network Security	Blockchain Technology

BLOCKCHAIN TECHNOLOGIES

The blockchain is one of the fastest growing skills in the IT sector today. This track will help the students to gain knowledge in blockchain technology, it has taken quite a turn in the industry given its popularity in providing safe and secured online transactions. Most individuals and organizations have started adopting blockchain because of the many benefits it offers to the industry today. It is used in many industry applications such as banking sector, voting, health care, real estate, the legal industry and government.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS301) FUNDAMENTALS OF COMPUTER NETWORKS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To introduce the fundamental various types of computer networks
- To demonstrate the TCP/IP and OSI models with merits and demerits
- To explore the various layers of OSI model
- To introduce UDP and TCP models
- To have the concept of different routing techniques for data communications

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand and explore the basics of Computer Networks reference models and the functionalities of physical layer

CO-2: Learn major concepts, principles involved in Data Link Layer and Network Layer

CO-3: Analyze how to maintain QoS in Network and maintaining of Congestion Control

CO-4: Demonstrate the Application Layer functionalities and importance of Security in the Network

UNIT-I:

Introduction to Networks: Internet, Protocols and Standards, The OSI Model, Layers in OSI Model, TCP/IP Suite, Addressing.

Physical Layer: Multiplexing, Transmission Media, Circuit Switched Networks, Datagram Networks, and Virtual Circuit Networks.

UNIT-II:

Data Link Layer: Introduction, Checksum, Framing, Flow and Error Control, Noiseless Channels, Noisy Channels, Random Access Controlled Access, Channelization, IEEE Standards, Ethernet, Giga-Bit Ethernet, Wireless LANs, SONET-SDH, Frame Relay and ATM.

UNIT-III:

Network Layer: Logical Addressing, Internetworking, Tunneling, Address Mapping, ICMP, IGMP, Forwarding, Routing-Flooding, Bellman Ford, Disjkstra's routing protocols, RIP, OSPF, BGP and Multicast Routing Protocols. Connecting Devices-Passive Hubs, Repeaters, Active Hubs, Bridges, Routers.

UNIT-IV:

Transport Layer: Process to Process Delivery, UDP, TCP and SCTP Protocols, Congestion, Congestion Control, Quality of Service.

Application Layer: Domain Name Space, DNS in Internet, Electronic Mail.

UNIT-V:

File Transfer Protocol, WWW, HTTP, SNMP, Multimedia.

Network Security: Security services, mechanisms and attacks, IPSec, SSL, VPN, Firewall. Bluetooth, Zigbee, IPv4, IPv6.

TEXT BOOKS:

1. Data Communications and Networking, Behrouz A. Forouzan, 4th Edition, McGraw Hill Education, 2006
2. Computer Networks, Andrew S. Tanenbaum, 4th Edition, Pearson Education
3. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K. W. Ross, 3rd Edition, Pearson Education

REFERENCES:

1. Data Communications and Networks, William Stallings
2. Data Communication and Networks, Bhusan Trivedi, Oxford University Press, 2016
3. An Engineering Approach to Computer Networks, S. Keshav, 2nd Edition, Pearson Education
4. Understanding Communications and Networks, 3rd Edition, W.A. Shay, Cengage Learning

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS302) RELATIONAL DATABASE MANAGEMENT SYSTEMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the basic concepts and the applications of database systems
- To master the basics of SQL and construct queries using SQL
- To understand the relational database design principles
- To become familiar with the basic issues of transaction processing and concurrency control
- To become familiar with database storage structures and access techniques

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Demonstrate the basic concepts of database systems and design E-R models to represent simple database application scenarios

CO-2: Formulate SQL queries on the data

CO-3: Improve the database design by normalization

CO-4: Apply and relate the concept of transaction, concurrency control and recovery in database

CO-5: Familiar with basic database storage structures and access techniques using Indexing, hashing including B tree methods

UNIT-I:

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages – DDL, DML, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database Users and Administrators, History of Database Systems.

Introduction to Database Design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises.

Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical database Design: ER to Relational, Introduction to Views, Destroying /Altering Tables and Views.

UNIT-II:

Relational Algebra and Calculus: Preliminaries, Relational Algebra, Relational calculus – Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.

SQL: Queries, Constraints, Triggers: Form of Basic SQL Query, UNION, INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values Complex Integrity Constraints in SQL, Triggers and Active Databases, Designing Active Databases.

UNIT-III:

Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies - Reasoning about FDs, Normal Forms, Properties of Decompositions, Normalization, Schema Refinement in Database Design, Other Kinds of Dependencies.

UNIT-IV:

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

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

Recovery System-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with loss of nonvolatile storage, Early Lock Release and Logical Undo Operations, Remote Backup systems.

UNIT-V:

Storage and Indexing: Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing, Index Data Structures, Comparison of File Organizations.

Tree-Structured Indexing: Intuition for tree Indexes, Indexed Sequential Access Method (ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

Hash- Based Indexing: Static Hashing, Extendible hashing, Linear Hashing, Extendible vs. Linear Hashing.

TEXT BOOKS:

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

REFERENCES:

1. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning
2. Introduction to Database Management, M. L. Gillenson and others, Wiley Student Edition
3. Database Development and Management, Lee Chao, Auerbach Publications, Taylor & Francis Group
4. Introduction to Database Systems, C. J. Date, Pearson Education

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1IT301) CRYPTOGRAPHY AND NETWORK SECURITY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Fundamentals of Computer Networks, Distributed Data Bases

COURSE OBJECTIVES:

- To outline security concepts, threats, attacks, services and mechanisms
- To describe various cryptosystems- symmetric key cryptography, public key cryptography
- To apply authentication services and Secure hash functions
- To discuss the concepts of IP Security, web security, viruses and firewalls

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Analyze the basics of security attacks, services, goals and mechanism

CO-2: Apply a variety of cryptographic algorithms, Hash Functions and protocols underlying network security and authentication applications

CO-3: Understand and anlyze the key management requirements and implementation

CO-4: Examine and analyze various Email and Web Security mechanisms

CO-5: Understand the System Level Security issues

UNIT-I:

Security Attacks: Security Attacks (Active and Passive), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, Access Control and Availability) and Mechanisms, A model for Internetwork security, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

UNIT-II:

Conventional Encryption: Classical Encryption techniques(Rail fence, Hill Cipher, Caesar cipher, Vigenere cipher, Play Fair Cipher), Fiestel Cipher Structure, Data Encryption Standard, Block Cipher Design Principles and Modes of Operation, Triple DES, RC-4, AES Cipher, Placement of Encryption Function.

Public Key Cryptography and Authentication: Confidentiality using Symmetric Encryption – Principles of Public key Cryptosystems, RSA algorithm,

UNIT-III:

Key Management: Diffie-Hellman key Exchange, Elliptic Curve Cryptography.

Hash Functions: Hash Functions, Security of Hash Functions and MACs, Secure Hash Algorithm, HMAC, Digital Signatures, Authentication Protocols, Digital Signature Standard, Authentication Applications: Kerberos, X.509 Authentication Service

UNIT-IV:

Email Security and Web Security: Electronic Mail Security – PGP/ SMIME, IP security- Architecture, Authentication Header, Encapsulating Security Payload, Key Management, Web Security- Secure Socket Layer, Transport Layer Security and Secure Electronic Transaction

UNIT-V:

System Level Security: Intrusion detection – password management – Viruses and related Threats – Virus Counter measures – Firewall Design Principles – Trusted Systems.

TEXT BOOKS:

1. Cryptography and Network Security – Principles and Practices, William Stallings, Prentice Hall of India, 4th Edition, 2005
2. Hack Proofing Your Network, Ryan Russell, Dan Kaminsky, Rain Forest, Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W. Manzuik and Ryan Permeh, Wiley Dreamtech

REFERENCES:

1. Network Security Essentials: Applications and Standards, William Stallings Prentice Hall,1999, ISBN 0130160938
2. Security in Computing, Charles B. Pfleeger, Shari Lawrence Pfleeger, 3rd Edition, Pearson Education, 2003

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1CS403) DISTRIBUTED DATABASES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Database Management Systems, Computer Networks

COURSE OBJECTIVES:

- To introducing distributed database architecture and fragmentation methodologies
- To describe conceptual data models to design and access of fragmented data
- To demonstrate optimized query access strategies
- To enumerate the concepts of distributed transaction processing for reliable data

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Analyze issues related to distributed database design

CO-2: Apply Partitioning techniques to databases

CO-3: Design and develop query processing strategies

CO-4: Describe transaction processing and concurrency control in distributed database

CO-5: Derive reliable recovery techniques

UNIT-I:

Introduction: Features of Distributed versus Centralized Databases,

Levels of Distribution Transparency: Reference Architecture for Distributed Databases, Types of Data Fragmentation, Distribution transparency for Read – only Applications, Distribution transparency for update Applications, Distributed database Access primitives, Integrity Constraints in Distributed Databases.

UNIT-II:

Distributed Database Design: A framework, the design of database fragmentation, the allocation of fragments.

Translation of Global Queries to Fragment Queries: Equivalence Transformations for Queries, Transforming Global Queries into Fragment Queries, Distributed Grouping and Aggregate Function Evaluation, Parametric Queries.

UNIT-III:

Query Optimization: Framework for Query Optimization, Join Queries, General Queries.

Management of Distributed Transactions: A Framework for Transaction Management, Supporting Atomicity of Distributed Transactions, Concurrency Control for Distributed Transactions, Architectural aspects of Distributed Transactions

UNIT-IV:

Concurrency Control:

Foundation of Distributed Concurrency Control, Distributed Deadlocks, Concurrency Control based on Timestamps, Optimistic Methods for Distributed Concurrency Control.

UNIT-V:

Reliability:

Basic Concepts, Nonblocking Commitment Protocols, Reliability and concurrency Control, Determining a Consistent View of the Network, Detection and Resolution of Inconsistency, Checkpoints and Cold Restart.

TEXT BOOKS:

1. Principles of Distributed Database Systems, M. Tamer OZSU and Patuck Valduriez,
2. Pearson Education Asia, 2001
3. Distributed Databases, Stefano Ceri and Willipse Pelagatti, McGraw Hill

REFERENCES:

1. Database System Concepts, Henry F. Korth, A. Silberchatz and Sudershan, MGH
2. Database Management Systems, Raghuramakrishnan and Johhanes Gehrke, MGH

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1CS404) BLOCKCHAIN TECHNOLOGY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Fundamentals of Computer Networks, Distributed Data Bases, Cryptography and Network Security

COURSE OBJECTIVES:

- To get the terminologies and overview of blockchain technologies
- To study the concepts and foundation of blockchain technology
- To understand security mechanism and consensus in blockchain
- To design use cases and architecture blockchain technology

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the basic concepts and characteristics of Blockchain technology

CO-2: Demonstrate key mechanisms like Decentralization, Transparency and trust, Immutability, High availability, highly secure and different types of Blockchain

CO-3: Apply the concept of Hash Function and Related Hash Algorithm to provide the security and analyze the various types of blockchains

CO-4: Understand the Crypto Currency and implement, the applications using Blockchain Technology

UNIT-I:

Introduction to Blockchain Part I: Introduction to Centralized, Decentralized and Distributed system, History of Blockchain, Various technical definitions of Blockchain.

Introduction to Blockchain Technology Part II: Generic elements of a blockchain: Block, Transaction, Peer-to-peer network, Node, Smart contract, Why It's Called "Blockchain", Characteristics of Blockchain Technology, Advantages of blockchain technology.

UNIT-II:

Concept of Blockchain Technology Part I: Cryptography, Hashing, Nonce, Distributed database, Consensus, Smart Contract, Component of block, Structure of Block chain, Technical Characteristics of the Blockchain.

Concept of Blockchain Technology Part II: Applications of blockchain technology, Tiers of blockchain technology Bolckchain 0, Bolckchain 1, Blockchain 2, Blockchain 3, Generation of Blockchain X.

UNIT-III:

Technical Foundations Part I: Cryptography, Confidentiality, Integrity, Authentication, Cryptographic primitives, Public and private keys, RSA, Discrete logarithm problem, **Hash Function:** Message Digest (MD), Secure Hash Algorithms (SHAs), Design of Secure

Hash Algorithms (SHA), SHA-256, Design of SHA3, Elliptic Curve Digital signature algorithm.

Technical Foundations Part II: Consensus algorithm: Proof of work (PoW), Proof-of-Stake (PoS), Byzantine Fault Tolerance (BFT)

UNIT-IV:

Types of Blockchain: Public blockchains, Private blockchains, Semi-private blockchains, Side chains, Permissioned ledger, Distributed ledger, Shared ledger, Fully private and proprietary blockchains, Tokenized blockchains, Tokenless blockchains, CAP theorem and blockchain

UNIT-V:

Financial markets and trading, Trading, Exchanges, Trade life cycle, Order anticipators, Market manipulation.

Crypto Currency: Bitcoin, Bitcoin definition, Keys and addresses, Public keys in Bitcoin, Private keys in Bitcoin, Bitcoin currency units

Implementation Platforms: Hyperledger as a protocol, Reference architecture, Hyperledger Fabric, Transaction Flow, Hyperledger Fabric Details, Fabric Membership, Fabric Membership

TEXT BOOKS:

1. Mastering Blockchain, Imaran Bashir, Second Edition, Packt
2. Blockchain Basic, Daniel Drescher, A Press

REFERENCES:

1. Blockchain For Dummies®, IBM Limited Edition, John Wiley & Sons Inc.

ROBOTICS



ROBOTICS

Offered by: ELECTRONICS AND INSTRUMENTATION ENGINEERING

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Robotics	Fundamentals of Robotics	**Kinematics and Dynamics of Robot**	Drives and Control System for Robotics	Robot Programming and Intelligent Control Systems

ROBOTICS

Robotics is a field of study that involves the design, construction and operation of robots. This field overlaps with electronics, computer science, mechatronics and artificial intelligence. Robotic companies are booming all over the world and are seeking engineers with skills for implementing **Next -Level Automation**. This Open Elective Track for Robotics consists of four courses and is intended for making students industry ready in the field of robotics.

The First course in this track" Fundamentals **of Robotics"** introduces various physical aspects of building a robot, exploring topics like how a robot perceives its environment using Sensors and how it interacts with its environment through various Actuators & Grippers. This course also inspects a variety of robot applications in different domains.

Second Course in this track" Kinematics **& Dynamics of robots"** delves a level deeper discussing analysis and control of robots. It establishes strong mathematical foundation for describing and controlling robot movement. In this course students will learn in detail about Forward Kinematics, Inverse Kinematics, Workspace Analysis and Trajectory planning for robots.

Third Course in the Robotics track **"Drives and Control System for Robots"** explores in detail various Drive Mechanisms used in robotics such as Hydraulic, Pneumatic & Electric drives. After completing this course students will be able to analyze operational aspects of a drive system for a given robotic application. Fourth Course in the track **"Robot Programming and Intelligent Control System"** expands on Robot Programming, discussing various aspects of Robot Programming Languages and their functions. This course also dives deep into advanced topics like Artificial Intelligence, Neural Networks and Fuzzy control for robots.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EI301) FUNDAMENTALS OF ROBOTICS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the basic components of a Robot
- To learn different types of Robot sensors and actuators used in Robotics
- To identify different types of Robot grippers and their applications
- To acquire basic Knowledge on Robot kinematics
- To expose to various application fields of Robotics

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Gain knowledge about basic concepts of robots

CO-2: Appreciate the usage of different sensors and actuators in Robotics

CO-3: Select appropriate Gripping mechanism for a particular application

CO-4: Analyze the direct and the inverse kinematic problems

CO-5: Appreciate robot design deference's for various applications

UNIT-I:

Basic Concepts: An overview of Robotics, classification of Robots, Robot Components, Robot degrees of freedom, Robot Joints, Robot Coordinates, Robot reference frames, Programming modes, Robot Characteristics.

UNIT-II:

Sensors: Sensor characteristics, Position sensors, Velocity sensors, Acceleration sensors, Force and Pressure sensors, Torque sensors, Microswitches, Light and infrared sensors, Touch and tactile sensors, Proximity sensors, Range finders.

UNIT-III:

Actuators: Characteristics of actuating system, Comparison of actuating systems, Hydraulic actuators, Pneumatic devices, Electric motors, Magneto-strictive actuators, Shape-Memory Metals, Electro-active Polymer Actuators.

Grippers: Classification of Grippers, Drive system for Grippers, Mechanical Grippers, Magnetic Grippers, Vacuum Grippers, Adhesive Grippers, Hooks and Scoops, Gripper Force analysis and design, Active and Passive Grippers.

UNIT-IV:

Kinematics: Robots as Mechanisms, Matrix Representation, Homogeneous Transformation Matrices, Representation of Transformations, Inverse of Transformation Matrices, Forward and Inverse Kinematics with Equations.

UNIT-V:

Applications: Industrial applications, material handling, processing, assembly application, inspection application, application planning, justification of robots, non-industrial applications, Robot safety.

TEXT BOOKS:

1. Introduction to Robotics: Analysis, Control, Applications, Saeed B. Niku, 2nd Edition, Wiley
2. Robotics Technology and Flexible Automation, Deb S. R., John Wiley
3. Robotics and Control, R. K. Mittal, I. J. Nagrath, McGraw-Hill Education

REFERENCES:

1. Industrial Robotics, Technology programming and Applications, Mikell P. Groover, Nicholas G. Odrey, Mitchel Weiss, Roger N. Nagel, Ashish Dutta, McGraw-Hill, 2012
2. Robotics-Control, Sensing, Vision and Intelligence, K. S. Fu, R. C. Gonzalez, C. S. G. Lee, McGraw-Hill International Edition
3. Robotic Engineering–An Integrated Approach, Klafter R. D., Chimielewski T. A., Negin M., Prentice Hall of India, 2009

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1EI302) KINEMATICS OF ROBOTS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the basics of robot coordinate frames and their representation
- To obtain knowledge about direct kinematics and inverse kinematics for a robot manipulator
- To examine techniques for planning robot motion in a workspace
- To understand various methods for developing dynamic models for manipulator
- To learn control techniques applied to robot manipulators

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Mathematically represent a Robot system

CO-2: Calculate robot hand position and orientation for specific joint angles

CO-3: Calculate joint angles to achieve a particular hand position

CO-4: Plan trajectories for robot tool to do meaningful tasks

CO-5: Analyze different controlling techniques used for robot manipulators

UNIT-I:

Introduction: Introduction, position and orientation of objects, objects coordinate frame Rotation matrix, Euler angles Roll, pitch and yaw angles coordinate Transformations, Joint variables and position of end effector, Dot and cross products.

UNIT-II:

Direct Kinematics: Coordinate frames, Rotations, Homogeneous coordinates, Link coordinates D-H Representation, The ARM equation. Direct kinematic analysis for Four axis SCARA Robot and three, five and six axis Articulated Robots.

UNIT-III:

Inverse Kinematics: The inverse kinematics problem, General properties of solutions. Tool configuration, Inverse kinematics of four axis SCARA robot and three and five axis Articulated robot.

UNIT-IV:

Workspace Analysis and Trajectory Planning: Workspace Analysis, work envelope of a Four axis SCARA robot and five axis articulated robot workspace fixtures, the pick and place operations, Joint space technique - continuous path motion, Interpolated motion, straight line motion and Cartesian space technique in trajectory planning.

UNIT-V:

Robot Control: The Control Problem, State Equations: one axis robot; three axis SCARA robot, Constant solutions, Linear Feedback Systems, Single Axis PID Control, PD-Gravity Control.

TEXT BOOKS:

1. Fundamentals of Robotics: Analysis & Control, Robert J. Schilling, Prentice Hall of India
2. Robotics and Control, R. K. Mittal, I. J. Nagrath, McGraw Hill Education

REFERENCES:

1. Robotic Engineering–An Integrated Approach, Klafter. R.D, Chimielewski. T.A, Negin M, Prentice Hall of India, New Delhi, 2009
2. Industrial Robotics, Technology Programming and Applications, Mikell P. Groover & Nicholas G. Odrey, Mitchel Weiss, Roger N. Nagel, Ashish Dutta, Tata McGraw-Hill Education, 2012
3. Robotics-Control, Sensing, Vision and Intelligence, K.S. Fu, R.C. Gonzalez, C.S.G Lee, McGraw-Hill International Edition

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1EI401) DRIVE SYSTEMS FOR ROBOTS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To get acquainted with different robot drive mechanisms
- To understand in detail, working of hydraulic and pneumatic drives used in robotics
- To learn working principles of various electric drive systems for robotics
- To acquire basic Knowledge on servo systems for robot control

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Categorize various drive systems for robot movement

CO-2: Select appropriate drive system for a particular application

CO-3: Inspect different Hydraulic and Pneumatic drives and their applications in robotics

CO-4: Inspect different electric drives and their applications in robotics

UNIT-I:

Introduction: Objectives, motivation, open loop control, closed loop control with velocity and position feedback, Types of drive systems. Functions of drive system.

UNIT-II:

Robot Drive Mechanism: Lead Screws, Ball Screws, Chain & linkage drives, Belt drives, Gear drives, Precision gear boxes, Harmonic drives, Cyclo speed reducers.

UNIT-III:

Hydraulic Drives: Introduction, Requirements, Hydraulic piston and transfer valve, hydraulic circuit incorporating control amplifier, hydraulic fluid considerations, hydraulic actuators Rotary and linear actuators. Hydraulic components in robots.

UNIT-IV:

Pneumatic Drives: Introduction, Advantages, pistons-Linear Pistons, Rotary pistons, Motors-Flapper motor, Geared motor, Components used in pneumatic control. Pneumatic proportional controller, pneumatically controlled prismatic joint.

UNIT-V:

Electric Drives: Introduction, Types, DC electric motor, AC electric motor, stepper motors, half step mode operation, micro step mode. Types of stepper motors, Direct drive actuator.

TEXT BOOKS:

1. Engineering Foundation of Robotics, Francis N-Nagy Andras Siegler, Prentice Hall Inc.
2. Robotics Engineering - An Integrated Approach, Richard D. Klafter, Thomas. A, Chri Elewski, Michael Negin, PHI Learning, 2009

REFERENCES:

1. Industrial Robotics, Technology Programming and Applications, Mikell P. Groover & Nicholas G. Odrey, Mitchel Weiss, Roger N. Nagel, Ashish Dutta, Tata McGraw-Hill Education, 2012
2. Industrial Robotics, Bernard Hodges, 2nd Edition, Jaico Publishing House, 1993
3. Fundamentals of Robotics Analysis and Control, Robert J. Schilling, PHI Learning, 2009
4. Foundations of Robotics Analysis and Control, Tsuneo Yohikwa, MIT Press, 2003
5. Introduction to Robotics Mechanics and Control, John J. Craig, 3rd Edition, Pearson, 2008

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1EI402) INTELLIGENT SYSTEMS FOR ROBOTS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the fundamentals of robot programming
- To learn robot textual languages that are in common use
- To expose to artificial intelligence in robotics
- To acquire basic Knowledge on neural networks in robotics
- To acquire basic Knowledge on fuzzy logic in robotics

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Gain knowledge about different methods of robot programming
CO-2: Examine various robot language elements and their functions
CO-3: Analyze different AI techniques employed in robotics
CO-4: Design basic neuro-controller for robot motion control
CO-5: Apply fuzzy logic to robot control systems

UNIT-I:

Robot Programming: Methods of robot programming, leadthrough programming methods, robot program as a path in space - defining position in space, speed control, motion interpolation, WAIT, SIGNAL, DELAY commands, Branching.

UNIT-II:

Robot Languages: Textual robot language, generations of robot languages, robot language structure, operating systems, Robot language Elements and functions, constraints and variables, aggregates and location variables.

UNIT-III:

Basic Commands and Operations: Motion commands- move and related statements, speed control, points in workspace, paths and frames. End effector and sensor commands- end effector operation, sensor operation, REACT statement. Computations and operation. Program control and subroutines. Communications and data processing. Monitor mode commands.

UNIT-IV:

AI for Robotics: Introduction to Artificial Intelligence, goals of AI research, AI techniques- knowledge representation, problem representation, search techniques. LISP programming. AI and Robotics. LISP in the factory. Robotic Paradigms.

UNIT-V:

Neural Network & Fuzzy Logic Approach in Robotics: Introduction, Connectionist Models, Learning Principles and Learning Rules: Supervised, unsupervised, reinforcement learning. Neural Network in Robotics: Control of robot hands by neural network. Introduction to fuzzy logic, Fuzzy sets, Operation of Fuzzy sets, Fuzzy rule formation, Control rules, Fuzzy algorithm in robotics, Robot obstacle avoidance using fuzzy logic.

