Pimpri Chinchwad Education Trust's

PIMPRI CHINCHWAD COLLEGE OF ENGINEERING

SECTOR NO. 26, PRADHIKARAN, NIGDI, PUNE 411044

An Autonomous Institute Approved by AICTE and Affiliated to SPPU, Pune

Curriculum Structure and Syllabus

of

B. Voc. Internet of Things

(Regulations 2023)

Effective from Academic Year 2024-25

Chairman
BoS B.Voc. Program
PCET's, Pimpri Chinchwad College of Engineering
Sector No. 26, Pradhikaran, Nigdi, Pune-44

Chairman
Academic Council
PCET's, Pimpri Chinchwad College of Engineering
Sector No. 26, Pradhikaran, Nigdi, Pune-44

Institute Vision

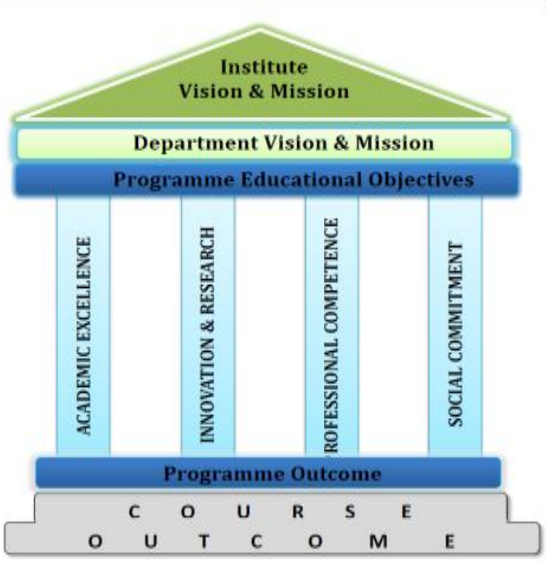
To be one of the top 100 Engineering Institutes of India in coming five years by offering exemplarily Ethical, Sustainable and Value Added Quality Education through a matching ecosystem for building successful careers.

Institute Mission

1. Serving the needs of the society at large through establishment of a state-of-art Engineering Institute.
2. Imparting right Attitude, Skills, Knowledge for self-sustenance through Quality Education.
3. Creating globally competent and Sensible engineers, researchers and entrepreneurs with an ability to think and act independently in demanding situations.

Quality Policy

We at PCCOE are committed to impart Value Added Quality Education to satisfy the applicable requirements, needs and expectations of the Students and Stakeholders. We shall strive for academic excellence, professional competence and social commitment in fine blend with innovation and research. We shall achieve this by establishing and strengthening state-of- the-art Engineering and Management Institute through continual improvement in effective implementation of Quality Management System.



.

INDEX

ABBREVIATIONS

Abbreviations	Course Full Name
MJ	Major Course
MI	Minor Course
MD	Multidisciplinary Course
AEC	Ability Enhancement Course
VAC	Value added Course
SEC	Skill Enhancement Course
FA	Formative Assessment
SA	Summative Assessment

CURRICULUM STRUCTURE

STRCTURE FOR IST YEAR B. Voc. (INTERNET OF THINGS)

SEMESTER I

B. Voc. Structure		Sem-I	Teaching Scheme				Examination Scheme						
Course Code	**Course Type**	**Course Name**	**L**	**P**	**H**	**CR**	**FA1**	**FA 2**	**SA**	**TW**	**OR**	**PR**	**Total**
VIT21101	MJ	Major Course I:: Sensor and Signal Conditioning	3	-	3	3	25	25	50	-	-	-	100
VIT21201	MI	Minor Course I: Engineering Drawing	3	-	3	3	25	25	50	-	-	-	100
VIT21301	MD	Multidisciplinary Course I: Applied Science	2	-	2	2	20	20	40	-	-	-	80
VIT21401	AEC	Ability Enhancement Course I: Writing skills		2	2	1	-	-	-	50	-	-	50
VIT21501	VAC	Value added Course I: Health & wellness		2	2	1	-	-	-	50	-	-	50
VIT21601	SEC	Internship I: On Job Training	-	20	20	10	-	-	-	-	-	200	200
		Total	**8**	**24**	**32**	**20**	70	70	**140**	**100**	**-**	**200**	**580**

SEMESTER II

B. Voc. Structure		Sem-II	Teaching Scheme				Examination Scheme						
Course Code	**Course Type**	**Course Name**	**L**	**P**	**H**	**CR**	**FA1**	**FA 2**	**SA**	**TW**	**OR**	**PR**	**Total**
VIT22102	MJ	Major Course II: Introduction to Controllers and Operations	3	-	3	3	25	25	50	-	-	-	100
VIT22202	MI	Minor Course II: Basics of Electrical & Electronics	3	-	3	3	25	25	50	-	-	-	100
VIT22302	MD	Multidisciplinary Course II: Applied Mathematics	2	-	2	2	20	20	40	-	-	-	80
VIT22402	AEC	Ability Enhancement Course II: Soft Skills		2	2	1	-	-	-	50	-	-	50
VIT22502	VAC	Value added Course II: IT Tools I		2	2	1	-	-	-	50	-	-	50
VIT22602	SEC	Internship I: On Job Training