TEXT BOOKS:

1. Industrial Robotics Technology, Programming and Applications, Mikell. P. Groover, McGraw Hill, 2012
2. Robotics Technology and Flexible Automation, Deb S. R., Tata McGraw Hill Publishing Company Limited

REFERENCES:

1. Design and Control of Intelligent Robotic Systems, (Studies in Computational Intelligence 177) M. Begum, F. Karray (auth.), Dikai Liu, Lingfeng Wang, Kay Chen Tan (eds.), Springer
2. Neural Networks in Robotics, Edited by George Bekey, Kenneth Y. Goldberg, Springer US, 2012
3. Neural Networks, Fuzzy Logic, Genetic Algorithm - Synthesis and Applications, Rajasekharan and Rai, PHI Publications
4. Introduction to Neural Networks using MATLAB 6.0, S. N. Sivanandam, S. Sumathi, S. N. Deepa, TMH, 2006

CYBER SECURITY



CYBER SECURITY

Offered by: **INFORMATION TECHNOLOGY**

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Cyber Security	Fundamentals of Computer Networks / Relational Database Management Systems	**Cryptography & Network Security**	Essentials of Cyber Security	Computer Forensics

CYBER SECURITY

Cybersecurity is **important** because it incorporates everything that relates to protecting our sensitive data, personally identifiable information (PII), protected health information (PHI), personal information, intellectual property, data, and governmental and **industry** information systems from stealing and destruction endeavoured. The cyber security track helps students to learn about how to
Defend networks and data from unapproved access.
Enhanced information security and business endurance supervision.
Upgraded stakeholder confidence in your information security preparations.
Developed company authorizations with the correct security controls in place.

Some of the more common career paths in the cyber security path are

- Chief Information Security Officer. ...
- Forensic Computer Analyst. ...
- Information Security Analyst. ...
- Penetration Tester. ...
- Security Architect. ...
- IT Security Engineer. ...
- Security Systems Administrator. ...
- IT Security Consultant.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS301) FUNDAMENTALS OF COMPUTER NETWORKS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To introduce the fundamental various types of computer networks
- To demonstrate the TCP/IP and OSI models with merits and demerits
- To explore the various layers of OSI model
- To introduce UDP and TCP models
- To have the concept of different routing techniques for data communications

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand and explore the basics of Computer Networks reference models and the functionalities of physical layer

CO-2: Learn major concepts, principles involved in Data Link Layer and Network Layer

CO-3: Analyze how to maintain QoS in Network and maintaining of Congestion Control

CO-4: Demonstrate the Application Layer functionalities and importance of Security in the Network

UNIT-I:

Introduction to Networks: Internet, Protocols and Standards, The OSI Model, Layers in OSI Model, TCP/IP Suite, Addressing.

Physical Layer: Multiplexing, Transmission Media, Circuit Switched Networks, Datagram Networks, and Virtual Circuit Networks.

UNIT-II:

Data Link Layer: Introduction, Checksum, Framing, Flow and Error Control, Noiseless Channels, Noisy Channels, Random Access Controlled Access, Channelization, IEEE Standards, Ethernet, Giga-Bit Ethernet, Wireless LANs, SONET-SDH, Frame Relay and ATM.

UNIT-III:

Network Layer: Logical Addressing, Internetworking, Tunneling, Address Mapping, ICMP, IGMP, Forwarding, Routing-Flooding, Bellman Ford, Disjkstra's routing protocols, RIP, OSPF, BGP and Multicast Routing Protocols. Connecting Devices-Passive Hubs, Repeaters, Active Hubs, Bridges, Routers.

UNIT-IV:

Transport Layer: Process to Process Delivery, UDP, TCP and SCTP Protocols, Congestion, Congestion Control, Quality of Service.

Application Layer: Domain Name Space, DNS in Internet, Electronic Mail.

UNIT-V:

File Transfer Protocol, WWW, HTTP, SNMP, Multimedia.

Network Security: Security services, mechanisms and attacks, IPSec, SSL, VPN, Firewall. Bluetooth, Zigbee, IPv4, IPv6.

TEXT BOOKS:

1. Data Communications and Networking, Behrouz A. Forouzan, 4th Edition, McGraw Hill Education, 2006
2. Computer Networks, Andrew S. Tanenbaum, 4th Edition, Pearson Education
3. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K. W. Ross, 3rd Edition, Pearson Education

REFERENCES:

1. Data Communications and Networks, William Stallings
2. Data Communication and Networks, Bhusan Trivedi, Oxford University Press, 2016
3. An Engineering Approach to Computer Networks, S. Keshav, 2nd Edition, Pearson Education
4. Understanding Communications and Networks, 3rd Edition, W.A. Shay, Cengage Learning

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS302) RELATIONAL DATABASE MANAGEMENT SYSTEMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the basic concepts and the applications of database systems
- To master the basics of SQL and construct queries using SQL
- To understand the relational database design principles
- To become familiar with the basic issues of transaction processing and concurrency control
- To become familiar with database storage structures and access techniques

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Demonstrate the basic concepts of database systems and design E-R models to represent simple database application scenarios

CO-2: Formulate SQL queries on the data

CO-3: Improve the database design by normalization

CO-4: Apply and relate the concept of transaction, concurrency control and recovery in database

CO-5: Familiar with basic database storage structures and access techniques using Indexing, hashing including B tree methods

UNIT-I:

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages – DDL, DML, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database Users and Administrators, History of Database Systems.

Introduction to Database Design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises.

Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical database Design: ER to Relational, Introduction to Views, Destroying /Altering Tables and Views.

UNIT-II:

Relational Algebra and Calculus: Preliminaries, Relational Algebra, Relational calculus – Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.

SQL: Queries, Constraints, Triggers: Form of Basic SQL Query, UNION, INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values Complex Integrity Constraints in SQL, Triggers and Active Databases, Designing Active Databases.

UNIT-III:

Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies - Reasoning about FDs, Normal Forms, Properties of Decompositions, Normalization, Schema Refinement in Database Design, Other Kinds of Dependencies.

UNIT-IV:

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

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

Recovery System-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with loss of nonvolatile storage, Early Lock Release and Logical Undo Operations, Remote Backup systems.

UNIT-V:

Storage and Indexing: Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing, Index Data Structures, Comparison of File Organizations.

Tree-Structured Indexing: Intuition for tree Indexes, Indexed Sequential Access Method (ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

Hash- Based Indexing: Static Hashing, Extendible hashing, Linear Hashing, Extendible vs. Linear Hashing.

TEXT BOOKS:

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

REFERENCES:

1. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning
2. Introduction to Database Management, M. L. Gillenson and others, Wiley Student Edition
3. Database Development and Management, Lee Chao, Auerbach Publications, Taylor & Francis Group
4. Introduction to Database Systems, C. J. Date, Pearson Education

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1IT301) CRYPTOGRAPHY AND NETWORK SECURITY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Fundamentals of Computer Networks, Distributed Data Bases

COURSE OBJECTIVES:

- To outline security concepts, threats, attacks, services and mechanisms
- To describe various cryptosystems- symmetric key cryptography, public key cryptography
- To apply authentication services and Secure hash functions
- To discuss the concepts of IP Security, web security, viruses and firewalls

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Analyze the basics of security attacks, services, goals and mechanism

CO-2: Apply a variety of cryptographic algorithms, Hash Functions and protocols underlying network security and authentication applications

CO-3: Understand and anlyze the key management requirements and implementation

CO-4: Examine and analyze various Email and Web Security mechanisms

CO-5: Understand the System Level Security issues

UNIT-I:

Security Attacks: Security Attacks (Active and Passive), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, Access Control and Availability) and Mechanisms, A model for Internetwork security, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

UNIT-II:

Conventional Encryption: Classical Encryption techniques(Rail fence, Hill Cipher, Caesar cipher, Vigenere cipher, Play Fair Cipher), Fiestel Cipher Structure, Data Encryption Standard, Block Cipher Design Principles and Modes of Operation, Triple DES, RC-4, AES Cipher, Placement of Encryption Function.

Public Key Cryptography and Authentication: Confidentiality using Symmetric Encryption – Principles of Public key Cryptosystems, RSA algorithm,

UNIT-III:

Key Management: Diffie-Hellman key Exchange, Elliptic Curve Cryptography.

Hash Functions: Hash Functions, Security of Hash Functions and MACs, Secure Hash Algorithm, HMAC, Digital Signatures, Authentication Protocols, Digital Signature Standard, Authentication Applications: Kerberos, X.509 Authentication Service

UNIT-IV:

Email Security and Web Security: Electronic Mail Security – PGP/ SMIME, IP security- Architecture, Authentication Header, Encapsulating Security Payload, Key Management, Web Security- Secure Socket Layer, Transport Layer Security and Secure Electronic Transaction

UNIT-V:

System Level Security: Intrusion detection – password management – Viruses and related Threats – Virus Counter measures – Firewall Design Principles – Trusted Systems.

TEXT BOOKS:

1. Cryptography and Network Security – Principles and Practices, William Stallings, Prentice Hall of India, 4th Edition, 2005
2. Hack Proofing Your Network, Ryan Russell, Dan Kaminsky, Rain Forest, Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W. Manzuik and Ryan Permeh, Wiley Dreamtech

REFERENCES:

1. Network Security Essentials: Applications and Standards, William Stallings Prentice Hall,1999, ISBN 0130160938
2. Security in Computing, Charles B. Pfleeger, Shari Lawrence Pfleeger, 3rd Edition, Pearson Education, 2003

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1IT401) ESSENTIALS OF CYBERSECURITY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Fundamentals of Computer Networks, Cryptography and Network Security

COURSE OBJECTIVES:

- To identify the key components of cyber security in network
- To describe various security levels and categories, operating system security
- To define authentication issues and network security
- To describe memory management and protection measures

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand Information security and categorize cyber-crimes

CO-2: Demonstrate cyber offenses, security levels and models with objects and access control

CO-3: Understand Security implications and threats on Mobile devices

CO-4: Analyze tools and methods used in cybercrime

CO-5: Understand Organizational Implications and security risks

UNIT-I:

Introduction to Cybercrime: Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The lega Perspectives and Indian Perspective, Cyber crime and the Indian ITA2000, A Global Perspective on Cybercrimes.

UNIT–II:

Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cybers talking, Cyber Café and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

UNIT–III:

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, **Mobile Devices:** Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

UNIT–IV:

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horse And Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT–V:

Cyber Security: Organizational Implications

Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications.

Social Media Marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

TEXTBOOK:

1. Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and SunilBelapure, WileyIndia

REFERENCES:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press
2. Introduction to Cyber Security, Chwan-Hwa (John)Wu, J.DavidIrwin, CRC Press T&F Group

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1IT402) COMPUTER FORENSICS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Fundamentals of Computer Networks, Cryptography and Network Security, Essentials of Cyber Security

COURSE OBJECTIVES:

- To provide an understanding of computer forensics fundamentals
- To analyze various computer forensics technologies and to provide computer forensics systems
- To identify methods for data recovery
- To apply the methods for preservation of digital evidence

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Define and discuss the concepts of computer forensics

CO-2: Explain and apply the concepts of computer investigations

CO-3: Discuss the Computer Forensics Analysis and Validation and apply current practices for processing crime and incident scenes

CO-4: Select and apply current computer forensics tools

CO-5: Analyze the Windows Operating systems and DOS

UNIT –I:

Computer Forensics Fundamentals: What is Computer Forensics? Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists.

Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of Law Enforcement — Computer Forensic Technology — Types of Business Computer Forensic Technology Computer Forensics Evidence and Capture: Data Recovery Defined—DataBack-upandRecovery—TheRoleofBack-upinDataRecovery—TheData-RecoverySolution.

UNIT–II:

Evidence Collection and Data Seizure: Why Collect Evidence? Collection Options— Obstacles — Types of Evidence — The Rules of Evidence — Volatile Evidence — GeneralProcedure—CollectionandArchiving—MethodsofCollection—Artifacts—

Collection Steps—Controlling Contamination: The Chain of Custody Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene—Computer Evidence Processing Steps—Legal Aspects of Collecting and Preserving Computer

Forensic Evidence Computer Image Verification and Authentication: Special Needs of Evidential Authentication—Practical Consideration—Practical Implementation.

UNIT–III:

Computer Forensics Analysis and Validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honey net project.

Processing Crime and Incident Scenes: Identifying digital evidence, collecting evidence in private-sector incident scenes, processing law enforcement crime scenes, preparing for a search, securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case.

UNIT–IV:

Current Computer Forensic Tools: Evaluating computer forensic tool needs, computer forensic software tools, computer forensics hard ware tools, validating and testing forensics software E-Mail Investigations: Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail, investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools.

Cell Phone and Mobile Device Forensics: Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

UNIT–V:

Working with Windows and DOS Systems: understanding file systems, exploring Microsoft File Structures, Examining NTFSdisks, Understanding whole disk encryption, windows registry, Microsoft startup tasks, MS-DOS startup tasks, virtual machines.

TEXTBOOKS:

1. Computer Forensics, Computer Crime Investigation, John R.Vacca, Firewall Media, New Delhi
2. Computer Forensics and Investigations, Nelson, Phillips Enfinger, Steuart, CENGAGE Learning
3. Real Digital Forensics, Keith J.Jones, Richard Bejtiich, Curtis W.Rose, Addison Wesley, Pearson Education

REFERENCES:

1. Forensic Compiling, A Practitioners Guide, Tony Sammes and Brian Jenkinson, Springer International Edition
2. Computer Evidence Collection & Presentation, Christopher L.T.Brown, Firewall Media
3. Home land Security, Techniques & Technologies, Jesus Mena, Firewall Media
4. Software Forensics Collecting Evidence from the Scene of a Digital Crime, Robert M. Slade,TMH 2005
5. Windows Forensics, Chad Steel, Wiley India Edition

DATA SCIENCES / BIG DATA AND ANALYTICS



DATA SCIENCES / BIG DATA ANALYTICS

Offered by: **INFORMATION TECHNOLOGY**

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Data Sciences / Big Data & Analytics	Statistical Methods for Data Science	**Computational Thinking using Python**	Fundamentals of Data Mining	Data Analysis and Visualization

DATA SCIENCES / BIG DATA AND ANALYTICS

Data science helps in risk evaluation and observing, possible deceitful comportment, payments, customer analysis, and experience, among much other exploitation. The capability to make **data**-driven choices generates a steadier financial situation and **data scientists** make the strength of the **industry.**

As such, **data science** track helps students to apply business concepts in banking, finance, manufacturing, transport, e-commerce, education, etc. that use **data science**. As a consequence, there are numerous **Data Science** Applications associated to it

Job Roles in Data Science Track

- Data Analyst
- Data Engineers
- Database Administrator
- Machine Learning Engineer
- Data Scientist
- Data Architect
- Statistician
- Business Analyst
- Data and Analytics Manager

Big Data analytics track helps the students to learn the process of gathering, establishing and examining large sets of **data** (called **Big Data**) to determine patterns and other beneficial information. Analysts occupied with **Big Data** characteristically want the acquaintance that comes from investigating the **data**.

Big data analytics is the practice of mining useful information by examining different **types** of big data sets. Big data analytics is utilized to determine concealed patterns, market developments and consumer favorites, for the advantage of organizational decision making.

Job responsibilities in a Big Data Analytics Track are

- To gather and accumulate data from disparate sources, clean it, organize it, process it, and analyse it to extract valuable insights and information.
- To identify new sources of data and develop methods to improve data mining, analysis, and reporting.
- To create data definitions for new database files or alterations made to the already existing ones for analysis purposes.
- To present the findings in reports (in table, chart, or graph format) to help the management team in the decision-making process.
- To apply statistical analysis methods for consumer data research and analysis purposes.
- To keep track of the trends and correlational patterns among complex data sets.
- To perform routine analysis tasks to support day-to-day business functioning and decision making.
- To collaborate with Data Scientists to develop innovative analytical tools.
- To work in close collaboration with both the IT team and the business management team to accomplish company goals.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1MT303) STATISTICAL METHODS FOR DATA SCIENCE

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PREREQUISITES: Calculus and probability theory

COURSE OBJECTIVES:

- To provide insights about the basic roles of various statistical methods in building computer applications
- To develop problem-solving skills using R programming
- To understanding the importance of Data Visualization for univariate, bivariate techniques
- To inferences about the population parameters using sample data
- To understanding regression techniques

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Analyze an extremely large data set and perform exploratory data analysis to extract meaningful insights

CO-2: Examine a real-world problem and solve the same with the Knowledge gained from various distributions study through R Programming

CO-3: Develop various visualizations of the data in hand and communicate results of analysis effectively (visually and verbally)

CO-4: Use and fit a linear regression model to data and use it for prediction

CO-5: Fit a polynomial regression model to data and use it for prediction

UNIT-I:

Introduction to Statistics and Descriptive Statistics: Definition of Statistics, Basic objectives. Applications in various branches of science with examples, Collection of Data: Internal and external data, Primary and secondary Data, Population and sample, Representative sample.

Descriptive Statistics: Classification and tabulation of univariate data, graphical representation, Frequency curves. Descriptive measures - Central tendency and Dispersion Bivariate data. Summarization, Marginal and Conditional frequency distribution.

UNIT-II:

Introduction to R: Introduction, Installing R and Data Types in R,

Programming using R: Operators, Conditional Statements, Looping, Scripts, Function creation. Creating list, List operations, Recursive list, creating a data frame, operations on data frames.

UNIT-III:

Data Visualization using R: Import-Export of data, Measures of central Tendency and Measures of Dispersion, Data Visualization – Scatter plot, Pie chart , Histogram, Bar chart, Box plot, Absolute and Relative frequencies, frequency distribution.

UNIT-IV:

Correlation & Linear Regression:

Correlation: Types of correlation

Linear and Multiple Regression: Introduction, the Regression Model, Multiple linear regression, Interval estimation, Estimation of parameters of β_0 and β_1, Estimation of σ^2.

UNIT-V:

Non Linear Regression: Regression of second degree polynomial (Non-linear least square method for polynomial function), Power function, Exponential, Estimation of coefficients, Linear and Polynomial Regressions in R.

TEXT BOOKS:

1. Introductory Statistics by Thomas H Wonnacott& Ronald J Wonnacot, John Wiley &Sons Inc., 1969
2. Applied Statistics and Probability for Engineers by Douglas C. Montgomery, George C. Runger, John Wiley & Sons, Inc. 3rd edition, 2003
3. R for Beginners, SandipRakshit, McGraw Hill Education, (Unit-II, Unit-III)

REFERENCES:

1. Statistical Methods, Rudolf J. Freund, Donna Mohr, William J. Wilson, 3rd Edition, 2010, (Unit-I, Unit-IV, Unit-V)
2. R-The Statistical Programming Language by Dr. Mark Gardner of Wiley India Pvt. Ltd.
3. Introduction to the Theory of Statistics, A. M. Mood, F.A. Graybill and D.C. Boes, McGraw Hill Education
4. A first course in Probability, S. M. Ross, Prentice Hall
5. Stastical Methods, S.P Gupta, 42nd revised edition, Sultan chand& sons, 2012

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1IT302) COMPUTATIONAL THINKING USING PYTHON

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Statistical Methods for Data Science

COURSE OBJECTIVES:

- To Understand why Python is a useful scripting language for developers
- To create and execute Python programs and to learn how to use lists, tuples and dictionaries in Python programs
- To learn how to build and package Python modules for reusability
- To learn how to design object-oriented programs with Python classes
- To learn how to use exception handling in Python applications for error handling

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Adapt and combine standard algorithms to solve a given problem (includes numerical as well as non-numerical algorithms)

CO-2: Adequately use standard programming constructs: repetition, selection, functions, composition, modules, aggregated data (arrays, lists etc.)

CO-3: Explain what a given program (in Python) does identify and repair coding errors in a program

CO-4: Understand and use object-based software concepts (constructing OO software will be deal with in the course Software Engineering)

CO-5: Use library software for (e.g.) building a graphical user interface, web application or mathematical software

UNIT-I:

Introduction, History, Features, setting up path, Working with Python, Basic Syntax, Variable and Data Types, Operator, Conditional Statements- If, If-else, Nested If-else Looping for While Nested loops Control Statements Break Continue Pass String Manipulation Accessing Strings Basic Operations String Slices Function.

UNIT-II:

Methods, Lists: Introduction, accessing list, Operations, Working with lists, Function and Methods,

Tuple: Introduction, accessing tuples, Operations, Working Functions and Methods.

Dictionaries: Introduction, accessing values in dictionaries, Working with dictionaries, Properties.

UNIT-III:

Functions: Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables.

Modules: Creation, Importing module, Math module, Random module, Packages.
Composition: Input-Output Printing on screen, reading data from keyboard, Opening and closing file Reading and writing files, Functions.

UNIT-IV:
Exception Handling: Exception, Exception Handling, except clause, Try, Finally, clause, User Defined Exceptions.
OOPs concept: Class and object, Attributes, Inheritance, Overloading, Overriding, Data hiding, Regular Expressions-Match function, Search function, Matching vs Searching Modifiers, Patterns.
Multithreading: Thread, starting a thread. Threading module, Synchronizing threads.

UNIT-V:
CGI: Introduction, Architecture, CGI environment variable, GET and POST methods, Cookies, File upload.
Database: Introduction, Connections, Executing queries, Transactions Handling error.
Networking: Socket, Socket Module, Methods, Client and server, Internet modules, Sending email.

TEXT BOOK:
1. Learning Python, David Ascher and Mark Lutz, O' Relly

REFERENCES:
1. Python Programming: An Introduction to Computer Science, John M. Zelle, 2nd Edition, Kindle Edition
2. Python Essential Reference, David M. Beazley, 4th Edition, Developer's Library

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1IT403) FUNDAMENTALS OF DATAMINING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Statistical Methods for Data Science, Computational Thinking using Python

COURSE OBJECTIVES:

- To introduce the basic concepts and techniques in building a Data Warehouse
- To apply preprocessing methods for any given raw data
- To develop skills of using recent datamining software for solving practical problems
- To implement and apply basic algorithms for supervised and unsupervised learning

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Assess raw input data and process it to provide suitable input for arrange of data mining algorithms

CO-2: Discover and measure interesting patterns from different kinds of databases

CO-3: Evaluate and select appropriate data-mining classification algorithms and apply, interpret and report the output appropriately

CO-4: Design and implement data – mining applications using sample, realistic data sets and modern tools

CO-5: Evaluate and select appropriate data-mining clustering algorithms and apply, interpret and report the output appropriately

UNIT–I:

Data Warehousing & Modelling: Basic Concepts: Data Warehousing: A multitier Architecture, Data ware house models: Enterprise warehouse, Data mart and virtual warehouse, Extraction, Transformation and loading.

UNIT–II:

Data Cube: A multidimensional data model, Stars, Snowflakes and Fact constellations: Schemas for multidimensional Data models, Dimensions: The role of concept Hierarchies, Measures: Their Categorization and computation, Typical OLAP Operations.

UNIT–III:

Data Warehouse Implementation & Data Mining: Data Ware house Architecture, What is data mining, Challenges, From Data Ware housing and Data Mining, Data Mining Tasks, Data Mining Functionalities, Major Issues in Data Mining. Data: Types of Data, Data Quality, Data Pre-processing, Measures of Similarity and Dissimilarity.

UNIT–IV:

Association Analysis: Association Analysis: Problem Definition, Frequent Item set Generation, Rule generation. Alternative Methods for Generating Frequent Item sets, FP-Growth Algorithm, Evaluation of Association Patterns.

UNIT–V:

Classification: Decision Trees Induction, Method for Comparing Classifiers, Rule Based Classifiers, Nearest Neighbor Classifiers, Bayesian Classifiers.

Clustering Analysis: Overview, K-Means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation, Density-Based Clustering, Graph- Based Clustering, Scalable Clustering Algorithms.

TEXTBOOKS:

1. Introduction to Data Mining, Pang-NingTan, Michael Steinbach, Vipin Kumar, First Impression, Pearson,2014
2. Data Mining-Concepts and Techniques, JiaweiHan, Micheline Kamber, JianPei, 3rd Edition, Morgan Kaufmann, 2012

REFERENCES:

1. Data Ware housing in the Real World, Sam Anahory, Dennis Murray, Tenth Impression, Pearson,2012
2. Mastering Data Mining, Michael J.Berry, Gordon S. Linoff, 2nd Edition, Wiley, 2012

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1IT404) DATA ANALYSIS AND VISUALIZATION

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Statistical Methods for Data Science, Computational Thinking using Python, Fundamentals of Data Mining

COURSE OBJECTIVES:

- To introduce concept and characteristics of probability distribution
- To introduce underlying design principles, properties and assumptions oflinear and non-linear regression modelling
- To introduce design principles involved in identifying interesting classification and prediction of data patterns
- To introduce properties of time series data and perform time series analysis

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply probability distribution concepts to identify univariate data patterns
CO-2: Apply regression modeling to build efficient mathematical models for prediction and classification
CO-3: Apply decision and regression trees for supervised learning
CO-4: Visualize time series data by applying time series techniques
CO-5: Explore case studies and projects

UNIT–I:
Data Definitions and Analysis Techniques: Elements, Variables, and Data categorization, Introduction to statistical learning, Descriptive Statistics: Measures of central tendency, Measures of location of dispersions.

UNIT–II:
Basic Analysis Techniques: Basic analysis techniques, Statistical hypothesis generation and testing, Chi-Square test, t-Test Analysis of variance, Correlation analysis, Maximum likelihood test.

UNIT–III:
Data Analysis Techniques: Regression analysis and visualization, Classification techniques and visualization, Clustering and visualization, Association rules analysis and visualization

UNIT–IV:
Time-series Analysis and Forecasting– Time-series components, Variation in Time Series, Cyclic Variation, Seasonal Variation, Irregular Variation.

UNIT–V:

Smoothing Techniques: A problem involving all four components of time series, Introduction to forecasting, forecasting models, Trend and Seasonal effects, Trend Analysis

Case-studies and Projects: Understanding business scenarios, Feature engineering and visualization, Sensitivity Analysis.

TEXTBOOKS:

1. Data Mining and Analysis, Mohammed J.Zaki, Wagner Meira, Cambridge, 2012
2. Data Mining: Theories, Algorithms, and Examples, NongYe, CRC Press Taylor & FrancisGroup,2014
3. Statistics for Management, David S.Rubin, Sanjay Rastogi, Masood Husain Siddiqui RichardI.Levin,7th Edition, Pearson Learning

REFERENCES:

1. Probability & Statistics for Engineers & Scientists, Ronald E.Walpole, RaymondH. Myers, Sharon L.Myersand KeyingYe, 9thEdition, PrenticeHallInc.
2. The Elements of Statistical Learning, Data Mining, Inference and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, 2nd Edition, Springer, 2014
3. An Introduction to Statistical Learning Mining Massive Data Sets, A.Rajaramanand J.Ullman, Cambridge University Press, 2012
4. Software for Data Analysis: Programming with R (Statistics and Computing), John M.Chambers, Springer

AUTONOMOUS VEHICLES



AUTONOMOUS VEHICLES

Offered by: AUTOMOBILE ENGINEERING

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Autonomous Vehicles	Principles of Automobile Engineering	**Modern Automotive Technologies**	Electric, Hybrid and Fuel Cell Vehicles	Connected and Autonomous Vehicles

AUTONOMOUS VEHICLES

The invention of the wheel marked a large step in the evolution of mankind. With mobility, man experienced a newfound freedom that opened the doors for several other inventions. Automobile engineering or automotive engineering is one of the most challenging careers in the field of engineering with a wide scope. This branch deals with the designing, developing, manufacturing, testing and servicing automobiles such as cars, trucks, motorcycles, scooters, etc. and the related engineering sub systems. For the perfect blend of designing and manufacturing automobiles, automobile engineering uses the features of different elements of engineering such as mechanical, electrical, electronic, instrumentation, civil, software and safety engineering. Exploring the topic from an interdisciplinary perspective is indispensable. Globalization and incredible growth of automobile industry have resulted in numerous opportunities for engineers both in India and abroad.

The 17th and 18th centuries were mostly about steam-powered vehicles transporting people and goods. While electric cars enjoyed popularity in the A19th and early 20th centuries, the later period saw the accelerated adoption of the petrol car, due to its advantages of power, mass production, cost and advances in the internal combustion engine. It is only in the 21st century that interest in electric cars has come back, given the need for cleaner, greener modes of transport. The modern period is associated with several path breaking technologies. Over the last couple of decades, there has been an explosion of electronics in vehicles. Connected cars that include technology features are ever more popular. These smart cars come with internet access, GPS, wi-fi, superior infotainment, advanced telematics and navigation capabilities. More innovations in in-vehicle infotainment and electronics promise to give car users even more enhanced capabilities in the near future.

Today, safety has become a larger concern than ever before. While entertainment and infotainment have made car driving a pleasure, this has also given rise to a growing tribe of distracted drivers. Add to this, underdeveloped roads, which take a toll on drivers today. Increased distractions and fatigue can also contribute to human fatalities. The future certainly points in the direction of driverless cars, which promise to alleviate concerns of traffic congestion and road safety. Driverless cars, also known as autonomous cars, will usher in a paradigm shift in the evolution of the modern automobile. Self-driving cars can sense the environment and traffic with the help of RADAR, LIDAR, GPS and computer vision and navigate without human intervention. Autonomous cars are claimed to have greater accuracy, reliability and faster reaction time compared to human drivers. This would lead to fewer traffic collisions and less road congestion.

Autonomous driving is a popular subject of today's discussion and automakers are developing complex systems that allow cars to drive themselves. If technology continues on its current course, car will do the concentrating for you. Self-parking, automatic emergency braking, adaptive cruise control and lane keeping are just some of the technologies that have leapt into the market in the past few years. Put them all together, get a picture of driving to assisted driving to fully autonomous cars. The open elective track "Autonomous Vehicles" offered by the department of automobile engineering trains the students to meet the technological challenges and

diverse needs of the industry and society in various areas of automobile engineering and equips them to excel in a truly competitive industry. With through knowledge in this filed, engineering graduates get opportunity to serve many top-notch automobile companies and IT companies as well.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1AE301) PRINCIPLES OF AUTOMOBILE ENGINEERING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the layout of an automobile and functionalities subsystems
- To provide overview on concepts of engine, cooling, lubrication and fuel systems
- To present constructional features and working of automotive driveline and running systems
- To study the fundamentals and principles of automotive electrical systems

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Explain the functionalities of automotive systems and subsystems

CO-2: Give an overview on engine and engine subsystems

CO-3: Describe working of automotive driveline and running systems

CO-4: Discuss the concepts of automotive starting, ignition and charging systems

UNIT-I:

Introduction: History, classification of automobiles, layout of an automobile, automobile sub systems and their role, types of chassis layouts and types of bodies.
Engine: Classification and components of an engine, principle and working of four stoke and two stroke SI and CI engines, air intake and exhaust system, fuel system layout for petrol and Diesel engines.

UNIT-II:

Cooling and Lubrication: Necessity of cooling, air-cooling, water cooling - thermosyphon and pump cooling, radiator, pump, thermostat, antifreeze solution and radiator fan. Mist, splash and forced lubrication, oil filters and oil pumps.

UNIT-III:

Drive Line: Clutches, principle, single plate clutch, multi plate clutch and centrifugal clutch. Gear box - Need, sliding mesh, constant mesh and synchromesh gear box. Propeller shaft, universal joint, differential, wheels and tyres.

UNIT-IV:

Running Systems: Suspension systems – Objective, rigid axle and independent suspension system and torsion bar. Steering system – Layout, steering mechanism, steering geometry and steering gearboxes. Brake system – Principle, stopping distance, types of brakes and actuation.

UNIT-V:

Electrical Systems: Starting system - Principle, working of different starter drive units and solenoid switches. Ignition system - Conventional ignition system types, ignition advance and retarding mechanisms. Charging system - Alternator principle, construction and working, cut-outs and regulators.

TEXTBOOKS:

1. Advanced Vehicle Technology, Heinz Heisler, Butterworth Heinemann Publishers, 2002
2. Automobile Electrical Equipment, Crouse W H, McGraw Hill Book Co., Inc., New York 3rd edition,1986

REFERENCES:

1. Motor Vehicle, Garrett T K, Newton K. and Steeds W., Butter Worths & Co. Publishers Ltd., New Delhi, 2001
2. Automotive Electrical Equipment, Kholi P L, Tata McGraw Hill Co., Ltd., New Delhi, 1975
3. Automotive Chassis and Body, Crouse W H, McG raw Hill Book Co., 5th edition, 1976
4. Automotive Mechanics, Giri N K, Khanna Publications, 2006

ONLINE RESOURCES:

1. https://archive.nptel.ac.in/courses/107/106/107106088/
2. https://www.youtube.com/watch?v=BOP8qLQzhDc

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1AE302) MODERN AUTOMOTIVE TECHNOLOGIES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Principles of Automobile Engineering

COURSE OBJECTIVES:

- To provide an overview on advanced engine control system concepts
- To understand the interdisciplinary concepts and GPS-enabled applications in automobile
- To present intelligent vehicle technologies like comfort, safety and security systems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply advanced engine control system concepts in engineering
CO-2: Address the key technologies in automotive navigation
CO-3: Appreciate the technological advancements driver assistance systems

UNIT-I:
Advanced Engine Controls: Concept of an electronic engine control system, engine control module, powertrain control module, electronic fuel injection - throttle body fuel injection, multi-point fuel injection, gasoline direct injection, common rail direct injection, electronic ignition control, engine mapping and on-board diagnostics.

UNIT-II:
Telematics: Global positioning system, geographical information systems, navigation system, architecture, automotive vision system, road recognition and infotainment system.

UNIT-III:
Comfort Systems: Adaptive cruise control system, active suspension system, power steering, collapsible and tiltable steering column and power windows.

UNIT-IV:
Safety Systems: Active and passive safety, airbags, seat belt tightening system, forward collision warning systems, child lock, anti-lock braking systems, traction control system and lane departure warning system.

UNIT-V:
Security Systems: Anti-theft technologies – mechanical, electromechanical and electronic immobilizers, alarm system, stolen vehicle tracking system, remote keyless entry, smart card system and number plate coding.

TEXTBOOKS:

1. Understanding Automotive Electronics, William B Ribbens, fifth edition, Butter worth Heinemann Woburn,1998
2. Intelligent Vehicle Technologies: Theory and Applications, Ljubo Vlacic, Michel Parent and Fumio Harashima, Butterworth-Heinemann publications, Oxford, 2001

REFERENCES:

1. Automotive Handbook, Robert Bosch, SAE, 5th edition, 2000
2. Navigation and Intelligent Transportation Systems – Progress in Technology, Ronald K Jurgen, Automotive Electronics Series, SAE, USA, 1998
3. Understanding Automotive Electronics, Bechhold, SAE, 1998

ONLINE RESOURCES:

1. https://archive.nptel.ac.in/courses/107/106/107106088/
2. https://www.youtube.com/watch?v=BOP8qLQzhDc

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1AE401) ELECTRIC, HYBRID AND FUEL CELL VEHICLES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Principles of Automobile Engineering, Modern Automotive Technologies

COURSE OBJECTIVES:

- To study the concepts and drivetrain configurations of electric and hybrid vehicles
- To understand about electric propulsion system
- To provide various energy storage devices
- To present principle, working and automotive applications of fuel cell and solar technology

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Explain the concepts and drivetrain configurations of electric and hybrid vehicles

CO-2: Present various electric motors used in EVs and HEVs

CO-3: Control electric motors used in EVs and HEVs

CO-4: Discuss various energy storage devices and hybridization

CO-5: Describe automotive applications of fuel cell and solar technology

UNIT-I:

Electric and Hybrid Vehicles: Electric vehicle – layout, components, configurations, advantages and limitations. Hybrid vehicle - concepts of hybrid electric drivetrain based on hybridization and powertrain configuration, architecture of series, parallel and series-parallel hybrid electric drivetrains, modes of operation, merits and demerits.

UNIT-II:

Electric Motors: Review of technology suited to automotive propulsion, requirements, DC motors, Induction motors, permanent magnet brushless DC motors, permanent magnet synchronous motors and switched reluctance motors.

UNIT-III:

Motor Drives: Speed and torque control, DC motor - Chopper based four quadrant operations, induction motor, permanent magnet motor and switched reluctance motor.

UNIT-IV:

Energy Storages: Electromechanical batteries - Types, parameters, lead acid batteries, nickel-based batteries, lithium-based batteries, battery management

system, ultracapacitors, hybridization of energy storages and battery swapping technology.

UNIT-V:

Fuel Cell and Solar Vehicles: Fuel cell vehicle – Operating principle, types of fuel cells, fuel cell options for fuel cell vehicle and fuel cell hybrid vehicle. Solar vehicle - Solar photovoltaic cell, solar array, solar car electrical system and drive train.

TEXTBOOKS:

1. Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay and Ali Emadi, CRC Press, 2004
2. Electric Vehicle Technology-Explained, James Larminie and John Loury, John Wiley & Sons Ltd., 2003

REFERENCES:

1. Electric and Hybrid Vehicles – Design Fundamentals, Iqbal Husain, CRC Press, 2010
2. Electric Vehicle Battery Systems, Sandeep Dhameja, Butterworth–Heinemann, 2002
3. Electric and Hybrid – Electric Vehicles, Ronald K. Jurgen, SAE, 2002
4. Light Weight Electric/Hybrid Vehicle Design, Ron Hodkinson and John Fenton, Butterworth–Heinemann

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ee112/preview
2. https://elearn.nptel.ac.in/shop/nptel/electric-vehicles-and-renewable-energy

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1AE402) CONNECTED AND AUTONOMOUS VEHICLES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Principles of Automobile Engineering, Modern Automotive Technologies, Electric, Hybrid and Fuel Cell Vehicles

COURSE OBJECTIVES:

- To understand the fundamentals of vehicle communication and networking
- To present the applications of communications technologies in AVs
- To know intra-vehicle and inter-vehicle communication technologies
- To provide various levels of vehicle autonomy and current State of AVs

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Explain the fundamentals of vehicle communication and networking
CO-2: Relate the applications of communications technologies in AVs
CO-3: Appreciate the intra-vehicle communication technologies
CO-4: Express the inter-vehicle communication technologies
CO-5: Discuss various levels of vehicle autonomy and current state of AVs

UNIT-I:

Communication Fundamentals and Controller Area Network: Communication fundamentals – frequency, bandwidth, power measurement, signal to noise ratio, transmission rate constraints, radio frequency spectrum allocation, RADAR operation and types of RADAR. CAN evolution, versions, types of controllers and layered architecture. CAN bus, message frames and error handling.

UNIT-II:

Introduction to Vehicle Communications: Intra-vehicle communications - communications protocols, systems and sensors (Braking, steering, power train, chassis systems, body electronics, instrument clusters, infotainment systems), inter-vehicle communications - cooperative driving (accident warning, frontal/rear collision prevention, lane change, assistance). Consumer assistance – traffic information, multimedia support and smart parking.

UNIT-III:

Intra-Vehicle Communications: Wired communication – Network comparison, two tier approach, LIN applications - Localized vehicle area support, general support areas, CAN applications - In vehicle operation, infotainment, wireless communication – Bluetooth vehicle applications, satellite services – satellite radio, vehicle care and traffic status.

UNIT-IV:

Inter-Vehicle Communication: Adhoc communications – applications in vehicle traffic monitoring, collision and congestion avoidance, highway lane reservation, emission control, vehicle frequency utilization – AM radio, Bluetooth, FM radio, GPS, short range RADAR, wireless LAN, intelligent roadway-infrastructure to vehicle and vehicle to vehicle communications. Evolving smart vehicle – ECU, wireless networking, forward RADAR, side RADAR, GPS, cellular transmission and event Recorder.

UNIT-V:

Autonomous Vehicles: Importance, levels of automation, policy making, social costs, safety and crashes, congestion, land use, energy and emissions, costs and disadvantages.

Current State of Autonomous Vehicles: Research, challenges, commercial development, sensor systems, sensor suits, environmental challenges, graceful degradation, V2V and V2I communication, sharing the drive, integrity, security, verification and policy implications.

TEXTBOOKS:

1. Inter and Intra Vehicle Communications, Gilbert Held Auerbach Publications, 2008
2. Autonomous Vehicle Technology-A Guide for Policymakers, James M. Anderson, Nidhi Kalra, Karlyn D. Stanley, Paul Sorensen, Constantine Samaras, Oluwatobi A. Oluwatola, RAND Corporation, Santa Monica, Calif., 2016
3. Autonomous Driving - Technical, Legal and Social Aspects, Markus Maurer, J. Christian Gerdes, Barbara Lenz, Hermann Winner, Editors, Springer, 2016

REFERENCES:

1. Intelligent Vehicle Technologies: Theory and Applications, Ljubo Vlacic, Michel Parent and Fumio Harashima, Butterworth-Heinemann Publications, Oxford, 2001
2. Navigation and Intelligent Transportation Systems – Progress in Technology, Ronald K. Jurgen, Automotive Electronics Series, SAE, USA, 1998
3. Automotive In–vehicle Networks, J. Gabrielleen, Wiley-Blackwell, 2008
4. In-Vehicle Network Architecture for the Next-Generation Vehicles, Syed Masud Mahmud, IGI
5. Communication Technologies for Vehicles, Mohamed Kassab Springer, 2015

ONLINE RESOURCES:

1. https://www.classcentral.com/subject/autonomous
2. https://www.youtube.com/watch?v=MX6aEkcFu6U

GENERAL - COMPUTING

GENERAL-COMPUTING

Offered by: COMPUTER SCIENCE AND ENGINEERING / INFORMATION TECHNOLOGY

Courses in the Pool:

- Programming through Java
- Relational Data Base Management Systems
- Computational Thinking using Python
- Introduction to Data Analytics
- Fundamentals of Computer Algorithms

1. PROGRAMMING THROUGH JAVA

Java is an extensively **used** programming language specifically intended for use in the distributed environment of the internet. **Java** help students to create wide-ranging applications that possibly will run on a single workstation or be distributed among servers and clients in a network.

Java is an extremely fruitful language and an upper option for many developers for many years. The motive that it has remained so prevalent is since it still happens the needs of functioning across networks.

Students will have different roles and responsibilities by learning Java Programming

- Designing, implementing, and maintaining Java applications that are often high-volume and low-latency, required for mission-critical systems.
- Delivering high availability and performance.
- Contributing in all phases of the development lifecycle.
- Writing well-designed, efficient, and testable code.

2. RELATIONAL DATABASE MANAGEMENT SYSTEMS

A relational database permits you to effortlessly find precise information. It also consents you to sort based on any field and produce reports that comprise only definite fields from each record. With features like, Data Accuracy, Easy Access to Data, Data Integrity, Flexibility, Normalization, High Security, Feasible for Future Modifications

By learning RDBMS Students will have different roles in Database environment

- Data Administrator,
- Database Administrator
- Database Designer
- Application Programmer

3. COMPUTATIONAL THINKING USING PYTHON

The **python** language is one of the utmost accessible programming languages available because it has streamlined syntax and not complex, which gives more importance on natural language. Due to its comfort of learning and practice, **python** codes can be readily written and executed much quicker than former programming languages.

Data Science: The libraries and frameworks Python offers, e.g. PyBrain, PyMySQL, and NumPy are one of the big reasons. Another reason is diversity. Python experience allows you to do a lot more than any other language, e.g. you can create scripts to automate stuff, go into web development, and so much more.

Students will have various Job Profiles by learning Python

- Software Engineer.
- Python Developer.
- Research Analyst.
- Data Analyst.
- Data Scientist.
- Software Developer.

4. INTRODUCTION TO DATA ANALYTICS

Data Scientists and Analysts **use data analytics** techniques in their research, and businesses also **use** it to inform their conclusions. **Data analysis** can assistance corporations healthier comprehend their customers, assess their ad-campaigns, personalize gratified, create content approaches and progress products.

By learning Data Analytics students will get Jobs with different designations

- IT Systems Analyst. Systems analysts use and design systems to solve problems in information technology. ...
- Healthcare Data Analyst. ...
- Operations Analyst. ...
- Data Scientist. ...
- Data Engineer. ...
- Quantitative Analyst. ...
- Data Analytics Consultant. ...
- Digital Marketing Manager.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1IT303) PROGRAMMING THROUGH JAVA

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To introduce object-oriented programming concepts using the Java language
- To introduce the principles of inheritance and polymorphism; and demonstrates how they relate to the design of abstract classes
- To introduce the implementation of packages and interfaces
- To introduce exception handling, event handling and multithreading

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Develop applications for range of problems using object-oriented programming techniques

CO-2: Design simple graphical user interface applications

CO-3: Explore the design of graphical user interface using applets and swings

UNIT-I:

Object Oriented Thinking and Java Basics: Need for OOP Paradigm, Summary of OOP Concepts, Coping with Complexity, Abstraction Mechanisms, A Way of Viewing World – Agents, Responsibility, Messages, Methods, History of Java, Java Buzzwords, Data Types, Variables, Scope and Life Time of Variables, Arrays, Operators, Expressions, Control Statements, Type Conversion and Casting, Simple Java Program, Concepts of Classes, Objects, Constructors, Methods, Access Control, This Keyword, Garbage Collection, Overloading Methods and Constructors, Method Binding, Inheritance, Overriding and Exceptions, Parameter Passing, Recursion, Nested and Inner Classes, Exploring String Class.

UNIT-II:

Inheritance, Packages and Interfaces: Hierarchical Abstractions, Base Class Object, Subclass, Subtype, Substitutability, Forms of Inheritance- Specialization, Specification, Construction, Extension, Limitation, Combination, Benefits of Inheritance, Costs of Inheritance. Member Access Rules, Super Uses, Using Final with Inheritance, Polymorphism- Method Overriding, Abstract Classes, The Object Class.

Defining, Creating and Accessing a Package, Understanding Classpath, Importing Packages, Differences between Classes and Interfaces, Defining an Interface, Implementing Interface, Applying Interfaces, Variables in Interface and Extending Interfaces, Exploring Java.IO.

UNIT-III:

Exception Handling and Multi-threading: Concepts of Exception Handling, Benefits of Exception Handling, Termination or Resumptive Models, Exception Hierarchy, Usage

of Try, Catch, Throw, Throws and Finally, Built in Exceptions, Creating Own Exception Sub Classes.
String Handling, Exploring Java. Util, Differences between Multi-Threading and Multitasking, Thread Life Cycle, Creating Threads, Thread Priorities, Synchronizing Threads, Interthread Communication, Thread Groups, Daemon Threads. Enumerations, Autoboxing, Annotations, Generics.

UNIT-IV:

Event Handling: Events, Event Sources, Event Classes, Event Listeners, Delegation Event Model, Handling Mouse and Keyboard Events, Adapter Classes.
The AWT Class Hierarchy, User Interface Components- Labels, Button, Canvas, Scrollbars, Text Components, Check Box, Check Box Groups, Choices, Lists Panels – Scrollpane, Dialogs, Menubar, Graphics, Layout Manager – Layout Manager Types – Border, Grid, Flow, Card and Grid Bag.

UNIT-V:

Applets: Concepts f Applets, Differences between Applets and Applications, Life Cycle of an Applet, Types of Applets, Creating Applets, Passing Parameters to Applets.
Swing: Introduction, Limitations of AWT, MVC Architecture, Components, Containers, Exploring Swing- Japplet, Jframe and Jcomponent, Icons and Labels, Text Fields, Buttons – The Jbutton Class, Check Boxes, Radio Buttons, Combo Boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS:

1. Java The Complete Reference, Herbert Schildt, 7th Edition, TMH
2. Understanding OOP with Java Updated Edition, T. Budd, Pearson Education
3. An Introduction to Programming and OO Design using Java, J. Nino and F.A. Hosch, John Wiley & Sons

REFERENCES:

1. Introduction to Java Programming, Y. Daniel Liang, Pearson Education
2. An Introduction to Java Programming and Object-Oriented Application Development, R. A. Johnson, Thomson
3. Core Java 2, Vol. 1 - Fundamentals, Cay. S. Horstmann and Gary Cornell, 8th Edition, Pearson Education
4. Core Java 2, Vol. 2 - Advanced Features, Cay. S. Horstmann and Gary Cornell, 8th Edition, Pearson Education

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS302) RELATIONAL DATABASE MANAGEMENT SYSTEMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the basic concepts and the applications of database systems
- To master the basics of SQL and construct queries using SQL
- To understand the relational database design principles
- To become familiar with the basic issues of transaction processing and concurrency control
- To become familiar with database storage structures and access techniques

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Demonstrate the basic concepts of database systems and design E-R models to represent simple database application scenarios

CO-2: Formulate SQL queries on the data

CO-3: Improve the database design by normalization

CO-4: Apply and relate the concept of transaction, concurrency control and recovery in database

CO-5: Familiar with basic database storage structures and access techniques using Indexing, hashing including B tree methods

UNIT-I:

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages – DDL, DML, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database Users and Administrators, History of Database Systems.

Introduction to Database Design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises.

Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical database Design: ER to Relational, Introduction to Views, Destroying /Altering Tables and Views.

UNIT-II:

Relational Algebra and Calculus: Preliminaries, Relational Algebra, Relational calculus – Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.

SQL: Queries, Constraints, Triggers: Form of Basic SQL Query, UNION, INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values Complex Integrity Constraints in SQL, Triggers and Active Databases, Designing Active Databases.

UNIT-III:

Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies - Reasoning about FDs, Normal Forms, Properties of Decompositions, Normalization, Schema Refinement in Database Design, Other Kinds of Dependencies.

UNIT-IV:

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

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

Recovery System-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with loss of nonvolatile storage, Early Lock Release and Logical Undo Operations, Remote Backup systems.

UNIT-V:

Storage and Indexing: Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing, Index Data Structures, Comparison of File Organizations.

Tree-Structured Indexing: Intuition for tree Indexes, Indexed Sequential Access Method (ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

Hash- Based Indexing: Static Hashing, Extendible hashing, Linear Hashing, Extendible vs. Linear Hashing.

TEXT BOOKS:

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

REFERENCES:

1. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning
2. Introduction to Database Management, M. L. Gillenson and others, Wiley Student Edition
3. Database Development and Management, Lee Chao, Auerbach Publications, Taylor & Francis Group
4. Introduction to Database Systems, C. J. Date, Pearson Education

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1IT302) COMPUTATIONAL THINKING USING PYTHON

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Statistical Methods for Data Science

COURSE OBJECTIVES:

- To Understand why Python is a useful scripting language for developers
- To create and execute Python programs and to learn how to use lists, tuples and dictionaries in Python programs
- To learn how to build and package Python modules for reusability
- To learn how to design object-oriented programs with Python classes
- To learn how to use exception handling in Python applications for error handling

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Adapt and combine standard algorithms to solve a given problem (includes numerical as well as non-numerical algorithms)

CO-2: Adequately use standard programming constructs: repetition, selection, functions, composition, modules, aggregated data (arrays, lists etc.)

CO-3: Explain what a given program (in Python) does identify and repair coding errors in a program

CO-4: Understand and use object-based software concepts (constructing OO software will be deal with in the course Software Engineering)

CO-5: Use library software for (e.g.) building a graphical user interface, web application or mathematical software

UNIT-I:

Introduction, History, Features, setting up path, Working with Python, Basic Syntax, Variable and Data Types, Operator, Conditional Statements- If, If-else, Nested If-else Looping for While Nested loops Control Statements Break Continue Pass String Manipulation Accessing Strings Basic Operations String Slices Function.

UNIT-II:

Methods, Lists: Introduction, accessing list, Operations, Working with lists, Function and Methods,

Tuple: Introduction, accessing tuples, Operations, Working Functions and Methods.

Dictionaries: Introduction, accessing values in dictionaries, Working with dictionaries, Properties.

UNIT-III:

Functions: Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables.

Modules: Creation, Importing module, Math module, Random module, Packages.
Composition: Input-Output Printing on screen, reading data from keyboard, Opening and closing file Reading and writing files, Functions.

UNIT-IV:
Exception Handling: Exception, Exception Handling, except clause, Try, Finally, clause, User Defined Exceptions.
OOPs concept: Class and object, Attributes, Inheritance, Overloading, Overriding, Data hiding, Regular Expressions-Match function, Search function, Matching vs Searching Modifiers, Patterns.
Multithreading: Thread, starting a thread. Threading module, Synchronizing threads.

UNIT-V:
CGI: Introduction, Architecture, CGI environment variable, GET and POST methods, Cookies, File upload.
Database: Introduction, Connections, Executing queries, Transactions Handling error.
Networking: Socket, Socket Module, Methods, Client and server, Internet modules, Sending email.

TEXT BOOK:
1. Learning Python, David Ascher and Mark Lutz, O' Relly

REFERENCES:
1. Python Programming: An Introduction to Computer Science, John M. Zelle, 2nd Edition, Kindle Edition
2. Python Essential Reference, David M. Beazley, 4th Edition, Developer's Library

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1IT304) INTRODUCTION TO DATA ANALYTICS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To be exposed to conceptual framework of big data
- To understand different techniques of data analysis
- To be familiar with concepts of data streams
- To be exposed to item sets, clustering, frame works and Visualization

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand big data fundamentals

CO-2: Learn various data analysis techniques

CO-3: Implement various data streams

CO-4: Understand item sets, clustering, frame works &Visualizations

UNIT –I:

Introduction to Big Data: Introduction to Big Data Platform – Challenges of Conventional systems – Web data – Evolution of Analytic scalability, analytic process and tools, Analysis vs Reporting–Modern data analytic tools,

Statistical Concepts: Sampling distributions, resampling, statistical inference, prediction error.

UNIT–II:

Data Analysis: Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and Kernel methods

Analysis of Time Series: Linear systems analysis, nonlinear dynamics – Rule induction –

Neural Networks: Learning and Generalization, competitive learning, Principal component analysis and neural networks

Fuzzy Logic: extracting fuzzy models from data, fuzzy decision trees, Stochastic search methods.

UNIT–III:

Mining Data Streams: Introduction to Streams Concepts–Stream data model and architecture–Stream Computing, Sampling data in a stream–Filtering streams–Counting distinct elements in a stream–Estimating moments–Counting onenessina Window–Decaying window–Real time Analytics Platform (RTAP)applications–case studies–real time sentiment analysis, stock market predictions.

Frequent Item sets and Clustering: Mining Frequent item sets– Market based Modeling A priori Algorithm– Handling large datasets in Main Memory–Limited Pass Algorithm–Counting frequent item sets in a Stream–Clustering Techniques –Hierarchical–K-Means.

UNIT–IV:

Clustering high dimensional data– CLIQUE and Pro CLUS–Frequent pattern-based clustering methods – Clustering in non-Euclidean space – Clustering for streams and Parallelism.

UNIT–V:

Frameworks and Visualization: MapReduce–Hadoop, Hive, Map R–Sharding–No SQL Databases – S3 – Hadoop Distributed file systems – Visualizations – Visual data analysis techniques,

Interaction Techniques: Systems and Applications

TEXTBOOKS:

1. Intelligent Data nalysis, Michael Berthold, David J.Hand, Springer, 2007
2. Mining of Massive Datasets, Anand Rajaramanand Jeffrey DavidUllman, Cambridge University Press, 2012

REFERENCES:

1. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, BillFranks, John Wiley & Sons, 2012
2. Big Data Glossary, Glenn J.Myatt, Making Sense of Data, John Wiley & Sons, PeteWarden, O'Reilly, 2011
3. Data Mining Concepts and Techniques, J iaweiHan, Micheline Kamber, 2ndEdition, Elsevier, 2008

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS305) FUNDAMENTALS OF COMPUTER ALGORITHMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To reinforce algorithms analysis methods
- To ability to analyze running time of an algorithm
- To understand different algorithm design strategies
- To familiarity with an assortment of important algorithms

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the concepts of computing complexity measures of algorithms
CO-2: Apply Divide and conquer method to solve engineering problems
CO-3: Illustrate the usage of the greedy method for optimization problems
CO-4: solve the complex recursive problems with dynamic programming strategy
CO-5: Examine the complexity classes, backtracking and branch & bound strategies

UNIT-I:
Introduction: Characteristics of algorithms. Analysis of algorithms: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs.

UNIT-II:
Divide and Conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication. Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

UNIT-III:
Greedy Method: General method, applications-Job sequencing with deadlines, 0/1 knapsack problem, Minimum cost spanning trees, Single source shortest path problem, Huffman Codes.

UNIT-IV:
Dynamic Programming: General method, Principle of optimality, applications-Multistage graphs, Matrix chain multiplication, Optimal binary search trees.
0/1 knapsack problem, All pairs shortest path problem, Traveling salesperson problem, Reliability design.

UNIT-V:
Backtracking: General method, applications- N-Queen problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles.

Branch and Bound: Traveling Salesperson problem, 0/1 Knapsack problem: LC Branch and Bound solution, FIFO Branch and Bound solution.
NP-Complete and NP-Hard problems: Basic concepts, non-deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes.

TEXT BOOKS:

1. Fundamentals of Computer Algorithms, E. Horowitz et al, Galgotia Publications
2. Introduction to Algorithms, Thomas H. Cormen, Charles E. Lieserson, Ronald L. Rivest and Clifford Stein, 4th Edition, MIT Press/McGraw-Hill

REFERENCES:

1. Algorithm Design, Jon Kleinberg and EvaTardos, 1st Edition, Pearson
2. Algorithm Design: Foundations, Analysis and Internet Examples, Michael T. Goodrich and Roberto Tamassia, Second Edition, Wiley
3. Algorithms – A Creative Approach, Udi Manber, 3rd Edition, Addison-Wesley, Reading, MA
4. Introduction to the Design and Analysis of Algorithms, Anany Levitin, 3rd Edition, Pearson Publications

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS306) INTRODUCTION TO FRONT END TECHNOLOGIES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To enable participants to develop elegant and responsive Front-end by leveraging latest technologies
- To enable them to learn new technologies by applying foundation paradigms
- To understand how HTML, CSS, javascript and Bootstrap work together
- To use jQuery to create webpages

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply HTML, CSS and JavaScript to develop dynamic web pages
CO-2: Use advanced technologies jquery and json to make web responsive and interactive web pages
CO-3: Demonstrate Bootstrap to make customized applications
CO-4: Apply the concepts of AngularJS in developing Web applications

UNIT-I:

Overview of HTML, CSS : Fundamentals of HTML,HTML Headings ,HTML Paragraph, HTML Styles, HTML Formatting , HTML Quotations , HTML Computer Code, HTML Comments & Colors, HTML CSS, Links and Images , HTML Lists, HTML Blocks , HTML Classes ,HTML Layout ,HTML Responsive , HTML iframes , Creating Style Sheet, CSS Box,Model- Border properties, Padding properties, Margin properties,CSS Navigation Bar , CSS Dropdowns ,CSS Tooltips , CSS3 Animations , CSS3 Buttons , CSS3 Pagination, CSS3 Multiple Columns .

UNIT-II:

Introduction to JavaScript: Introduction to JavaScript, Statements, expressions, Working with Web Forms and validating user input, JavaScript functions and events, Error handling in JavaScript, Document Object Model, Programming HTML DOM with JavaScript, Assigning event handlers in JavaScript using DOM object property.

UNIT-III:

Working with jQuery and JSON: Basics of jQuery, jQuery Events, Benefits of using CDN, jQuery Selectors, jQuery input vs :input, jQuery DOM manipulation methods, jQuery Elements, Working with JSON Objects, JSON Arrays, Nested JSON object, Conversion of JSON object to string, Conversion of string to JSON object.

UNIT-IV:

Working with Bootstrap: Introduction to Bootstrap, Setting up Bootstrap, Bootstrap Grid System, Bootstrap Image Gallery, Bootstrap Typography, Bootstrap Blockquotes and

Lists, Bootstrap Code Blocks, Bootstrap Table Classes, Bootstrap Button Classes, Bootstrap Dropdown.

UNIT-V:

Introduction AngularJs: Building Single page applications with AngularJS Single page application – introduction, two way data binding, MVC in angular JS, controllers, getting user inputs, loops, Client side routing – accessing URL data, various ways to provide data in angular JS.

TEXT BOOKS:

1. HTML 5 Black Book, Dt Editorial Services, Dreamtech Press
2. Radford, S. (2015). Learning Web Development with Bootstrap and AngularJS. India: Packt Publishing
3. York, R. (2011). Beginning JavaScript and CSS Development with JQuery. Germany: Wiley

REFERENCES:

1. Learning Web Development With Bootstrap And Angularjs By Stephen Radford, Packt Publishing
2. Powell, T. A. (2010). HTML & CSS: The Complete Reference, Fifth Edition. Switzerland: McGraw Hill LLC

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS307) CONCEPTS OF GENERATIVE AI

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To Understand what Generative AI is, why it matters
- To know how it's shaping the future of business
- To analyze different AI tools
- To be able to decide about the application of Generative AI in various domains

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Demystify the technical terminology surrounding Generative AI

CO-2: Understand the significance of Generative AI in today's digital landscape

CO-3: Gain hands-on experience with state-of-the-art AI tools

CO-4: Make informed decisions about the application of Generative AI in various domains

UNIT-I:

Introduction and Capabilities of Generative AI: Introduction to Generative AI, Capabilities of Generative AI, Text Generation using Generative AI.

UNIT-II:

Applications and Tools of Generative AI: Applications of Generative AI, Economic Potential of Generative AI, Tools for Image Generation, Tools for Audio and Video Generation, Tools for Code Generation

UNIT-III:

Generative AI for your own Industry: Impacts of generative AI on your own Industry, Use cases of Generative AI, AI and Digital Transformation, Impact of Generative AI over job roles, Developing Internal Policies.

UNIT-IV:

Strategic Planning in the age of AI: Roles of AI in Strategic Decision-making, Building AI Policies within Your Organization, Build a Plan for Implementing Generative AI in Your Organization

UNIT-V:

Prompt Engineering and Advanced ChatGPT: Introduction to Advanced ChatGPT, Advanced Techniques for Prompting ChatGPT, Applications of Advanced ChatGPT, Chatbot Development with ChatGPT, Advanced Integration with Other Tools.

TEXT BOOKS:

1. Generative Deep Learning, David Foster
2. Hands-On Generative AI with Python, Kirill Dubovikov
3. Research papers from top conferences (NeurIPS, ICML, etc.)

GENERAL

Professional Ethics and Human Values

Ethics is a necessary and listed Graduate Attribute for all engineers according to the Washington Accord. As engineers deal with society and provide for society, it is important that the ethical concerns pertaining to technology are well understood and addressed, particularly when technological advancements are still in their infancy and early growth stages but already enjoy a widespread use! Human Values form the basis for all ethics, and ethical theories help resolve professional dilemmas too. This course aims to create an appreciation for normative and applied ethics with special focus on professionalism as well as technology education and practice. Given the diverse set of roles a STEM professional may play in a society, there is an inherent societal need for STEM professionals to be ethical. The formative years of students of engineering are deemed the best time to impress upon them the practical importance and application aspects of ethics. The curriculum is designed to include an inherent appreciation for the Indian Ethos and cover a wide variety of topics with suitable case studies and examples all through. The course is aimed to become a practicable guide that enables the learners to apply the learned content while facing the practical contexts encountered in their individual life and career, even as the times and lives are ever-changing.

As a course designed to ideally educate and empower all engineers, this course content contributes substantially to the attainment of "Ethics" as one of the eleven Graduate Attributes identified in the Washington Accord, and contributes moderately to a few other Graduate Attributes—including but not limited to The Engineer and The World, Lifelong Learning, and Design/Development of Solutions—while also contributing slightly to the attainment of some more Graduate Attributes such as Individual and Collaborative Team Work, Communication, Project Management and Finance.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1HS301) PROFESSIONAL ETHICS AND HUMAN VALUES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To emphasise on the importance of ethics for STEM professionals
- To help create a personal and practicable toolkit for ethical behaviour in personal and professional settings
- To relate the profession of engineering to sociocultural, ethical, and moral contexts in India and globally
- To develop more socially conscious STEM professionals who create and conceive a better society and a better world without sacrificing or ignoring public good

COURSE OUTCOMES: After completion of the course the students should be able to

CO-1: Distinguish morals, values, and ethics in Indian and global contexts as well as personal, sociocultural, and professional contexts

CO-2: Resolve moral and ethical dilemmas through relevant ethical guidance using ethical inquiries and/or appropriate ethical theories

CO-3: Demonstrate understanding of professionalism and be responsible social experimenters as STEM professionals in diverse roles

CO-4: Be conscientious about professional contributions that adhere to digital and technology ethics principles in ensuring public welfare and sustainable development

CO-5: Extend and apply individual moral/ ethical persona in organisational, business, and global environments

UNIT-I:

Introduction and Motivation

Definitions: Morals, Values, Ethics; Golden Rule; Maslow's Theory of Needs; Diversity, Equity, Inclusivity, and Accessibility (DEIA); Sustainable Development Goals (SDG)

Human Values: Universal Human Values, Conventional and Constitutional Values in Indian Ethos, Building Blocks for Moral Persona—Conscientiousness, Integrity, Empathy Morality and Moral Development: Moral Character, Moral Autonomy; Platform vs. Purpose

Ethicality: Civic Virtue for Ideal Society vs. Anomie; Ethics as basis for Legal Framework; Indian Ethos

Motivation: Examples and Case Studies of Ethical and Moral Decline in social, business, and professional contexts; Threats to Ethics due to changing technology landscape; Need for protection of Personally Identifiable Information (PII) and Data Privacy; Introduction to Trolley Problem and Discussion on Moral and Ethical Dilemmas; Issues in Decision-making—Value Judgement and Moral Judgement; Ethics in Academics and Research

UNIT-II:

Human Values, Moral Development, and Ethical Theories of Right Action

Moral Development: Kohlberg's Theory vs. Gilligan's Theory; Understanding Biases

Ethical Theories: Classification of Ethical Theories—Prescriptive, Descriptive, and Applied Ethics by Character and by Conduct; Deontological Ethics (Immanuel Kant, John Rawls), Virtue Ethics (Aristotelianism), Consequentialism (Act & Rule Utilitarianism); Divine Command Ethics and Ethics through Spirituality; Ethical Pluralism; Overview of Rights Theories

Ethical Guidance: Ethical Frameworks and Values for organisations; Practicable guidance from the Bhagavad-Gita and Eastern Philosophies; Ethical Inquiries—Normative, Conceptual, and Factual; Ethical Decision-making Tools; Ethics and Law—Ethics as a Basis for Law, Awareness of Rights of Convicts and Criminals

UNIT-III:

Ethics for STEM Professionals

Profession and Professionalism: Definitions; Professional Characters, Traits, Virtues, Roles, Rights and Responsibilities; Overview of Business Ethics and Work Ethics; STEM Professionals as Managers, Leaders, Consultants, Expert Witnesses, Scientists, Researchers and Academicians, and Entrepreneurs

STEM Profession as Social Experimentation: Comparison with scientific experiments; Application of Ethical Theories and Ethical Inquiries in professional contexts to gather relevant information; Informed Consent

Responsibilities of STEM Professionals as Social Experimenters: Need for being Ethical by Design; Accountability and Answerability in general and in autonomous technology applications; Focus on DEIA, SDG, and Social Innovation; Guidance through Professional Societies

UNIT-IV:

Understanding Ethics through STEM Case Studies

Safety and Risk: Understanding Safety and Risk through case studies—Titanic, Chernobyl, Bhopal; Overview of risks implied by digital technologies

General Aspects: Environmental Ethics and Carbon Footprint; Non-disclosure Agreements (NDA) and Intellectual Property (IP) as a Professional Right and as exploited by businesses; Copyrights and Ethics in Arts; Social Engineering and Ethics

Digital Ethics: Data Ethics; Ethics of AI; Ethics on Social Media; Ethics of Humans as Data Objects; Legal frameworks and policies for Data Management—Content Development, Protection, Integrity, Transparency, and Accountability; Ethics in the context of emerging technology areas such as Large Language Models (LLM), Digital Forensics, Internet of Things (IoT), Robotics and Automation, Cybersecurity & Cybercrime, Healthcare & Clinical Management, Finance, and Personal Tech

Technology Ethics: Computer Ethics, Machine and Robot Ethics; Ethics of technology advancements — an ethical urge to create green technologies, steps taken in the EU

UNIT-V:

Ethics for Workplace and Societal Wellbeing

Ethics in Organizational Behavioral Aspects: Collegiality, Loyalty, Trust; Workplace Deviances, Occupational Crime, and Culpability; Employee Rights and Relations; Ethical Frameworks and Codes of Ethics and Conduct; Conflicts of Interest, Conflict

Management and Resolution; Creating Ethical Climate, Ethics Education and Training, Grievance Redressal Procedures; Whistleblowing

Global Context: Work-Life Balance, DEIA at workplace, Cultural aspects, Concerns for Multinational Companies

Ethics and Society: Impact of Wars, Politics, and Religion on society; Understanding Privilege, Marginalisation, and Minorities; Ethico-economical Aspects: Fair Trade, Capitalism vs. Communism, Developed vs. Developing vs. Underdeveloped economies

TEXTBOOKS:

1. Ethics in Engineering, Mike W. Martin, Roland Schinzinger, McGraw Hill Education, 2017 (ISBN: 978-9339204457)
2. Business Ethics: An Indian Perspective, A.C. Fernando, K.P. Muralidheeran, E.K. Satheesh, Pearson Education, 2019 (ISBN: 978-9353437442)
3. Professional Ethics, R. Subramanian, Oxford University Press, 2017 (ISBN: 978-0199475070)
4. Professional Ethics and Human Values, M. Govindarajan, S. Natarajan, V.S. Senthil Kumar, Prentice Hall India, 2015 (ISBN: 978-8120348165)

REFERENCES:

1. Engineering Ethics: Concepts & Cases, Charles E. Harris, Jr., Michael S. Pritchard, Michael J. Rabins, Cengage Learning, 2012 (ISBN: 978-8131517291)
2. Classical Indian Ethical Thought: A Philosophical Study of Hindu, Jaina and Bauddha Morals, Kedar Nath Tiwari, Motilal Banarsidass Publishers, 2017 (ISBN: 978-8120816084)
3. Ethics for the Whole World, Dalai Lama, 978-9351360803 Vijay Kumar Ivaturi et al., The Manual for Indian Start-Ups, Penguin Random House India, 2017 (ISBN: 978-0143428527), To Be Human, Jiddu Krishnamurti, Shambhala, 2000 (ISBN: 978-1570625961)
4. On Ethics and Economics, Amartya Sen, Oxford India, 1999 (ISBN: 978-0195627619)

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1HS302) ENTREPRENEURSHIP

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To motivate STEM professionals to inculcate the skills thereof in any professional role and to consider intrapreneurship or entrepreneurship as career choices for personal and societal growth
- To impart lean management principles and practices to plan, execute, and convert one's own idea into a sustainable business model using relevant tools and templates
- To gain practical knowledge to design and develop one's own lean startup venture
- To identify and avoid some potential pitfalls in validation and design of an innovative product or service and prepare against the same in production and marketing phases

COURSE OUTCOMES: After completion of the course the students should be able to

CO-1: Discover societal problems as entrepreneurial opportunities and ideate to develop solutions through systematic and creative approaches to innovation and business strategy

CO-2: Apply lean methodology to startup ideas and create a suitable Business Plan

CO-3: Use various tools/templates to pitch/present innovative solution/business plan/ idea

CO-4: Validate ideas, design, production, and marketing systematically using techniques such as 5 Whys, Innovation Accounting, Value and Growth Propositions

CO-5: To strategise during ideation, production, market research, marketing and facing competition

UNIT-I:

Entrepreneurial Skills and Opportunities

Entrepreneurship as a Career for STEM Professionals: Motivation and Overview; Ethical and Empathetic Personality and Skill Set needed for an entrepreneur; Current Business Trends; Concepts of Intrapreneurship, Social Entrepreneurship, Technopreneurship, Studentpreneurship; Overview of Innovation—Sources and Types, inspiration from SDG as well as Industry 4.0 and Emerging Technologies; Entrepreneurial Management vs. Corporate Management; Overview of Startup India and list of other Online and Offline Resources for aspiring entrepreneurs including funding opportunities

UNIT-II:

Introduction to Lean Startup Methodology: Overview, Principles of Lean Startup, Lean vs. Traditional Startup; Lean Startup Management; Vision-to-Steering, Start-Define-Learn-Experiment, Leap-Test-Measure-Pivot, Build-Measure-Learn

UNIT-III:

Business Model Concepts and Design Thinking: Components of Business Plan; Business Model Canvas (BMC); Lean Canvas (LC); Pitch Deck; Elevator Pitch; Minimum Viable Product (MVP), Proof of Concept (PoC), Prototype

Design Thinking for Business: Understanding Users and Personas, Customers' Jobs to be done (JTBD); Examples and case studies of product-based, service-based, and social innovation-based startups; Business Modelling through the three lenses of innovation—Desirability, Feasibility, and Viability; Sustainability and Scalability

UNIT-IV:

Building and Evaluating Your Business Model: Identifying Early Adopters, Value Proposition, and High-level Concept; Awareness of other resources: Problem-framing Canvas, Users' Bulls-Eye Canvas, Opportunity Canvas, Value Proposition Canvas, Ethics Canvas and Data Ethics Canvas

Market Research and Analysis: TAM, SAM, SOM; Three Learning Milestones of Innovation; Pivot or Persevere; The Engines of Growth: Sticky, Viral, and Paid; Root Cause Analysis (RCA) through 5 Whys; Value and Waste

UNIT-V:

Evaluating and Strengthening Your Business Model: List of Evaluation tools for Team Management and Project Management; Kan-ban Diagram for Project Planning and Resource Allocation; Awareness of Financial Planning—Projection, Valuation, Stages, Forms of Financing; Analogs and Antilogs; The three A's: Actionable, Accessible, and Auditable Metrics and Vanity Metrics; Why startups still fail? Paralysis by Analysis and Extinct by Instinct; Can you make your startup failproof? Building right teams and partners; Strategy as innovation

TEXTBOOKS:

1. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Eric Ries, Penguin Portfolio, 2015 (ISBN: 978-0670921607)
2. Entrepreneurship Simplified: From Idea to IPO, Ashok Soota, S R Gopalan, Penguin Random House India, 2016 (ISBN: 978-0670088959)
3. Startup Easy - Part 1: The Essentials, Shishir Gupta, StartupLanes.Com, 2017 (ISBN: 978-9386503886)

REFERENCES:

1. Measure What Matters: OKRs: The Simple Idea that Drives 10x Growth, John Doerr, Penguin Portfolio, 2018 (ISBN: 978-0241348482)
2. Entrepreneurship Development and Business Ethics, Abhik Kumar Mukherjee, Shaunae Roy, Oxford University Press, 2019 (ISBN: 978-0199494460)
3. The Manual for Indian Start-Ups, Vijay Kumar Ivaturi et al., Penguin Random House India, 2017 (ISBN: 978-0143428527)

4. Social Entrepreneurship in India: Quarter Idealism and a Pound of Pragmatism, Madhukar Shukla, SAGE Publications India Pvt Ltd, 2020 (ISBN: 978-9353882372)
5. Entrepreneurship: A South Asian perspective, Donald F Kuratko, T.V Rao, Cengage Learning. 2012

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CE305) SMART CITIES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand smart city basic concepts, global standards, and Indian context of smart cities
- To explain smart community, smart transportation and smart buildings
- To understand Energy demand, Green approach to meet Energy demand and their capacities
- To identify Smart Transportation Technologies in cities and concepts towards smart city

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Explain and elaborate smart city concepts and their international and national standards

CO-2: Conceptualize smart community, transportation and building concepts

CO-3: Develop and calibrate energy demand and their capacity limits

CO-4: Predict the various smart urban transportation systems and the transition from existing city towards a smart city

UNIT-I:

Introduction to Smart Cities: Introduction to Smart Cities - Understanding Smart Cities - Dimensions of Smart Cities – World urbanization, Global Experience of Smart Cities, Smart City case studies-Indian scenario - India "100 Smart Cities" Policy and Mission. City as a System of Systems- Systems thinking – Developing a smart city approach – Core elements of a smart city – Relevant open data for a smart city – Sustainability – Privacy and Ethics.

UNIT-II:

Smart Cities Planning and Development: Introduction to Smart Community; Smart community concepts: Concept of Smart Community - Smart Transportation - Smart Building and Home Device - Smart Health - Smart Government - Smart Energy and Water - Cybersecurity, Safety, and Privacy; Internet of Things, Blockchain, Artificial Intelligence, Alternate Reality, Virtual Reality.

UNIT-III:

Smart Urban Energy Systems: Conventional vs. Smart, City components, Energy demand, Green approach to meet Energy demand, Index of Indian cities towards smartness – a statistical analysis -Meeting energy demand through direct and indirect solar resources- Efficiency of indirect solar resources and its utility, Capacity.

UNIT-IV:

Smart Transportation Systems: Smart Transportation Technologies - Driverless and connected vehicles - ride sharing solutions - The "improve" pathway - The "shift" pathway – Smart Roads and Pavement systems – Relevant case studies

UNIT-V:

Future of Smart Cities: The transition of legacy cities to Smart - Right transition process - the benefit of citizens, cities have to adopt effective management and governance approaches-factors in the transition phase of legacy cities to Smart cities and their managerial implications.

TEXT BOOKS:

1. Internet of Things in Smart Technologies for Sustainable Urban Development, G. R. Kanagachidambaresan, R. Maheswar, V. Manikandan, K. Ramakrishnan., Springer, 2020
2. Society 5.0: A People-Centric Super-Smart Society, Hitachi-U Tokyo Laboratory (H-U Tokyo Lab), Springer, 2020
3. The Routledge Companion to Smart Cities, Katharine S. Willis, Alessandro Aurigi, Routledge International Handbooks, 2020

REFERENCES:

1. Smart Cities in Asia: Governing Development in the Era of Hyper-Connectivity Yu-min Joo, Yu-Min Joo, Teck-Boon Tan, Edward Elgar, 2020
2. Urban Systems Design: Creating Sustainable Smart Cities in the Internet of Things Era, Yoshiki Yamagata, Perry P. J. Yang, Elsevier, 2020
3. Smart Cities and Artificial Intelligence: Convergent Systems for Planning, Design, and Operations, Christopher Grant Kirwan, Zhiyong Fu, Elsevier, 2020

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EE303) TRENDS IN ENERGY SOURCES FOR SUSTAINABLE DEVLOPMENT

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the role of sustainable energy
- To know components of solar PV and wind energy conversion systems
- To understand the principles of Biomass, geo-thermal and wave energy systems
- To learn various energy storage methods

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand various sources for sustainable energy
CO-2: Understand Solar Photo voltaic and wind energy systems
CO-3: Learnt the harnessing techniques of Biomass, geothermal and ocean energy
CO-4: Familiarize with energy storage methods

UNIT-I:
Introduction: Trends in energy consumption - Conventional and renewable sources, Energy sources and their availability, Energy Conservation status in India -need of new energies for sustainable development.

UNIT-II:
Fundamentals of Solar Radiation: Introduction-The Sun as Source of Energy, Extraterrestrial and Terrestrial Radiations, Spectral Power Distribution of Solar Radiation, instruments for measuring solar radiation and sunshine recorder.
Solar PV Conversion: The PV Cell-Crystalline Solar cells -Thin film and amorphous solar cells, Module, Array, Equivalent Electrical circuit- Open circuit voltage and Short circuit current, I-V, P-V Curves. Developments in efficient non silicon solar cells

UNIT-III:
Wind Energy: origin of winds-Global (or Planetary) Winds- Local Winds-Factors Affecting the Distribution of Wind Energy on the Surface of Earth, Wind Turbine – Types, construction of HAWT, VAWT, performance characteristics, Betz criteria.

UNIT-IV:
Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Biogas digesters, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

UNIT-V:
Geothermal Energy: Resources, types of wells, methods of harnessing the energy Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic

cycles. Tidal and Wave Energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

Energy Storage: Electro Chemical Storage: lead-acid- nickel cadmium-nickel-metal-hydride and lithium type batteries-Principle of operation, Types, Advantages and disadvantages. Non-Electric Storage: Methods of Energy storage –Pumped Energy Storage – Compressed air Energy Storage, Superconducting Magnet Energy Storage.

TEXT BOOKS:

1. Non-Conventional Energy Sources, G. D. Rai, 6th Edition, Khanna Publishers, 2004
2. Non-Convention Energy Resources, B. H. Khan, 3rd Edition, McGraw-Hill, 2017

REFERENCES:

1. Renewable Energy Sources, Twidell & Weir, 3rd Edition, CRC Press, 2015
2. Solar Energy, Sukhatme, 3rd Edition, McGraw-Hill, 2008
3. Non-Conventional Energy, Ashok V. Desai, Wiley Eastern, 1990

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1ME303) 3D PRINTING AND DESIGN

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the need and know about the applications of 3D Printing
- To understand the need of liquid and solid based 3D Printing systems
- To know about the powder-based 3D Printing systems
- To understand the importance of CAD, post-processing and inspection involved in 3D Printing

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Summarize the importance of 3D Printing and its applications

CO-2: Explain the process involved in liquid and solid based 3D Printing Systems

CO-3: Explain the powder-based 3D Printing systems

CO-4: Apply the knowledge of CAD, post-processing and inspection involved in 3D Printing

UNIT-I:

Introduction: Introduction to 3D Printing, Classification, 3D Printing Process Chain, Materials for 3D Printing, Distinction between 3D Printing & Conventional Manufacturing.

Applications: Brief overview of applications in Aerospace, Automotive, Biomedical, Defense, Construction, Jewelry, Coin and Tableware Industry, Artificial Intelligence & IOT in 3D Printing

UNIT-II:

Liquid Based 3D Printing Systems: Introduction, Principle, Processes and Applications of Material Jetting and Stereolithography.

UNIT-III:

Solid Based 3D Printing Systems: Introduction, Principle, Processes and Applications of Fused Deposition Modeling (FDM) and Laminated Object Manufacturing (LOM).

UNIT-IV:

Powder Based 3D Printing Systems: Introduction, Principle, Processes and Applications of Selective Laser Sintering (SLS), Three-Dimensional Printing (3DP).

UNIT-V:

CAD, Post Processing and Inspection for 3D Printing: CAD data formats, CAD model preparation, Part orientation and support generation, Overview of 3D Printing softwares - MAGICS and MIMICS.

Post Processing: Introduction, Post Processing Techniques like Support material removal, Cleaning, Sanding and Polishing.

Inspection: Introduction, Significance, Inspection techniques like Dimensional measurement along X, Y and Z axes, visual inspection of the surface finish (overall aesthetics and intact features), flatness or warp check, and FOD (foreign objects or debris) check.

TEXT BOOKS:

1. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Ian Gibson, David W. Rosen, Brent Stucker, Springer, 2010
2. Rapid Prototyping: Principles and Applications, Chua C. K., Leong K. F., and Lim C. S., 3rd Edition, World Scientific, 2010

REFERENCES:

1. Rapid Prototyping and Engineering Applications: A Toolbox for Prototype Development, Liou L. W. and Liou F. W., CRC Press, 2007
2. Rapid Prototyping: Theory and Practice, Kamrani A. K. and Nasr E. A., Springer, 2006
3. Rapid Tooling: Technologies and Industrial Applications, Hilton P. D. and Jacobs P. F., CRC Press, 2000
4. Rapid Prototyping, Gebhardt A. Hanser, Gardener Publications, 2003

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1ME304) ADVANCED MATERIALS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic sciences

COURSE OBJECTIVES:

- To understand basic principles of advanced materials
- To understand the applications of all kinds of Industrial materials
- To select materials for given applications.
- To identify the need of developing Nano materials, smart materials, ceramics, glasses and non-metallic materials

COURSE OUTCOMES: After completion of the course, the student will be able to

CO-1: Explain the concepts and principles of advanced materials

CO-2: Suggest the material for the applications of all kinds of Industrial components

CO-3: Understand the material selection concepts to select a material for a given application

CO-4: Understand the behaviour and applications of Nano materials, smart materials, ceramics, glasses and non-metallic materials

UNIT -I:

Classification and Selection of Materials: Classification of materials, properties required in Engineering materials, Selection of Materials; Motivation for selection, cost basis and service requirements - Selection for mechanical properties, strength, toughness, fatigue and creep - Selection for surface durability corrosion and wear resistance – Case studies in materials selection with relevance to aero, auto, marine, machinery and nuclear applications.

UNIT -II:

Composite Materials: Fiber reinforced, laminated and dispersed materials with metallic matrix of aluminium, copper and Titanium alloys and with non-metallic matrix of unsaturated polyesters and epoxy resins. Important properties and applications of these materials.

UNIT- III:

Low & High Temperature Materials: Properties required for low temperature applications, Materials available for low temperature applications, Requirements of materials for high temperature applications, Materials available for high temperature applications, Applications of low and high temperature materials.

UNIT- IV:

Modern Metallic Materials: Dual Steels, Micro alloyed, High Strength Low alloy (HSLA) Steel, Maraging Steel, Inter metallics, Ni and Ti Aluminides.

Non-metallic Materials: Polymeric materials, Fibers, Foams, Adhesives and Coatings, structure, Properties and Applications.

UNIT- V:

Smart Materials: Shape Memory Alloys, Varistors and Intelligent materials for bio-medical applications.

Nanomaterials: Definition, Types of nanomaterials including carbon nanotubes and nanocomposites, Physical and mechanical properties, Applications of nanomaterials.

TEXT BOOKS:

1. Materials Science and Engineering, WD. Callister Jr. Wiley India Pvt. Ltd 2010
2. Engineering Design: A Materials and Processing Approach G.E. Dieter McGraw Hill 1991

REFERENCES:

1. Materials Selection in Mechanical Design, M.F. Ashby Pergamon Press 1992
2. Introduction to Engineering Materials & Manufacturing Processes, NIIT Prentice Hall of India, 2003
3. Engineering Materials Properties and Selection, Kenneth G. Budinski Prentice Hall of India, 1992
4. Selection of Engineering Materials, Gladius Lewis Prentice-Hall, New Jersey,1990

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EC305) 5G/6G TECHNOLOGIES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To learn air Interface for 5G as the most important elements that differentiate between 2G, 3G, 4G and 5G
- To study the concepts of 5G networks, technologies, and services
- To understand the concept of 5G NR and different 5G waveforms
- To study the basic principles of 6G networks

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the need for 5G and the Use cases for 5G
CO-2: Understand 5G architectural details
CO-3: compare different 5G radio access technologies
CO-4: Analyse various modulation schemes for 5G
CO-5: Understand the evolution of 5g to 6G

UNIT-I:

Fundamentals of 5G Technology: Introduction, Historical trends of wireless communications, Evolution of LTE technology to beyond 4G, 5G roadmap, 5G Overview, Physical Layer Changes in 5G, Protocol changes in 5G, 5G Use cases.

UNIT-II:

5G Network Architecture: Introduction, 5G RAN architecture, 5G Core, EPC to 5GC, Main Functional Entities of the 5G Core, High-Level Features of 5G Core, Network Slicing, QoS, 5G Security.

UNIT-III:

Numerology and Slot Structure: Numerology and Slot Structure in 4G LTE, SCSs for 5G NR, frequency ranges, Bandwidths, and bands for 5G NR, Symbol, Slot, Subframe, and frame for 5G NR, slot structure for 5G NR.

UNIT – IV

5G radio-access Technologies: 5G Waveform, OFDM, Modulation and coding in 5G, Propagation Characteristics of 5G Channel models, MIMO communication essentials, Massive MIMO in 5G, Small cells, D2D, M2M

UNIT – V

Evolution of 6G systems: Evolution from 5G to 6G, 6G frequency bands, Bandwidths and data rates, channel models, OTFS orthogonal Time frequency Space, Rate split multiple access, NOMA for 6G, AI/ML model for 6G network optimization.

TEXT BOOKS:

1. Fundamentals of 5G Communications: Connectivity for Enhanced Mobile Broadband and Beyond Wanshi Chen, Peter Gaal, Juan Montojo, Haris Zisimopoulos © 2021 | Published: July 7, 2021
2. Fundamentals of 5G Mobile Networks Jonathan Rodriguez, WILEY Publications

REFERENCES:

1. 5G Mobile and Wireless Communications Technology Afif Osseiran, Jose F. Monserrat, Patrick Marsch Cambridge University Press Second Edition 2011
2. 5G NR: The Next Generation Wireless Access Technology Erik Dahlman, Stefan Parkvall, Johan Sko'ld Elsevier First Edition 2016
3. Evolution of Air Interface towards 5G Prof. Suvra Sekhar Das Electrical and Electronics Engineering, IIT Kharagpur
4. Evolution of Air Interface for 5G, River Publishers 2018, Journal and conference papers, white papers

ONLINE RESOURCES:

1. https://www.theiotacademy.co/5G-6G-Talks

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EC306) FUNDAMENTALS OF VLSI

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To learn the fabrication process of integrated circuit and operation of MSO transistors
- To understand the electrical properties of MOS transistors
- To learn the basics of digital design
- To Understand the design procedure of various digital circuits
- To study the concepts of stick diagrams and layouts with the knowledge of MOS layers

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand IC Fabrication process steps required for various MOS circuits
CO-2: Know the various electrical properties of MOS transistors
CO-3: Understand the importance of digital circuits in IC design.
CO-4: Design the various combinational and digital circuits.
CO-5: Design the circuits using CMOS logic style and understand the role of testing

UNIT-I:

Introduction to Integrated Circuit Technology: MOS Technologies, PMOS, NMOS, CMOS fabrication process. Basic MOS Transistors Operation - Enhancement and Depletion Mode Transistors, and VLSI Design Flow.

UNIT-II:

Basic Electrical Properties of MOS: Drain to Source Current equation, MOS transistor threshold voltage, Transconductance and Output conductance, figure of merit. Pass transistor, NMOS Inverter, CMOS Inverter.

UNIT-III:

Introduction to Digital Design: Binary Logic, Postulates and theorems, SOP and POS forms, digital logic gates, Karnaugh Maps –minimization using two variable, three variable and four variable K-Maps, Don't Care Conditions.

UNIT-IV:

Overview of Digital Circuits – Half Adder, Full Adder, Half subtractor and Full Subtractor, Ripple carry adder, fundamentals of Decoders, Encoders, Multiplexers.
Combinational Vs Sequential Circuits, Functionality of Flip Flops-RS flip flop, D flip flop, JK flip flop, T flip flop, Introduction to Registers and Counters.

UNIT-V:

Combinational MOS Logic Circuits: Primitive CMOS logic gates - NOR and NAND gate, Realizing Boolean expressions using CMOS gates.

VLSI Circuit Design Processes: MOS Layers, Stick Diagrams- nMOS and CMOS design styles. Layout Diagram for nMOS and CMOS inverters, Need for Scaling in VLSI, Testing Philosophy and Role of Testing in IC technology.

TEXT BOOKS:

1. Essentials of VLSI Circuits and Systems, Kamran Eshraghian, Dougles and A. Pucknell, PHI, 2005
2. Digital Design, M. Morris Mano, 3rd Edition, Pearson Education/PHI, 2003

REFERENCES:

1. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E. Weste, David Harris, Ayan Banerjee, 4th Edition, Pearson,2015
2. Introduction to VLSI Systems: A Logic, Circuit and System Perspective, Ming-BO Lin, CRC Press, 2011
3. Essentials of Electronic Testing for Digital, Memory and Mixed Signal VLSI Circuits, M.L. Bushnell, V. D. Agrawal, Kluwer Academic Publishers, 2015

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS304) AI FOR BEGINNERS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand and analyze the basic concepts of artificial intelligence
- To identify, explore the complex problem-solving strategies and approaches
- To analyze the concepts of basic concepts of neural networks and learning process
- To explore and analyze the methodology used in machine learning and computer vision

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand and apply the basic concepts of artificial intelligence and its use cases. lives

CO-2: Explore the various search strategies and approaches for problem solving

CO-3: Correlate the fields related to AI, and articulate various learning paradigms

CO-4: Describe several issues and ethical concerns surrounding AI

UNIT-I:

Introduction to AI: What is AI-On Overview, History of AI, Applications and Examples of AI, AI Concepts, Terminology, Key fields of AI. AI Issues, Concerns, and Ethical Considerations.

UNIT-II:

AI as Search Process: On overview of Search Strategy. Types of Searches- Uninformed, Informed, Bidirectional search, Heuristic search. Local search, Local beam search, Adversarial Search.

UNIT-III:

AI as Knowledge Exploration: Introduction to Propositional Logic, Rules of Inference, First Order Logic (FOL) Syntax, Semantics, Entailment, Tools to represent knowledge.

UNIT-IV:

AI as a Learning Task: Introduction to Learning, Learning types -Supervised, Unsupervised, Reinforcement Learning, Machine learning, Deep Learning, The link between AI, ML, DL.

UNIT-V:

AI as Neural Networks: Introduction to biological neural networks. Link between biological neuron and artificial neuron. Architecture of artificial neural network, Types of Neural networks-single layer, multilayer, Back propagation networks.

TEXT BOOKS:

1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Prentice Hall, 2010
2. Machine Learning, Tom M. Mitchell, M. C. Graw Hill Publications
3. Neural Networks-A Comprehensive Foundation, Simon Haykin, 2nd Edition, Pearson Education, 2004

REFERENCES:

1. Artificial Intelligence, Elaine Rich & Kevin Knight, 2nd Edition, TMH
2. Artificial Intelligence, A New Synthesis, Nils J. Nilsson, Elsevier
3. Artificial Neural Networks, Yegnanarayana B., PHI

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS309) BLOCKCHAIN TECHNOLOGY ESSENTIALS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To introduce and get the technological overview of blockchain technologies
- To Study the foundation of Blockchain Technology and demonstrate the various types of Blockchain
- To explore the application area of Blockchain Technology
- To introduce smart contract, consensus algorithm and Security Mechanism
- Introduction to available platforms to implement Blockchain Technology

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand and explore the Blockchain Technology
CO-2: Describe smart contract concepts
CO-3: Explore different types of Blockchain
CO-4: Develop the platforms to implement Blockchain Technology

UNIT-I:

Fundamental of Blockchain: Introduction to Centralized, Decentralized and Distributed system, computer network peer to peer connection, understanding of blockchain, History of Blockchain, Various technical definitions of Blockchain.

Generic elements of a Blockchain: Block, Transaction, Node, Why It's Called "Blockchain", Characteristics of Blockchain Technology, Advantages of blockchain technology, Limitations of blockchain as a technology, Applications of blockchain technology, Tiers of blockchain technology Blockchain 0, Blockchain 1, Blockchain 2, Blockchain 3, Generation of Blockchain X, Confidentiality, Integrity, Authentication

UNIT-II:

Concept of Blockchain Technology: Component of block, Structure of Block chain, Technical Characteristics of the Blockchain, genesis block, Nonce, architecture of blockchain applications, Types of blockchain: Public blockchain, private blockchain, hybrid blockchain, examples of Public, private, hybrid blockchain and it merit and demerit, Permissioned ledger, Distributed ledger, Shared ledger, Fully private and proprietary blockchains, Tokenized blockchains, Tokenless blockchains

UNIT-III:

Smart Contract, Byzantine Fault Tolerance (BFT), Byzantine generals problem, byzantine agreement problems, Cryptography, Hashing, Distributed database, Consensus mechanisms, and basic of Cryptographic primitives, Technical Characteristics of Secure Hash Algorithms (SHA), Digital signature, Consensus Algorithm: Proof of work (PoW), Proof-of-Stake (PoS), Proof of authority (PoA)

UNIT-IV:

Cryptocurrency, Digital currency, Bitcoin, Bitcoin definition, Keys and addresses, Public keys in Bitcoin, Private keys in Bitcoin, how bitcoin currency work, Ethereum, Ethereum network, either, Ethereum Nodes, Ethereum clients, transaction fees, Ethereum Virtual Machine, Various Cryptocurrency and differences.

UNIT-V:

Implementation Platforms: Hyperledger as a protocol, Reference architecture, Hyperledger Fabric, Transaction Flow, Hyperledger Fabric Details, Fabric Membership, Fabric Membership, Blockchain in AI, Blockchain in IoT, Blockchain in Cloud Computing.

TEXT BOOKS:

1. Mastering Blockchain, Imaran Bashir, 2nd Edition, Packt
2. Blockchain Basic, Daniel Drescher, A Press

REFERENCES:

1. Blockchain For Dummies®, IBM Limited Edition, John Wiley & Sons, Inc

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EI303) FUNDAMENTALS OF ROBOTICS AND DRONES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the basics of robots
- To classify various types of actuators, grippers and sensors
- To acquire knowledge on kinematics and vision systems used for different robots
- To acquire knowledge on the basics of drones

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Acquire knowledge on various types of Power Sources (actuators), sensors and grippers

CO-2: Acquire knowledge on different applications of various types of robots

CO-3: Analyze the direct and the inverse kinematic problems and calculate the manipulator Dynamics

CO-4: Acquire knowledge on the applications of machine vision in robotics

CO-5: Acquire Knowledge on the basics of drones

UNIT-I:

Basic Concepts: An overview of Robotics, classification of Robots, Robot Components, Robot degrees of freedom, Robot Joints, Robot Coordinates, Robot reference frames, Programming modes, Robot Characteristics.

UNIT-II:

Actuators, Grippers and Sensors

Actuators: Characteristics of activating system, comparison of activating system Hydraulic devices, Pneumatic devices, electric motors, magneto-strictive actuators.

Sensors & Grippers: Robot end effectors, Classification, drive system for Gripper, Mechanical Grippers, Magnetic Grippers, Vacuum Grippers, Adhesive Grippers, Hooks, Scoops. Sensor characteristics, Position sensors, velocity sensors, acceleration sensors, torque sensors, light and infrared sensors, touch and tactile sensors, proximity sensors, range finders.

UNIT-III:

Kinematics: Forward and reverse kinematics. Matrix representation of translational and Rotational motion – Homogeneous Transformation-DH representation of standard configuration Robots Inverse Kinematics. Joint space vs. Cartesian space-Basics of Trajectory planning in joint and Cartesian space.

UNIT-IV:

Robot Vision: Low level and High-level vision Image acquisition, Illumination Techniques, Imaging Geometry, Some Basic Relationships between Pixels, Segmentation, Description, Segmentation and Description of 3-D Structures, Recognition, Interpretation.

UNIT-V:

Basics of Drones: Theory behind how drones work, individual components that makeup a drone, basic concepts involved radio-controlled model flying, building a complete quad copter drone from scratch.

TEXT BOOKS:

1. Introduction To Robotics: Analysis, Control, Applications, Saeed B. Niku, 2nd Edition, Wiley
2. Industrial Robotics, Technology Programming and Applications, Mikell P. Groover, Nicholas G. Odrey, Mitchel Weiss, Roger N. Nagel, Ashish Dutta, McGraw-Hill, 2012

REFERENCES:

1. Robotics Technology and Flexible Automation, Deb S. R., John Wiley
2. Robots and Manufacturing Automation, Asfahl C. R, John Wiley
3. Robotic Engineering–An Integrated Approach, Klafter R. D., Chimielewski T. A., Negin M., Prentice Hall of India
4. Drones for Beginners, Udemy

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1IT305) INTRODUCTION TO CLOUD COMPUTING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To impart the basics of cloud computing for business management
- To illustrate and explore the benefits of cloud storage and its applications, usage by managers
- To enable students explore cloud computing driven real time systems

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the characteristics and models in Cloud computing

CO-2: Asses Cloud services applications and the challenges associated with Cloud Computing

CO-3: Apply various cloud services and deployment models and virtualization techniques for business

CO-4: Analyze the concepts of cloud storage and demonstrate their use

CO-5: Evaluate various cloud programming models and apply them in virtual office management

UNIT-I:

Cloud Computing Overview: Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self-service, Broad network access, Location independent resource pooling , Rapid elasticity , Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.

UNIT-II:

Cloud Insights: Architectural influences – High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability, simplicity, vendors, security, Limitations – Sensitive information - Application development- security level of third party - security benefits, Regularity issues: Government policies.

UNIT-III:

Cloud Architecture- Layers and Models: Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption. Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.

UNIT-IV:

Cloud Simulators- CloudSim and Green Cloud: Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture(User code, CloudSim, GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud.

UNIT-V:

Introduction to VMWare Simulator: Basics of VMWare, advantages of VMware virtualization, using VMware workstation, creating virtual machines-understanding virtual machines, create a new virtual machine on local host, cloning virtual machines, virtualize a physical machine, starting and stopping a virtual machine.

TEXT BOOK:

1. Cloud computing a practical approach, Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010

REFERENCES:

1. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Michael Miller – Que, 2008
2. Cloud computing for dummies, Judith Hurwitz, Robin Bloor, Marcia Kaufman, Fern Halper, Wiley Publishing, Inc, 2010
3. Cloud Computing (Principles and Paradigms), Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc24_cs17/preview

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1IT306) FUNDAMENTALS OF COMPUTER VISION

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the Fundamental Concepts Related to Multi-Dimensional Signal Processing
- To understand Feature Extraction algorithms
- To understand Visual Geometric Modeling and Stochastic Optimization

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Recognizethebasicfundamentalsofvisionanddescribethescopeofchallenges
CO-2: Develop algorithms to analyze feature detection and feature alignment
CO-3: Analyze images and videos for problems such as tracking and structure from motion
CO-4: Choose object, scene recognition and categorization algorithms for real time images
CO-5: Apply various techniques to build computer vision applications

UNIT-I:
Introduction to Computer Vision and Image Formation: Introduction, Geometric primitives and transformations, Photometric image formation, Digital Camera image formation.
Image Processing: Point operators, linear filtering, more neighborhood operators, Fourier transforms, Pyramids and wavelets, Geometric transformations.

UNIT-II:
Featured etection and matching: Points and patches, Edges, Lines.
Segmentation: Active contours, Split and merge, Mean shift and modefinding, Normalized cuts.
Feature-based Alignment: 2D and 3D feature-based alignment, Pose estimation.

UNIT-III:
Structure from motion: Triangulation, Two-frame structure from motion, Factorization, Bundle adjustment, constrained structure and motion.
Densemotion Estimation: Translational alignment, parametric motion, Spline-based motion, Optical flow, Layered motion.

UNIT-IV:
Image Stitching: Motion Models, Global alignment, Sparse and dense corresponding, Global Optimization.

UNIT–V:

Recognition: Object detection, Face recognition, Instance recognition, Category recognition, Context and scene understanding.

TEXT BOOKS:

1. Computer Vision: Algorithms and Applications, Richard Szeliski, Springer-Verlag London Limited, 2011
2. Digital Image Processing, R.C.Gonzalez and R.E.Woods, Addison Wesley, 2008

REFERENCES:

1. Pattern Recognition: Statistical. Structural and Neural Approaches, Robert J.Schallkoff, John Wiley and Sons, 1992
2. Computer Vision: A Modern Approach, D.A. Forsyth and J.Ponce, Pearson Education, 2003
3. Multiple View Geometry, R.Hartley and A.Zisserman, Cambridge University Press, 2002
4. Multiple View Geometry in Computer Vision, Richard Hartley and Andrew Zisserman, 2nd Edition, Cambridge University Press, March 2004
5. Introduction to Statistical Pattern Recognition, K.Fukunaga, 2nd Edition, Academic ress, Morgan Kaufmann,1990

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc24_ee38/preview

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1AE303) INTRODUCTION TO ADVANCED VEHICLE TECHNOLOGIES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the layout of an automobile and functionality of chassis elements
- To know the working of automotive engine and electrical systems
- To provide the concepts of electric and hybrid vehicles
- To present various intelligent automotive systems and levels of vehicle autonomy

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Explain the functionalities of automotive systems and subsystems
CO-2: Describe the working of automotive engine and electrical systems
CO-3: Summarize the concepts of electric and hybrid vehicles
CO-4: Discuss various intelligent automotive systems
CO-5: Review the levels of vehicle autonomy and communication

UNIT-I:

Introduction: Classification of automobiles, layout of an automobile and types of bodies.

Automotive Chassis: Introduction to chassis systems - engine, cooling, lubrication, fuel feed, ignition, electrical, driveline - clutch, transmission, propeller shaft, differential, axles, wheels and tyres, steering, suspension and braking.

UNIT-II:

Engine: Working principle of four stoke and two stroke SI and CI engines, fuel system – layout of petrol and diesel fuel systems, electronic fuel injection - multi-point fuel injection, gasoline direct injection and common rail direct injection.

Electrical System: Simple automotive wiring diagram, components of electrical system and functionality.

UNIT-III:

Electric and Hybrid Vehicles: Electric vehicle – layout, components, configurations, advantages and limitations. Hybrid vehicle - concepts of hybrid electric drivetrain based on hybridization and powertrain configuration, architecture of series, parallel and series-parallel hybrid electric drivetrains, modes of operation, merits and demerits.

UNIT-IV:

Intelligent Vehicle Systems: Automotive navigation, night vision, head-up display, airbag, seat belt tightening system, immobilizers, adaptive cruise control, forward collision warning, lane departure warning and anti-lock braking system.

UNIT-V:

Autonomous Vehicles: Levels of automation, research, challenges, commercial development, sensor systems, sensor suits, environmental challenges, graceful degradation, V2V and V2I communication, sharing the drive, integrity, security, verification and policy implications.

TEXTBOOKS:

1. Advanced Vehicle Technology, Heinz Heisler, Butterworth Heinemann, 2002
2. Intelligent Vehicle Technologies: Theory and Applications, Ljubo Vlacic, Michel Parent and Fumio Harashima, Butterworth-Heinemann, Oxford, 2001
3. Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay and Ali Emadi, CRS Press, 2004

REFERENCES:

1. Automotive Mechanics, Giri N. K., Khanna Publications, 2006
2. Automotive Electrical Equipment, Kohli P. L., Tata McGraw Hill Co., Ltd., New Delhi, 1975
3. Electric and Hybrid Vehicles – Design Fundamentals, Iqbal Husain, CRC Press, 2010
4. Autonomous Vehicle Technology-A Guide for Policymakers, James M. Anderson, Nidhi Kalra, Karlyn D. Stanley, Paul Sorensen, Constantine Samaras, Oluwatobi A. Oluwatola, RAND Corporation, Santa Monica, Calif., 2016

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ee112/preview
2. https://www.classcentral.com/subject/autonomous

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS310) INTRODUCTION TO APPLICATION DEVELOPMENT WITH C#

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To create an integrated development environment for object-oriented C# programs
- To build website menus with CSS and JavaScript
- To relate programming language constructs and problem solving techniques
- To analyze and Apply modifications to C# programs that solve real-world problems

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the fundamentals of HTML5 and define the styles for web pages using CSS

CO-2: Create web pages and add dynamic behavior to web pages using Javascript

CO-3: Communicate with the database using SQL

CO-4: Develop a simple CUI [Character User Interface] based application using C# & SQL

UNIT-I:

Computer, Software Engineering Fundamentals & OOP: Introduction to Computer Basics, Basics of Network, Networking Levels and Layers and Protocols, Protocol Stacks, Networking and Internet Service, Software Engineering Fundamentals - Overview of Requirement Analysis, Overview of Software Design, Overview of Software Implementation, Overview of Testing, Overview of Software Maintenance, Overview of Configuration management and version Control, Agile Basics, OOP - Object Oriented Concepts, Objects and Classes, Principles in Object- Oriented technology

Usecase: Create a class for BankAccount

UNIT-II:

HTML & CSS: Introduction to Web Technology, Introduction to HTML5, HTML5 Elements, Semantic Elements, Table, List, Working with Links, Image Handling, Form-Input Elements, HTML5 Form elements, HTML5 Attributes, Video & Audio, iframes, CSS - Introduction to CSS3, CSS Syntax, CSS Styling, Text and Fonts properties, CSS Selectors, Different color schemes, CSS Borders, CSS Margins, CSS Backgrounds

Usecase: Create a website for college

UNIT-III:

JavaScript, RDBMS Concepts and SQL: JavaScript basics, Functions in Javascript, Javascript validation, Events, Javascript event handling, JavaScript Strings, JavaScript Dates, Array in Javascript, Document Object Model (Window, Frame, Navigator

Objects), Working with Document Object (Its Properties and methods, Cookie handling), Introduction to RDBMS Concepts, Introduction to SQL, Creating and Managing Tables, Data Manipulation, Basic SQL SELECT Statements, Scalar & Aggregate Functions, Joins & Subqueries, Views & Index
Usecase: Apply validations for Telephone Complaint Registration Form
Usecase: Create student table for College Management System(CMS)

UNIT-IV:
Introduction to C# Programming: Introduction to .NET Framework 4.5 - What is .NET Framework, .NET Framework, Languages, and Tools, .NET Framework Major Components, Common Language Runtime (CLR), Compilation and Execution in .NET, Understand the .NET Framework 4.5stack, Exploring VS2017, Introduction to C# 6.0 - Features of C#, C# Compilation and Execution, General Structure of a C# Program, Creating and Using a DLL
Usecase: Create a Console Application (.exe) project called CalcClientApp

UNIT-V:
Language Fundamentals of C#: Language Fundamentals - Keywords, Value Types and Reference Types, Implicit and explicit type conversions, Boxing and Unboxing, Enum, Operators and Assignments, Variables and Literals, Flow
Control: C# Control Statements, Nullable, Classes and Objects, Strings, Array, Generic Collections
Usecase: Store employee objects using Generic Collections
Basics of ADO.NET: Various Connection Architectures, Understanding ADO.NET and its class library, Important Classes in ADO.NET, Connection Class, Command Class, DataReader Class, DataAdapter Class, DataSet Class
Usecase: Implement ADO.NET classes that belong to both Connected and Disconnected Architectures

TEXT BOOKS:

1. Web Programming, Building Internet Applications, Chris Bates, 2nd Edition, Wiley Dreamtech
2. Introduction to Database Systems, C.J.Date, Pearson Education
3. Professional C# 2012 with .NET 4.5, Christian Nagel et al. Wiley India, 2012

REFERENCES:

1. Programming World Wide Web, Sebesta, Pearson
2. Internet and World Wide Web – How to program, Dietel and Nieto PHI/Pearson Education Asia
3. Database Development and Management, Lee Chao, Auerbach Publications, Taylor & Francis Group
4. Pro C# 2010 and the .NET 4 Platform, Andrew Troelsen, 5th Edition, A Press, 2010
5. Programming C# 4.0, Ian Griffiths, Matthew Adams, Jesse Liberty, 6th Edition, O"Reilly, 2010

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS311) INTRODUCTION TO APPLICATION DEVELOPMENT WITH JAVA

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To build website menus with CSS and JavaScript
- To create a bank account using class and keep track of customers data
- To create and store employee objects using collection framework
- To analyze and apply menu driven program using JDBC to save,delete, update
- To create an integrated development environment for object-oriented Java programs

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the fundamentals of HTML5 and define the styles for web pages using CSS

CO-2: Create customers data who are buying products using Classes and Objects

CO-3: Understand the Collection Framework concepts and its implementation

CO-4: Communicate with the database using SQL

CO-5: Develop a simple CUI [Character User Interface] based application using Java & SQL

UNIT-I:

HTML: Introduction to Web Technology, HTML5 Introduction, HTML5 Elements, Semantic Elements, Table, List, Links in HTML5, Handling of Images, Form Elements, HTML5 Form elements and Attributes, Video & Audio, iframes

Style Sheets: Introduction to CascadingStyleSheet3, CSS Syntax, CSS Styling, Text and Fonts properties, CSS Selectors, Color schemes, CSS Borders, CSS Margins, CSS Backgrounds

Use case: Design a website for college

JavaScript: Introduction to JavaScript, JavaScript Functions, JavaScript validation, Event handling in JavaScript, JavaScript Strings, JavaScript Dates, Array in JavaScript, Document Object Model (Window, Frame, Navigator Objects), Document Object (Its Properties and methods, Cookie handling),

UNIT-II:

Introduction to Java: Java Environment, Java Fundamentals - Keywords, Primitive Data Types, Operators and Assignments, Java's Control Statements, Wrapper Classes, Using Scanner Class,

Object Oriented Programming: Object Oriented Paradigm, Classes and Objects, Principles in Object- Oriented technology

Use case: Create a class for Bank Account

Strings: String Handling functions, Array - One dimensional array, Array of Objects, Using Arrays class, variable length arguments
Usecase: To keep track of customers data who are buying products from a store

UNIT-III:
The Collection Framework: Lists – Array List, LinkedList, Stack, Vector, Set – HashSet, Linked Hash Set, Tree Set, Map – HashMap, Linked HashMap, Hash table. Retrieving Elements from Collections – Enumeration, Iterator, List Iterator, String Tokenizer – Sorting using Comparable and Comparator.
Use Case: Store employee objects using collection framework

UNIT-IV:
JDBC: Overview of JDBC, JDBC Architecture, Types of JDBC Drivers. Process SQL with JDBC - Create Connection, Query, Update
Use case: Write the menu driven program using JDBC which will have following options
a. Store
b. Display by id
c. Delete by id
d. Update salary by id
e. Exit
RDBMS Concepts and SQL: Introduction to RDBMS Concepts, Introduction to SQL, Creating and Managing Tables, Data Manipulation, Basic SQL SELECT Statements, Scalar & Aggregate Functions, Joins & Subqueries, Views & Index
Use case: Check the validations for Telephone Complaint Registration Form
Use case: Create student table for College Management System (CMS)

UNIT-V:
Computer: Computer Fundamentals, Preface to Networks, Networking Levels, Layers of Computer Networks, Protocol Stacks, Networking, and Internet Service
Software Engineering Fundamentals: Introduction, Requirements Collection & Analysis, Fundamentals of Software Design, Software Implementation, Types of Testing, Software Maintenance, Overview of Configuration management and version Control Tools, Basics of Agile Process

TEXT BOOKS:

1. Web Programming, Building Internet Applications, Chris Bates, 2nd Edition, Wiley Dreamtech
2. Introduction to Database Systems, C.J. Date, Pearson Education
3. Big Java, Cay Horstmann, John Wiley and Sons, 2nd Edition

REFERENCES:

1. Programming World Wide Web, Sebesta, Pearson
2. Internet and World Wide Web – How to program, Dietel and Nieto PHI/Pearson Education Asia
3. Database Development and Management, Lee Chao, Auerbach Publications, Taylor & Francis Group
4. Java How to Program, H.M.Dietel and P.J.Dietel, 6th Edition, Pearson Education/PHI

5. Core Java 2, Vol. 1, Fundamentals, CayS. Horstmann and Gary Cornell, 7th Edition, Pearson Education

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS312) INTRODUCTION TO APPLICATION DEVELOPMENT WITH PYTHON

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To create an integrated development environment for object-oriented Python programs
- To build website menus with CSS and JavaScript
- To relate programming language constructs and problem solving techniques
- To analyze and Apply modifications to Python programs that solve real-world problems

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the fundamentals of HTML5 and define the styles for web pages using CSS

CO-2: Create web pages and add dynamic behavior to web pages using Javascript

CO-3: Communicate with the database using SQL

CO-4: Develop a simple CUI [Character User Interface] based application using Python & SQL

UNIT-I:

Concepts of Networks, Overview of Software Engineering & OOP: Computer Basics, Network basics, Networking Levels, Layers and Protocols, Protocol Stacks, Networking and services of Internet

Software Engineering lifecycle - Overview of Requirement Analysis, Software Design, Implementation of software, Outline of Testing, Maintenance, Configuration management and version Control, Agile fundamentals

OOP - Object Oriented Concepts, OOP Principles

Usecase: Create a class for Employee Account

UNIT-II:

Introduction to Web Technology: Overview of Web Technology, Introduction to HTML5, HTML5 Elements, Semantic Elements, Table, List, Links, Image Handling, Form-Input Elements, HTML5 Form elements, HTML5 Attributes, Video & Audio, iframes,

CSS - Introduction to CSS3, CSS Syntax, CSS Styling, Text and Fonts properties, CSS Selectors, Different color schemes, CSS Borders, Margins, Backgrounds

Usecase: Create a website for an institution

UNIT-III:

Outline of JavaScript, RDBMS Concepts and SQL: JavaScript basics, Functions ,validations, Events, handling events ,Strings, Dates, Arrays, DOM(Window, Frame, Navigator Objects), Document Object -Properties and methods, handling of Cookies,

RDBMS Concepts, SQL, Management of Tables, Manipulation of tables, SQL SELECT Statements, Scalar & Aggregate Functions, Joins &Sub queries, Views & Index
Usecase: Apply validations for Telephone Complaint Registration Form
Usecase: Create student table for College Management System (CMS)

UNIT-IV:
Introduction to Python: Introduction, Features of Python, Versions, Keywords and Identifiers, Statements & Comments, Variables, Datatypes, Type Conversion, I/O and import, Language Fundamentals - Operators, Namespace, Modules in Python, Python DateTime
Classes and Objects: Classes and Objects in Python? Advantages of Using Classes in Python, Defining a Class in Python, Creating an Object in Python, The self, The_init_() function in Python, class and instance variables, Python Inheritance and its Types,
Usecase: Develop an application using Python for accepting your personal details and display the same
Usecase: Store employee objects using various data structures

UNIT-V:
Advance Concepts in Python: Strings, Lists, Sets, Tuples, Dictionary .
Array - What is an Array, Difference between Array and List in Python, Creating an Array, Accessing a Python Array Element, Basic Operations of Arrays, Functions - Creating a Function, Calling a Function, Pass by reference vs value, Required arguments, Keyword arguments, Default arguments, Variable-length arguments, The Anonymous Functions, The return Statement, Global vs. Local variables, Modules - What is a Module?, Create a Module, Use a Module, Variables in Module, Naming a Module, Renaming a Module, Built-in Modules, Using the dir() Function, Import From Module, Packages, NumPy
Usecase: Develop an application for Hospital Management System(HMS)

TEXT BOOKS:

1. Web Programming, Building Internet Applications, Chris Bates, 2nd Edition, Wiley Dreamtech
2. Introduction to Database Systems, C.J. Date, Pearson Education
3. Python Programming: A Modern Approach, Vamsi Kurama, Pearson

REFERENCES:

1. Programming World Wide Web, Sebesta, Pearson
2. Internet and World Wide Web – How to program, Dietel and Nieto PHI/Pearson Education Asia
3. Database Development and Management, Lee Chao, Auerbach Publications, Taylor & Francis Group
4. Core Python Programming, W.Chun, Pearson
5. Introduction to Python, Kenneth A. Lambert, Cengage

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1MT304) NUMERICAL METHODS AND LINEAR PROGRAMMING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PREREQUISITES: Differentiation, Integration, Basic concepts of Linear Algebra

COURSE OBJECTIVES:

- Solving numerical methods for non linear equations
- Applying various methods of interpolation and their application
- Evaluating definite integrals and solve Ordinary Differential Equations
- Formulating of Linear Programming Problem and of approaches of optimization techniques
- Applying different methods to solve the transportation problem

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Apply the numerical methods to find roots of algebraic and transcendental equations

CO-2: Interpolate the polynomial function using finite difference methods

CO-3: Solve the ordinary differential equations using various numerical techniques

CO-4: Model the Linear Programming Problem and estimate the feasible solutions

CO-5: Apply optimization techniques in industrial optimization problems

UNIT-I:

Solutions of Non-Linear Equations: Introduction; Mathematical preliminaries; Solution of algebraic and transcendental equation –bisection method, the method of false position, Fixed point iterative method, Newton - Raphson method, and their order of convergence

UNIT-II:

Interpolation: Introduction; Finite differences; Forward differences; Backward differences; Central differences; Differences of a polynomial; Newton's formulae for interpolation; Central difference interpolation formulae; Gauss's central difference formulae and Lagrange's and Hermite interpolation formulae

UNIT-III:

Numerical Integration: Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, and Simpson's 3/8 rule, Gaussian quadrature 2 & 3 point formulae.

Numerical Solutions of Ordinary Differential Equations: Solution of initial value problems by Taylor's series, Picard's method of successive approximations, Euler's method, Modified Euler's method and 4th order Runge – Kutta method, Predictor Corrector methods - Adams Bash forth method- Adams Moulton method (without proof).

UNIT-IV:

Linear programming: Basic concepts, problem formulation, Concept of Duality, Dual of given Linear Programming Problem, canonical and standard forms of Linear Programming Problem, simplex method, Solutions to Linear Programming Problem by Dual Simplex Method, Artificial variables technique- Big-M method

UNIT-V:

Transportation problems: Balanced and Unbalanced transportation problems- North-West corner rule, Least Cost Method, Vogel's Approximation Method (VAM) and MODI method.

TEXT BOOKS:

1. Higher Engineering Mathematics, B.V. Ramana; 33rd Reprint, McGraw Hill Education (India) private Limited, 2018
2. Advanced Engineering Mathematics by R.K.Jain and S.R.K.Iyengar; Narosa Publications, 2016
3. Operations Research, Kanti Swarup, P.K. Gupta and ManMohan, 13th edition, Sultan Chand and Sons, 2007

REFERENCES:

1. Operations Research, Theory and Applications, J.K. Sharma, 6th Edition, Trinity Press, Laxmi Publications Pvt. Ltd. 2016
2. Advanced Engineering Mathematics by Erwin Kreyszig, 8th Edition; Publisher: John Wiley
3. Elementary Numerical Analysis – an algorithmic approach -Samuel D. Conte and Carl De Boor (2006); 3rd edition; Publisher: Tata McGraw Hill
4. Operations Research: An introduction, Taha H.A.,7th edition, Pearson Prentice Hall, 2002
5. Introduction to Operations Research, Hillier and Lieberman, 8th Ed., McGraw Hill

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1MT305) OPTIMIZATION TECHNIQUES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PREREQUISITES: Basic knowledge of Calculus and Linear Algebra

COURSE OBJECTIVES:

- To understanding concepts of convex sets, convex functions
- To derivative based and derivative free optimization
- To formulating LP problem, solution of LP and feasibility of solutions
- To applying different methods to solve the transportation problem
- To understanding network based optimization technique

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Explore and understand role of convex functions in optimization problems

CO-2: Derive the Karush-Kahn-Tucker(KKT) optimality conditions for constrained optimization problem

CO-3: Formulating of Linear Programming Problem and of approaches of optimization techniques

CO-4: Apply optimization techniques in industrial optimization problems

CO-5: Learn the role modern tools in optimization problems

UNIT-I:

Optimization Basics: Review of calculus: Derivatives, Gradient, Convex sets, convex functions, Optimization, Basics of Optimization Problems: Representation, Local and Global minima, Conditions of Optimality, Newton's method, Gradient Method (Gradient Descent Method) and Steepest Descent Method of finding optimality with Numerical Examples

UNIT-II:

Constrained Optimization: Constrained optimization problem formulation, Equality and Inequality constraints problems with numerical examples, Tangent space and normal space, Lagrange's Theorem, Karush-Kahn-Tucker (KKT) condition, convex optimization.

UNIT-III:

Linear programming: Basic concepts, problem formulation, Concept of Duality, Dual of given Linear Programming Problem, canonical and standard forms of Linear Programming Problem, simplex method, Solutions to Linear Programming Problem by Dual Simplex Method, Artificial variables technique- Big-M method

UNIT-IV:

Transportation Problems: Balanced and Unbalanced transportation problems- North-West corner rule, Least Cost Method, Vogel's Approximation Method (VAM) and MODI method.

UNIT-V:

Genetic and Evolutionary Optimization: Introduction, Genetic Algorithms: Representation, Chromosomes and Genes, Generations; Fitness, Genetic Algorithms: selection, crossover, mutation, elitism with numerical examples, Multi-Objective Optimization

TEXT BOOKS:

1. Operations Research, Kanti Swarup, P.K. Gupta and ManMohan, 13th edition, Sultan Chand and Sons, 2007
2. Optimization Techniques: An Introduction, L. R. Foulds, Undergraduate Texts in Mathematics (UTM)
3. Optimization insights and applications, Jan Brinkhuis and Vladimir Tikhomirov

REFERENCES:

1. Optimization methods for Engineering design: Applications and Theory, Alan R. Parkinson Richard J. Balling John D. Hedengren, Brigham Young University
2. Optimization Toolbox: MATLAB User's Guide
3. Numerical Recipes in C: The Art of Scientific Computing, William H. Press, Saul A. Teukolsky, William T. Vetterling and Brian P. Flannery
4. Engineering optimization: Theory and Practice, S.S.Rao

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1PH301) NANOSCIENCE AND TECHNOLOGY FOR ENGINEERS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the basic principles of quantum physics and nanoscience
- To study size dependent properties of materials at nanoscale and carbon nano tubes
- To explore various fabrication techniques for nanomaterials
- To ascertain different characterization techniques to analyze nanomaterials
- To extend applications of nanomaterials in engineering

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Explain the basic principles of nanoscience
CO-2: Realize the importance of size dependent properties of nano materials
CO-3: Apply various fabrication techniques for nanomaterials
CO-4: Identify suitable characterization techniques to analyze nanomaterials
CO-5: Illustrate the applications of nanomaterials in engineering

UNIT-I:

Basics of Nanoscience: Introduction to quantum mechanics, electron as wave, Schrodinger time independent wave equation, particle in a potential box, Heisenberg Uncertainty Principle, Pauli's exclusion principle, Idea of band structure, density of states for zero, one, two, and three dimensional materials (Qualitative), Quantum confinement, Quantum wells, wires, dots.

UNIT-II:

Properties of Nanomaterials: Surface to Volume ratio, Size dependent properties- Mechanical, Thermal, Electrical, Optical, Magnetic and Structural properties of nanomaterials, Electrical and Mechanical properties of Carbon nanotubes.

UNIT-III:

Fabrication techniques of Nanomaterials: Physical methods- Ball milling, electron beam lithography, Sputtering, Laser ablation. (construction, working, advantages and disadvantages).

Chemical methods - Sol-gel method, Chemical vapor deposition, Hydrothermal, Co-Precipitation. (construction, working, advantages and disadvantages).

UNIT-IV:

Characterization of Nanomaterials: XRD, Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy, UV-VIS spectroscopy, Raman spectroscopy.

UNIT-V:

Nanomaterials in Engineering: Nano sensors-gas and chemical, Introduction to Nano Electro Mechanical Systems (NEMS), Applications of Nanomaterials in Drug delivery, Coatings, and Renewable energy.

TEXT BOOKS:

1. Nanotechnology: Principles & Practicals, Sulbha K Kulakarni, Capital Publishing Co. New Delhi
2. Nano: The Essentials. T. Pradeep, McGraw Hill Education
3. Nanostructures & Nanomaterials Synthesis, Properties & Applications. Guozhong Cao, Imperial College Press, London

REFERENCES:

1. Essentials of Nanoscience and Nanotechnology by Katta Narsimha Reddy
2. Introduction to Nanotechnology. C.P. Poole Jr. and F.J. Ownes, Wiley Student Edition
3. Nanoscience and Technology: Novel Structure and Phenomena-Ping and Sheng

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1PH302) ESSENTIALS FOR QUANTUM COMPUTING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To recall the basic principles of quantum physics
- To study various mathematical tools required for quantum computing
- To ascertain matrix representation and commutative relations of various operators
- To understand concept of qubit and its measurement
- To explain various types of quantum gates

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Recognize the importance of quantum mechanics
CO-2: Identify various operators for quantum computing
CO-3: Represent matrices and commutative relations
CO-4: Realize the concept of qubit and its measurement
CO-5: Apply different quantum gates in quantum computing

UNIT-I:

Basics of Quantum Mechanics: Introduction to quantum mechanics, Schrodinger time dependent and independent wave equation, Particle in a potential box, Heisenberg Uncertainty Principle, Pauli's exclusion principle, Quantum harmonic oscillator Linearity and Superposition.

UNIT-II:

Mathematical Tools for Quantum Computing-I: Linear vector space, Hillbert space, Dirac notation, Operators- Linear operator, Hermitian operators, Skew Hermitian operator, Inverse and Unitary operator, Eigen value and Eigen vector of operator, Unitary transformation and its properties.

UNIT-III:

Mathematical Tools for Quantum Computing-II: Matrix representation of Kets, Bras, Operators, Eigen values and Eigen vectors of matrices, Position representation, Momentum representation and their connection, Position and Momentum Operators and their commutation relations, Probability density and Expectation values.

UNIT-IV:

Fundamentals of Quantum Computing: Introduction to Quantum Computing, Types and Uses of Quantum Computers, Entanglement, Interference and Coherence/decoherence, Qubits, Representation and measurements of qubits.

UNIT-V:

Quantum Gates: Basic quantum logic gates. The Bloch sphere (Qualitative), Quantum States and Registers, Single Qubit gates, Hadamard Gate, Pauli Gates, Phase gate (S) and (T), Multi Qubit Gates, CNOT Gate.

TEXT BOOKS:

1. Quantum mechanics- concepts and applications, Nouredine Zettili, Wiley publications
2. Quantum Computing: Beginners Introduction, PARAG K. LALA, Mc Graw Hill
3. Quantum Computation and Quantum Information by Michael A. Nielsen and Isaac L. Chuang, Cambridge University Press

REFERENCES:

1. Introduction to Quantum Mechanics, D J Griffiths, Cambridge University Press
2. Molecular Quantum Mechanics, Peter Atkins, Ronald Friedman, Oxford University Press
3. Quantum Computing- A gentle Introduction, Eleanor Rieffel and Wolf gang Polak, The MIT Press Cambridge, Massachusetts London

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CH301) INTRODUCTION TO CLIMATE CHANGE

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To introduce students to the concept of climate change and its historical context
- To analyze the ecological consequences of climate change Impacts
- To explore strategies for adaptation & mitigation of climate change
- To understand the global climate change models and predictions
- To examine international and national climate policies, and the challenges associated with climate change governance

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Identify natural and anthropogenic drivers of climate change

CO-2: Assess the impacts of climate change on environment

CO-3: Appraise various adaptation & mitigation options, for effective climate management

CO-4: Able to analyse climate models and adaptability of AI and IOT

CO-5: Evaluate the effectiveness of climate policies and assess the importance of technological innovations

UNIT-I:

Basics of Climate Change: Introduction & causes of climate change.

Natural Drivers: volcanoes, change in earth's orbit, solar variations & ocean currents.

Anthropogenic Drivers: greenhouse gas emissions, aerosols & land use. Key climate variables - temperature, precipitation, sea level. Human footprint on global warming.

UNIT-II:

Impact and Vulnerabilities: Climate change impacts on: water resources, wetlands, glaciers melting, biodiversity, agriculture, marine environment – (sea level rise, ocean current and circulation, ocean acidification, coastal lives) and human health - case studies.

UNIT-III:

Mitigation & Adaptation Strategies: Renewable energy technologies (solar, wind, hydro, geothermal & biomass), energy efficiency measures, carbon capture and storage (CCS). Policy frameworks (Kyoto Protocol, Paris Agreement). Adaptation strategies (resilient infrastructure, climate-smart agriculture & urban planning).

UNIT-IV:

Climate Models and Projections: Basics of climate modelling. Historical climate data analysis (past, present and future). General Circulation Models (GCMs), emission

scenarios, Representative concentration pathways (RCPs), uncertainty in climate projections, regional climate modelling, impacts on ecosystems and society. Fundamentals of AI & IOT for climate modelling.

UNIT-V:

Climate Policy and Governance: Global climate change governance, Climate change finance sources: challenges and opportunities to assess and manage Climate finance. Evaluate climate change policies: UNFCC and other entities. Climate negotiations, National scenario; in NAPCC, India's commitments (INDCs) and National communication (NATCOM). Initiative policies and regulation: Important agencies and organizations,

TEXT BOOKS:

1. Climate Change: A Multidisciplinary Approach, Anindita Bhadra and Navroz K. Dubash, 1st Edition, Sage Publications India Pvt Ltd, 2019
2. Climate Change and India: Vulnerability Assessment and Adaptation, Arvind Kumar and Shalini Sharma, 1st Edition, Springer, 2019
3. Climate Change Biology, Jonathan A. Newman and Madhur Anand, 1st Edition, CABI, 2011
4. Climate Change Governance and Adaptation: Case Studies from South Asia, Amalendu Jyotishi et al, 1st Edition, Routledge India, 2019

REFERENCES:

1. Climate Change: A Very Short Introduction, Mark Maslin,4th Edition, Oxford University Press2019
2. Climate Change and Biodiversity in India, M.S. Manohar Rao and P.V. Sridhar Rao, 1st Edition, Universities Press, 2019
3. Climate Change: What Everyone Needs to Know, Joseph Romm, 2nd Edition, Oxford University Press, 2018
4. Climate Change: Impacts, Adaptation, and Vulnerability, Intergovernmental Panel on Climate Change (IPCC), 1st Edition, Cambridge University Press, 2007
5. Environmental Governance: Reconsidering the Boundaries of Environmental Policy, Jens Newig and Edward Challies, 1st Edition, MIT Press, 2019
6. Introduction to modern climate change by Andrew Dessler and Edward Parson
7. Climate models: An assessment of strengths and limitations by National Research council

ONLINE RESOURCES:

1. Coursera: Climate Change: The Science
2. edX: Climate Action: Solutions for a Changing Planet
3. Coursera: Climate Change Policy and Public Health

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CH302) SUSTAINABLE CHEMISTRY FOR ENGINEERING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To explore the principles and applications of sustainable chemistry
- To emphasize the importance of green chemistry in addressing environmental challenges
- To introduce sustainable materials for green practices
- To provide comprehensive understanding of sustainable energy technologies
- To promote sustainable development practices aiming towards societal needs

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Identify the role of chemistry in promoting sustainability

CO-2: Familiarize with the concept of green chemistry and emphasize on LCA

CO-3: Interpret the importance of sustainable materials & green manufacturing

CO-4: Analyse and implement sustainable energy solutions

CO-5: Integrate technology for sustainable practices

UNIT-I:

Introduction to Sustainable Chemistry: Overview of sustainability concepts and principles, the role of chemistry in promoting sustainability, Sustainable development goals and their relation to chemistry (SDGs) -Zero hunger, good health & wellbeing, clean water and sanitation, affordable & clean energy, Industry, innovation & infrastructure, sustainable cities & communities, responsible consumption & production, climate action, life below water, life on land, partnerships for the goals. Case studies on sustainable chemistry practices.

UNIT-II:

Green Chemistry Principles & Applications: Definition & scope of green chemistry, Relation between green chemistry & sustainability, 12 Principles of green chemistry, Applications of green chemistry. Introduction to Life Cycle Assessment (LCA) methodologies - ISO14040, ISO14044, Cradle to grave, cradle to gate and cradle to cradle. Application of LCA to engineering processes and products.

UNIT-III:

Sustainable Materials & Green Manufacturing: Introduction to sustainable materials, criteria for evaluating the sustainability of materials. Impact of sustainable materials on environment. Eco friendly materials and their applications in packaging, construction, and consumer goods. Integration of smart materials into sustainable design. Green manufacturing-Definition & significance, emerging technologies for sustainable & green manufacturing. Industry 4.0 and its impact on green practices.

UNIT-IV:

Sustainable Energy Technologies: Definition & importance of sustainable energy, global energy consumption & environmental impact, Overview of clean energy sources that have minimal environmental impact compared to traditional fossil fuels-solar energy, wind energy, biomass energy. Sustainable transport-introduction to Electric Vehicles (EV), Technological advancements over the years in EVs, electric vehicle performance & efficiency comparison with traditional internal combustion engine vehicles, integration of autonomous technology with EVs.

UNIT-V:

Trends towards Sustainability: Waste minimization and resource recovery, waste reduction, and waste tracking systems. Recycling & waste management- Plastics recycling – Code of practice – Primary, secondary, tertiary, and quaternary recycling with examples. Mechanical recycling of commonly used plastics, such as PP, PE, PET, etc. Waste plastics as fillers. Advances towards clean chemistry-minimizing the use of traditional chemical catalysts by integrating biocatalysts (enzymes) into chemical processes. Integration of technology - application of artificial intelligence & machine learning for designing & optimization of sustainable chemical processes.

TEXT BOOKS:

1. Sustainable Chemistry, Stanley E. Manahan, 2nd Edition, CRC Press,
2. Green Chemistry, Theory and Practical, Paul T.Anastas and John C.Warner, Oxford University Press
3. Rashmi Sanghi and M.M. Srivastava, Green Chemistry-Environment Friendly Alternatives, Narosa Publishing House, New Delhi, 2009
4. Recycling and recovery of plastics, Johanner Brandrup, Hanser Publishers, New York, 1996-R
5. Sustainable Materials: Environmental and Engineering Perspectives, Subramanian Senthilkannan Muthu, 1st Edition, Springer

REFERENCES:

1. Green Chemistry: An Introductory Text, Mike Lancaster, RSC Books
2. Sustainable Energy – Without the Hot Air, David J.C. MacKay, UIT Cambridge Ltd.
3. Green Manufacturing: Fundamentals and Applications, David A. Dornfeld and Barbara S. Linke, 1st Edition, Springer
4. Waste and Resource Management: Sustainable Handling of Waste Materials, Bernd Bilitewski, Georg Härdtle, and Klaus Marek, 4th Edition, Wiley
5. Artificial Intelligence in Chemistry and Drug Design" by Cory M. Reynolds and Alexander Tropsha, Royal Society of Chemistry, 1st Edition

ONLINE RESOURCES:

1. Coursera - Introduction to Environmental Science and Sustainability
2. edX - Applications of Artificial Intelligence in Chemistry
3. FutureLearn - Recycling: Global Practices of Sustainable Cities
4. Coursera - Plastic Waste Management

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EN301) STORYTELLING FOR EFFECTIVE COMMUNICATION

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Should have adequate knowledge of LSRW skills

INTRODUCTION:
Effective communication is essential in all aspects of life, whether it is in personal relationships or professional settings. One powerful tool for impactful communication is storytelling as it connects to the audience/reader quickly. A well-told story can captivate an audience/reader, evoke emotion, and convey important messages in a memorable way. Storytelling creates engagement, alongside fostering creativity and flexibility which makes it an incredibly helpful tool across all types of communication. While presenting facts, figures, and logical arguments, using a suitable storytelling strategy not only yields the best results but also helps hone negotiation, team-building, and leadership skills in addition to a host of other life skills. Storytelling is associated with both verbal and nonverbal communication.

COURSE OBJECTIVES:
- To develop storytelling strategies among students
- To enable students to develop stories for various contexts
- To hone the communication skills of the students
- To develop skills to apply digital technology for storytelling purposes
- To develop life skills among the students through various stories

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the storytelling strategies for various contexts
CO-2: Develop digital stories for various contexts
CO-3: Use the elements of storytelling, understand narrative techniques, and characters, and build the stories
CO-4: Hone their life skills to be applicable in real-life contexts
CO-5: Apply storytelling techniques for placement activities

UNIT-I:
Storytelling your way to power
Why we tell stories
Significance of verbal and nonverbal communication while telling a story
Connect your message with the story
Matching your audience/readers to your story

UNIT-II:
Digital storytelling
Storytelling techniques

Storytelling strategies for presentations

UNIT-III:

Elements of a great story

plot, narrative techniques, first person, second person, third person narration.
Assembling the building blocks
Characters and their development
End with a bang
Common mistakes storytellers make

UNIT-IV:

Life Skills through storytelling-Sample stories

Honing leadership skills
Team skills
Change management skills
Interpersonal skills

UNIT-V:

Storytelling for selection process

Self-introduction as a story
Anecdotes useful during a group discussion
Anecdotes useful during an interview
SOP -a story writing

TEXT BOOKS:

1. Using Storytelling to Effectively Communicate Data, Michael Freeman Infinite Skills, 2015
2. Communication, Sharing Our Stories of Experience, Howard Kamler, Psychological Press,1983
3. Storytelling, Michael Wilson, Emerald Publishing Limited, 2022

REFERENCES:

1. Digital Storytelling for Employability, Ed by: Laura Malita, Vanna Boffo, Firenze University Press, 2010
2. Storytelling with You, Cole Nussbaumer Knaflic, Willy publishers, 2022
3. Conversation Skills, Keith Coleman, Communication & Social Skills, 2019
4. Digital Storytelling in the Classroom, Jason. B. Ohler, Corwin, 2013
5. The Instructional Value of Digital Storytelling, Patricia McGee, Routledge, 2015

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EN302) FILM ANALYSIS AND CRITICAL APPRECIATION

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

INTRODUCTION:

Film Analysis and Critical Appreciation is a thought-provoking Open Elective course aimed at fostering a holistic perspective essential for future engineering and technology professionals. This course is designed to transcend the realms of entertainment, providing a unique lens through which learners can develop a robust sociocultural awareness and gain exposure to humanities, enriching their interdisciplinary skills

COURSE OBJECTIVES:

- To help students acquire knowledge of the history and development of cinema by studying and analysing major film movements to comprehend their impact on the evolution of cinematic language
- To train students to identify and differentiate various film genres, understanding their conventions, narrative structures, and other significant aspects
- To encourage students to understand and critically evaluate key elements such as cinematography, editing, sound, and mise-en-scène in film besides recognising the nuanced use of these elements to convey meaning
- To provide students the opportunity to explore major theories of film criticism and understand how these theories contribute to the interpretation and analysis of films
- To equip students with the critical thinking skills and appropriate strategies to conduct thematic analysis by exploring how films address and convey social, cultural, and political themes and gain insights into the interplay of narrative, visuals, and sound in conveying and shaping thematic content

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Trace the historical development of cinema and understand its evolution as a distinctive art form

CO-2: Identify and analyse different film genres, their characteristics and narrative conventions to examine how genres contribute to audience expectations and influence storytelling

CO-3: Critically evaluate key elements in films, including cinematography, editing, sound, and mise-en-scène, and analyse their impact on storytelling in selected films, providing specific examples

CO-4: Comprehend major theories of film criticism, applying them to analyze and interpret selected movies for enhanced understanding of a film's meaning

CO-5: Demonstrate skills in conducting thematic analysis, examining how movies address social, cultural, and political themes

UNIT-I:

Introduction: A brief history of cinema; development of film as an art form; an overview of some major movements in world cinema: German Expressionism, Italian New Realism, French New Wave, British New Wave, Dogme 95

UNIT-II:

Film Genres

Broad classification: Narrative, Documentary, and Avant-garde; Major genres: action, comedy, drama, romance, fantasy, horror, science fiction, biopics, detective and mystery, adventure; awareness about sub-genres, hybrids and cross-genre films; conventions and expectations within specific genres

UNIT-III:

Elements of Film: Delve into the cinematic experience from the audience's perspective by exploring the Big Four: Mise-en-scène: props, costumes, lighting, setting; Cinematography: camera angle, camera distance, camera movement; Editing: graphic match, diegesis, shots; Sound: diegetic and non-diegetic

UNIT-IV:

Theories of Film Criticism

Four levels of meaning: referential content, explicit content, implicit content, symptomatic content; Approaches to the study of cinema: Semiotics: Realist, Formalist, Rhetorical;

Structuralist: Mythic, Political, Feminist, Psychoanalytical, Sociological; Contextual: Auteur, Genre, Historical

UNIT-V:

Critical Analysis of Plot, Characters and Themes: Story and Plot; Linear and Non-linear narrative structure; Major character archetypes; stereotypes and tropes; Interpretation of themes; Relationship between theme and character; Role of the audience in meaning-making: subjectivity and cultural context; Questions of power, identity, ethical dilemmas, and moral conflicts; Literary adaptations in film: analysing how thematic and character elements are translated.

SUGGESTED LIST OF FILMS FOR ANALYSIS

WORLD CINEMA:

1. The Cabinet of Dr. Caligari (1920, German: Das Cabinet des Dr. Caligari; silent)
2. Mother (1926, Russian)
3. Modern Times (1936, American)
4. The Lady Vanishes (1938, British)
5. Casablanca (1942, American)
6. Bicycle Thieves (1948, Italian)
7. Breathless (1960, French: À bout de souffle)
8. Fist of Fury (1972, Chinese)
9. The Godfather (1972, American)
10. Taxi Driver (1976, American)
11. The Celebration (1998, Danish: Festen)
12. Pulp Fiction (1994, American)

13. Charlie and the Chocolate Factory (2005, American)
14. Inception (2010, American)
15. The Social Network (2010, American)
16. Barbie (2023)

INDIAN CINEMA:

1. Harischandra (1913)
2. Pather Panchali (1955)
3. Mayabazaar (1957)
4. Sholay (1975)
5. Dilwale Dulhaniya Le Jayenge (1995)
6. Monsoon Wedding (2001)
7. Anniyan/ Aparichitudu (2005)
8. Tare Zameen Par (2007)
9. The Lunchbox (2013)
10. Bahubali – The Beginning (2015)
11. Awe(2018)
12. RRR (2022)
13. 12th Fail (2023)

REFERENCES:

1. It's Just a Movie: A Teaching Essay for Introductory Media Classes, Smith, Greg M. Cinema Journal, vol. 41 no. 1, 2001, p. 127-134. Project MUSE, https://doi.org/10.1353/cj.2001.0025
2. The Art of Watching Films, Boggs, J. M., & Petrie, D. W., 7th edition. New York: McGraw-Hill, 2008.
3. Piper, Jim. Get The Picture? US: Allworth Press, 2008

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EN401) CROSS-CULTURAL COMMUNICATION THROUGH WORLD LITERATURE

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Should have adequate LSRW skills

INTRODUCTION:

In this course, we will be critically exploring literature created by writers from all over the world. We will also use the work to understand different cultures around the world with the intention to grasp cross-cultural communication cues. With globalization marching fast, it is essential for the present students to comprehend the cultures of different nations. We will embark on our journey with a mind for understanding and exploring cultures and cross-influences that show up in the literature of that place. A part of this journey will, then, include comprehending and comparing the cultural communication across these nations, and exploring the evolution of societies and nation–states. This journey will allow engineering students to comprehend the cultures, societies, and human psychology of individuals across the globe. This understanding will help them become aware of the cultures, people, and societies of different nations of the world and can shape them as global citizens and competent communicators with a good understanding of cross-cultural communication.

We will make our journey through the medium of research groups, panel presentations, seminar discussions, critical writing, and exams.

COURSE OBJECTIVES:

- To develop open- and fair-minded thinking skills for the analysis of societies/cultures/nations
- To examine how cultures have shaped the literature of nations
- To understand different cultures through a study of literature and society there by analyzing cross cultural communication
- To equip students with cross cultural communication
- To train students to become global citizens

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Open and fair-minded thinking skills and will be able to analyse societies/cultures/nations

CO-2: Capacity to examine the cultures that have shaped the literature of different nations

CO-3: Ability to understand world cultures and societal issues with an intention to grasp cross-cultural communication

CO-4: Equipped to understand the nuances of cross-cultural communication

CO-5: Capable of applying the knowledge of cross-cultural communication strategies to real-life scenarios

UNIT-I:

Introduction to cross-cultural communication

American Literature

1. "America and I" a short story by Anzia Yezierska
2. "Notes of a Native Son" an essay by James Baldwin

UNIT-II:

Basic concepts and definition of culture and communication

African Literature

1. "A Private Experience" a short story by Chimamanda Ngozi Adichie
2. "Civilian and Soldier" a poem by Wole Soyinka

UNIT-III:

Examining variation of faiths and values in relation to cross-cultural communication

Russian Literature

1. "The Beggar Boy at Christ's Christmas Tree" a short story by Fyodor Dostoevsky
2. "The Dragonfly & the Ant" a poem by Ivan Krylov's.

UNIT-IV:

Barriers in cross communication contexts

British Literature

1. "On Education" an essay by Bertrand Russell
2. "An Irish Engagement" –a one act play by Walter Watts

UNIT-V:

Aspects of communication affected by culture

Asian Literature

1. A Matrimonial Fraud-A Chinese story.
2. The Idea of an Ever-ever Land, An Excerpt from Shashi Tharoor's Essay in 'Left, Right, and Centre

TEXT BOOKS:

1. The Handbook of Communication in Cross-cultural Perspective, Ed, Donal Carbaugh, Taylor & Francis, 2016
2. Cross cultural Communication Global Perspective, N.L. Gupta, Concept Publishing Company 1998
3. Communicating and Adapting Across Cultures: Living and Working in the Global Village, Riall Nolan · 1999, ABC-CLIO

REFERENCES:

1. How I Found America: Collected Stories, Yezierska, Anzia. Yezierska, Anzia, published by Persea, 2003
2. Notes of a Native Son, Baldwin, James. published by Beacon Press, 2012
3. The Thing around Your Neck, Chimamanda Ngozi Adichie published by The Guardian: The Observer, 2008
4. Civilian and Soldier, Wole Soyinka, Emory University, Atlanta 1996
5. The Heavenly Christmas Tree, Fyodor Dostoevsky, Creative Co. 1992

ONLINE RESOURCES:

1. https://ia601609.us.archive.org/10/items/cu31924010707440/cu31924010707440.pdf- Chinese short stories
2. https://ruverses.com/ivan-krylov/dragonfly-and-the-ant/3704/
3. https://dreamtopper.in/wp-content/uploads/2023/05/Broken-Images-12th-Kaleidoscope-Book.pdf

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EN402) BUSINESS COMMUNICATION

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic Proficiency in LSRW Skills

COURSE OBJECTIVES:

- To express oneself in English with greater fluency, accuracy, and confidence
- To exhibit good team-building skills
- To develop skills and techniques (speaking & writing) for effective communication
- To make effective presentations
- To conduct oneself professionally in a workplace environment

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Communicate effectively and confidently
CO-2: Participate in Team building, and work efficiently in teams
CO-3: Comprehend and practice suitable workplace etiquette
CO-4: Draft business letters, emails, and memos using appropriate language
CO-5: Participate in and contribute to meetings constructively

UNIT-I:
Effective Communication

a) Fundamentals of Effective Communication
b) How to sell your ideas
c) Types of communication networks
d) Barriers of Communication
e) Business vocabulary 1

UNIT-II:
Effective Communication for Team Building

a) Importance of Groups in an Organization; Interactions in a Group, Group Decision Taking
b) Stages of Team Building, Interaction with the Team
c) Group Dynamics, Managing Conflicts in the Team
d) Problem-solving, Decision Making and Interpersonal skills
e) Business Vocabulary 2

UNIT-III:
Office Etiquette

a) Personal Grooming
b) Presentation Etiquette
c) Spaces & Gender Differences, Inclusivity
d) Business Vocabulary 3

UNIT-IV:

Effective Writing Skills

a) 7 Cs of Communication
b) Writing Process: Pre-writing, writing & Post-writing
c) Neutral and Positive messages
d) Writing emails, Business Letters, Circulars, Notices & Memos
e) Communicating in the Digital world - netiquette

UNIT-V:

Business Meetings

a) Conducting and participating in meetings
b) Writing Agenda & Minutes of the meeting
c) Etiquette in meetings

TEXT BOOKS:

1. Effective Business Communication, Murphy, Herta A., Herbert Hildebrandt, Jane Thomas, 7th Edition, New Delhi: Tata McGraw Hill Education Private Ltd., 2008
2. Effective Emails: The Secret to Straightforward Communication at Work, Fenning, Chris, N.p., Alignment Group Limited, 2022

REFERENCES:

1. Talk Like TED: The 9 Public Speaking Secrets of the World's Top Minds, Gallo, Carmine, United Kingdom, Pan Macmillan, 2014
2. Made to Stick: Why Some Ideas Survive and Others Die, Heath, Chip, and Heath, Dan, United States, Random House Publishing Group, 2007
3. Team Building: Proven Strategies for Improving Team Performance, Dyer, W. Gibb, et al, United Kingdom, Wiley, 2013

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EN303) CREATIVE WRITING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

INTRODUCTION:

This Open Elective course on Creative Writing is designed to equip students of engineering and technology with effective written communication and the capacity to approach problem-solving and innovation with a creative mindset. The course enables students to refine their ability to convey complex ideas with clarity and creativity by delving into the intricacies of figurative language, narrative voice, and multiple perspectives. Beyond the craft of writing, the course addresses critical aspects of the writing process, from idea generation to self-evaluation, peer feedback, and ethical considerations. Students will also gain insights into current trends, emerging genres, and the impact of technology on the ever-evolving landscape of creative writing.

COURSE OBJECTIVES:

- To nurture creativity and develop a unique writing voice
- To equip students with the fundamental elements and techniques of effective creative writing across various genres
- To guide students through the writing process, fostering critical thinking, revision, and editing skills
- To prepare students for potential publication or sharing their work, exploring different avenues and ethical considerations
- To spark curiosity and engagement with contemporary trends and the future of creative writing

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Create original works of short fiction, non-fiction (memoir or travelogue), and/or poetry demonstrating mastery of genre conventions and narrative techniques

CO-2: Analyze and apply elements of creative writing, including plot, character development, setting, imagery, and voice, to enhance their writing

CO-3: Effectively engage in the writing process by brainstorming, outlining, drafting, revising, editing, and proofreading their work

CO-4: Demonstrate an understanding of different publication options and ethical considerations in creative writing

CO-5: Explore current trends and future potential of creative writing, experimenting with emerging genres and formats

UNIT-I:

Introduction to Creative Writing and Genres: What is Creative Writing? Different types such as fiction, non-fiction (memoir and travelogue), poetry, and drama; Role of imagination; Discovering your voice: identifying your unique writing style and

perspective; Popular genres, their key features, and conventions; Reading as a writer: analysing published works to learn from masters and discover writing techniques

UNIT-II:

Elements of Creative Writing: Building strong plots, developing compelling characters, crafting vivid settings, and mastering the art of dialogue; Figurative language and imagery: exploring metaphors, similes, personification, and other relevant literary devices; Point of view, narrative voice, and multiple perspectives

UNIT-III:

Writing Process 1 - Strategies and Techniques: Brainstorming and idea generation: techniques for overcoming writer's block and generating fresh ideas; Outlining and character development: planning the story structure and creating believable characters with depth and motivation; Scene building and description: learning to craft immersive scenes that engage the reader's senses; Genre-specific strategies; Ethical considerations in creative writing: exploring issues like plagiarism, cultural appropriation, and responsible representation

UNIT-IV:

Writing Process 2 - Review, Revise, Edit, and Proofread: Self-evaluation, peer feedback and incorporating constructive criticism; Revision and editing: strategies for tightening prose, fixing plot holes, and polishing writing for clarity and flow; Copyediting and proofreading: correcting typos, grammatical errors, and formatting inconsistencies; Preparing for publication: understanding different publishing methods, agent queries, and self-publishing options

UNIT-V:

Current Trends in Creative Writing: Emerging genres and popular trends such as flash fiction, graphic novels, and online storytelling platforms; Impact of technology on writing, readership, and publishing models; New forms of narrative and the evolving landscape of creative writing.

REFERENCES:

1. Abrams, M.H. Glossary of Literary Terms. Boston: Wadsworth Publishing Company, 2005
2. Bell, Julia and Magrs, Paul. The Creative Writing Course-Book. London: Macmillan, 2001
3. Earnshaw, Steven (Ed). The Handbook of Creative Writing. Edinburgh: EUP, 2007

SUGGESTED READINGS:

1. Atwood, Margaret. Negotiating with the Dead: A Writer on Writing. Cambridge: CUP, 2002
2. Bell, James Scott. How to Write Dazzling Dialogue.CA: Compendium Press, 2014
3. Egri, Lajos. The Art of Dramatic Writing. NY: Simon and Schuster, 1960
4. Gardner, John. The Art of Fiction. New York: Vintage, 1991
5. Johnson, Jeannie. Why Write Poetry? US:F. D. Univ. Press, 2007
6. Mezo, Richard E. Fire i' the Blood: A Handbook of Figurative Language. USA: Universal Publishers.1999

7. Strunk, William and White, E. B. The Elements of Style. London: Longman, 1999
8. Turabian, Kate L. A Manual for Writers. Chicago: Univ. of Chicago Press, 2007
9. Ueland, Brenda. If You Want to Write. India: General Press, 2019
10. Zinsser, William. On Writing Well. New York: Harper Collins, 2006

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1MG302) PERSONAL FINANCE AND TAX PLANNING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the basic concepts of personal finance and describe steps in personal management process
- To create awareness on investment, speculation & gambling and discuss about security trading and settlement
- To describe investment avenues like financial assets and money market instruments for making investment
- To explain investments alternatives like mutual funds and insurance options for making investment
- To acquaint with the basic concepts of income tax and describing various sources of income and e-filing

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Explore the various concepts of personal finance and effectively implement personal management process

CO-2: Differentiate between investment, speculation & gambling and able to demonstrate about security trading and settlement

CO-3: Assess various investment avenues and able to implement effective investment

CO-4: Analyze various types mutual fund schemes and insurance plans

CO-5: Assess various concepts of income tax and able to file income tax returns through e-filing

UNIT-I:

Introduction to Personal Finance: Definition, Importance & Need of Personal Finance, Key areas of Personal Financial Management, Personal Financial Management Processes.

UNIT-II:

Introduction to Investment Decisions: Investment, Speculation and Gambling, Features of Investment, Investment Process, the Investment Environment, Securities Market of India, Securities Trading and Settlement, Types of Orders, Margin Trading.

UNIT-III:

Investment Alternatives-I: Investment Avenues: Financial Assets, Capital market instruments- Stocks, Bonds, Commodities and Derivatives, Post office Deposits, Bank Deposits.

Money Market Instruments: Need and Importance, Types-Commercial Papers, Treasury bills, Certificate of Deposits, Bills of Exchange, Mortgage loans.

Other Investment Avenues: Gold, Real estate, PPF, NPS and SIP.

UNIT-IV:

Investment Alternatives-II: Introduction to Mutual funds: Definitions of Mutual funds, Structure of Mutual funds, advantages and disadvantages of Mutual funds, Types of Mutual funds. AMFI.

Insurance: IRDA; definition and characteristics of Insurance, Types of Insurance, Life Insurance, General Insurance and Health Insurance.

UNIT-V:

Introduction to Taxation: Introduction, types of taxes, direct and indirect taxes, Key terms of IT.

Sources of Income: Income from salaries, Income from House Property, Income and Profession and Business and Income from other sources.

Assessment of Individual Tax- Total Income – deductions – Process of E-filing.

TEXT BOOKS:

1. Personal Finance, Jeff Madura, 7th Edition, Pearson, 2020
2. Personal Financial Planning, Randall S. Billingsley, Lawrence J. Gitman, 15th Edition, Cengage, 2021
3. Direct Taxes Law & Practice, Vinod K. Singhania, Kapil Singhania, Taxmann, 2023

REFERENCES:

1. Handbook on Income Tax, CA. Raj K Agarwal, 9th edition, Bharat, 2024
2. Personal Finance, Arthur J. Keown, 8th Edition, Pearson, 2019
3. Personal Finance Planning, S. Murali, K.R. Subba Krishna, Himalaya Publishing House, 2019
4. Systematic Approach to Income Tax, Girish Ahuja, Ravi Gupta, 48th Edition, Commercial Publishers (India) Pvt. Ltd., 2023

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1MG303) CORPORATE FINANCE

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To provide basic functions of financial management and describing the concepts and techniques of time value of money and its impact on decisions of financial management
- To describe various aspects of Investment decision process and explain various techniques of capital budgeting Decisions.
- To discuss/learn long term and short-term sources of financing
- To explain capitalization and capital structures and different types of leverages and its impact on profitability or earnings of the organization
- To elucidate/ explain the basic concepts of working capital estimation & its importance and explain about various strategies of receivable and inventory management

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Analyze the various concepts of finance function and able to distinguish between present value and future value of cash flows and its impact on financial decision

CO-2: Examine various capital expenditure decisions and its impact on profitability of the organization.

CO-3: Explore various sources of finance and optimal capital mix

CO-4: Assess different types of leverages and the impact of leverage on earnings of the organization

CO-5: Analyze various concepts of working capital and able to estimate working capital required by the organization for smooth running of its operation

UNIT-I:

Introduction to Financial Management: Nature, scope, objectives, and goals of finance function, concept of time value of money- future value and present value, the basic valuation model.

UNIT-II:

Financial Planning and Strategy: Introduction, strategic decision making and planning, interface between financial planning and strategic management, financial forecasting, basics of capital budgeting: meaning, features and capital budgeting process, capital budgeting decisions techniques- traditional methods: payback period, accounting rate of return, modern methods: net present value, internal rate of return, and profitability index.

UNIT-III:

Sources of Financing: Introduction to financial market-role of financial markets, segments of financial market, product and services, long term sources of finance-equity, preference shares, debentures, internal finance, loan financing, short term sources of finances.

UNIT-IV:

Capitalization and Capital structures: Concept of capitalization, types of capitalization, capital structure, capital structure vs. financial structure, financial leverage, operating leverage and composite leverage.

UNIT-V:

Working Capital Management: Introduction to working capital, meaning and concept of working capital, gross working capital and net working capital, operating cycle nature and characteristics of working capital, factors affecting working capital management, estimating working capital.

Receivables management- meaning and importance, strategies of receivable management. Inventory management- definition of inventory, need and techniques of inventory management.

TEXT BOOKS:

1. Financial Management, Prasanna Chandra, 11th edition, Mc Graw hill, 2022
2. Financial Management: Text and Problems, M.Y.Khan, P.K.Jain, 8th edition, Mc Graw Hill, 2019
3. Financial Management, I.M. Pandey, 11th edition, Vikas Publications, 2015

REFERENCES:

1. Financial Management, Eugene F. Brigham Michael C.Ehrhardt, 14th edition, Cengage Learning, 2015
2. Management Accounting, R.K.Sharma and Shashi K.Gupta, Kalyani Publications, 2017
3. Financial Management, S.N.Maheshwari, Sultan Chand & Sons, 2019

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1MG304) COST AND MANAGEMENT ACCOUNTANCY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To describe basic concepts of cost and management accounting and key differences between financial accounting, cost accounting and management accounting
- To provide various techniques of cost accounting for various industries to ascertain price of a product or service
- To discuss about concept of process costing and treatment of losses and ascertaining cost of by products and joint products
- To create awareness on standard costing technique and concepts of analysis of variance and its role in cost controlling
- To explain steps in budgetary control and able to prepare various types of budgets

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Assess the importance of cost and management accounting and able to differentiate between various types of accounting

CO-2: Analyse various cost accounting techniques and identify cost of a product or service

CO-3: Asses the importance and applications of process costing and differentiate between normal and abnormal losses and treatment on products and services

CO-4: Apply concepts of standard costing and able to calculate various types of variances

CO-5: Demonstrate the steps in budgetary control and able to prepare various types of budgets

UNIT-I:

Introduction to Management and Cost Accounting: Introduction to management accounting-definition, objective, nature and scope of management accounting, cost accounting- cost, costing and cost accounting, objectives and importance of cost accounting, classification of costs; management accounting vs. cost accounting vs. financial accounting, role of accounting information in planning and control.

UNIT-II:

Costing for Specific Industries & Marginal Costing: Costing for specific Industries-Unit costing, job costing, cost sheet and tender, machine hour rate.

Marginal costing- Features, advantages and limitations of marginal costing, break-even analysis-assumptions, limitations, and applications of marginal costing: make or buy decisions, key or limiting factor, product mix decisions.

UNIT-III:

Process Costing: Process Costing-features, applications, advantages and limitations of process costing, cost of process – process losses and its treatment, accounting for joint product and by-product.

UNIT-IV:

Standard costing and Variance analysis

Standard Costing: Meaning, and importance, Variance Analysis-types-material variance, labour variance and sales variance.

UNIT-V:

Budgets and Budgetary Control: Budgetary Control- Budget, budgetary control, steps in budgetary control, different types of budgets- sales budget, Cash budget, Flexible budget, Production budget, Performance budget, Zero Based Budgeting.

TEXT BOOKS:

1. Cost Accounting, M.Y.Khan and P.K.Jain, 2th edition, Mc Graw Hill Education, 2017
2. Management Accounting, R.K.Sharma and Shashi K. Gupta, Kalyani Publications, 2017
3. A Text book of Cost and Management Accounting, M.N.Arora, Vikas Publishing, 2021

REFERENCES:

1. Cost and Management Accountancy, P.C.Tulsian, SChand, 2022
2. Cost Accounting: Theory and Practice, Bhabatosh Benerjee, 14th revised edition, PHI, 2022
3. Cost and Management Accounting, Ravi M Kishore, 6th e Reprint, Taxmann, 2021

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1MG301) FUNDAMENTALS OF MANAGEMENT

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the principles, functions, theories and practices of different management areas and to provide them with practical exposure to cases of success/failure in business
- To explain the importance of planning, decision making in an organization
- To discuss the various organizational structures, authority and responsibility, line& staff relationships in an organization
- To understand recruitment, selection process and discuss the need of directing in an organization
- To discuss the differences between coordination and cooperation and explain the controlling function

COURSE OUTCOMES: After completion of the course, the students will be able to

CO-1: Apply principles and theories to improve the practice of management

CO-2: Devise the plans and take the right decisions based on the environmental analysis

CO-3: Assess the types of organizational structures and evaluate the impact on employees for organizational effectiveness

CO-4: Undertake full and fair recruitment and selection systematically and compare and contrast leader vs manager

CO-5: Differentiate between coordination and cooperation and the different types of control in organization

UNIT-I:

Introduction to Management: Concept, nature and scope, importance of management, hierarchy/levels of management, management skills and managerial competencies, Evolution of management thought: Classical Theories- Scientific Management, Administrative Management, Neo-Classical Theories- Hierarchy of needs, Two Factor Theory, Hawthorne Experiments, Theory X & Theory Y, Modern Theories: Systems Theory and Contingency Theory, Introduction to Functions (POSDCORB) of Management.

UNIT-II:

Planning and Decision Making: Planning- Concept and importance, planning process, Essentials of a Good plan, Types of plans, planning tools and techniques, Management by Objectives, environmental analysis and diagnosis.

Decision Making-Concept and process, types of Decision-making, Decision-Making Model.

UNIT-III:

Organizing: Concept, nature, Principles, span of Management, organizational structure, types of organizational structures- mechanistic and organic and their merits and demerits, Authority and responsibility - delegation, centralization and decentralization of authority, line and staff relationship.

UNIT-IV:

Staffing and Directing: Staffing- Nature of staffing function, Human Resource Planning, Sources of Recruitment, recruitment process and types. Selection - process, types of selection, job offer, placement and induction

Directing-Need for directing, principles and characteristics of directing, Leader Vs Manager.

UNIT-V:

Coordination and Controlling: Coordination–Need, types and techniques of Coordination-Distinction between coordination and co-operation-Requisites for excellent co-ordination

Controlling- Importance of controlling, characteristics of control, steps, resistance to control, design of effective control system and types.

TEXT BOOKS:

1. Essentials of Management: An International, Innovation and Leadership Perspective, Harold Koontz & Heini Weihrich, 11th Edition, Tata Mc Graw-Hill Education, 2020
2. Fundamentals of Management, Stephen P.Robbins, Mary Coulter, David De Cenzo, 9th edition, Pearson Education, 2016
3. Introduction to Management, John R. Schermerhorn., Daniel G. Bachrach, 13th edition, Wiley, 2016

REFERENCES:

1. Principles of Management, Anil Bhat, Arya Kumar, Oxford University Press, 2018
2. Principles and Practices of Management and Organizational Behaviour, Chandrani Singh, Aditi Khatri, Sage Publications, 2016
3. Principles of Management, T. Ramasamy, Himalaya Publishing House, 2018

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1MG306) MARKETING MANAGEMENT

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the basic concepts of marketing and market research process
- To explain the aspects of analysing market opportunities, customer value and marketing mix
- To elucidate on designing a customer driven strategy through marketing segmentation, targeting and positioning
- To describe the significance of distribution decisions, pricing, promotion and communication strategies
- To discuss the trends in contemporary marketing

COURSE OUTCOMES: After completion of the course, students should be able to

CO-1: Impart knowledge on marketing process, mix and environment

CO-2: Analyse the market opportunities and customer value with the use of marketing mix elements

CO-3: Create the segmentation, targeting and positioning of the products and services

CO-4: Find the right mix of pricing, promotion and marketing channels and evaluate the communication strategies

CO-5: Assess the trends in contemporary marketing

UNIT-I:

Introduction to Marketing: Introduction to Marketing, Core Marketing Concepts, Marketing environment, Marketing Strategies and Plans, Market research, market research process, Marketing vs Selling.

UNIT-II:

Analyzing Marketing Opportunities, Customer Value and Marketing Mix: Consumer Decision-making, Building Customer Value, Analyzing Consumer Markets, Consumer Behaviour, Cultural, Social & Personal Factors, Developing Products & Brands, Product Levels; Classifying Products, Product Range, Product Line & Product Mix, Product Life Cycle, New Product Development, New Service Development, Stages of Product/ Service innovation development, The Process of Adoption, Branding.

UNIT-III:

Designing a Customer Driven Strategy: Market Segmentation, Targeting, Positioning Process, Segmentation of Consumer Market, Business Market, Requirement for Effective Segmentation, Market Targeting, Evaluating Market Segmentation,

Selecting Target Market Segmentation, Positioning and Repositioning, Positioning Maps, Product Positioning Strategies.

UNIT-IV:

Distribution Decisions, Promotion, Pricing & Communication Strategies Marketing Channels, Channel Intermediates and Functions, Channel Structure, Channel for Consumer Products, Business and Industrial Products, Alternative Channel, Channel Strategy Decisions.

The Promotional Mix, Advertising, Public Relations, Sales Promotion, Personal Selling, Direct and Online Marketing.

Pricing- Factors affecting pricing, pricing methods and strategies

Marketing Communication: Communication Process, Communication Promotion Mix, Factors affecting the Promotion Mix.

UNIT-V:

Contemporary Marketing: Current trends in Marketing, Customer Relationship Management, Trend Markets: Digital Marketing and platforms, Rural Marketing and its trends, International Marketing and its importance, Green Marketing-Principles &Practices, concept of Trail Marketing and services, Search Engine Optimisation.

TEXT BOOKS:

1. Principles of Marketing, Philip Kotler, Gray Armstrong, Prafulla Agnihotri, 18th edition, Pearson Education, 2020
2. Marketing: An Introduction, Rosalind Masterson, Nichola Phillips, David Pickton, 5th edition, Sage Publications, 2021
3. Principles of Marketing: A South Asian Perspective, Lamb, Hair, Sharma, Mc Daniel, Cengage Learning, 2016

REFERENCES:

1. Marketing 4.0: Moving from Traditional to Digital, Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Wiley, 2016
2. Marketing Management, Arun Kumar & N. Meenakshi, 3rd edition, Vikas Publications, 2016
3. Marketing Management, Ramaswamy, Nama Kumari, 6th edition, Sage Publications, 2018

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1MG305) HUMAN RESOURCE MANAGEMENT

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To explain the concepts, significance and role of human resource management in an organization
- To describe the aspects of job analysis, job evaluation and manpower planning
- To understand the techniques of recruitment and process of selection
- To analyze the significance of training & development and succession planning
- To learn the concepts of performance management, appraisals and compensation management

COURSE OUTCOMES: After completion of the course, the student should be able to:

CO-1: Appreciate the concepts, role and functions of HRM and the need of HR to act as a strategic business partner of the organization

CO-2: Relate the need for job analysis and job evaluation and, their significance in human resources planning

CO-3: Apply the practices of recruitment and the process of selection in relevance with needs of the organization

CO-4: Design the suitable methods of employee training & development in accordance with the emerging trends and necessities

CO-5: Analyze the system of performance management and job evaluation in an organisation and suggest applicable changes where necessary, for the improvement of the organisation and employee efficiency

UNIT– I:

Introduction to HRM: Definition, Nature & scope of Human Resource Management - Evolution of Human Resource Management, Objectives, Functions, Importance of Human Resource Management, Challenges of Human Resource Management, Contemporary role of Human Resource Manager, Concept of e-HRM.

UNIT-II:

Job Analysis, & Human Resource Planning: Concept of Job Analysis - Job Description and Specifications, Introduction to Human Resource Planning, Importance, Objectives of HR Planning, Human Resource Planning Process.

UNIT-III:

Recruitment & Selection: Introduction to Recruitment and Selection, Concepts of Recruitment – Recruitment Techniques, Sources of Recruitment. Selection - Types of Selection Methods, Selection Process, on-boarding and Induction, Exit Process.

UNIT-IV:

Training and Development: Nature and Scope of Training and Development - Objectives, Methods, Process, Analysis of Training Needs & Designing the Training Program, Implementation, Feedback.

Development- Training Vs Development, Management Development, Process, Evaluation of Development Programs, Succession Planning.

UNIT-V:

Performance and Compensation Management: Concept and process of Performance Management, Performance Appraisal-Definition, Objectives, Process and Methods, Mentoring and Coaching.

Compensation Management: factors influencing and challenges, Job Evaluation - Definition, Objectives, Process and Methods, Components of CTC.

TEXT BOOKS:

1. Human Resource Management: Text and Cases, K. Aswathappa, TMH, 8th Edition, 2017
2. Essentials of Human Resource Management, P. Subba Rao, Himalaya Publishing, 6th Edition, 2021
3. Human Resource Management, Gary Dessler, Biju Varkkey, Pearson, 4th Edition, 2017

REFERENCES:

1. Human Resource Management, Biswajeet Pattanayak, 5th Edition, 2018
2. Human Resource Management, Robert L. Mathis, John H. Jackson, Manas Ranjan Tripathy, Cengage Learning 2016
3. Human Resource Management, Text and Cases, Sharon Pande and Swapnalekha Basak, Vikas Publishing, 2nd Edition, 2016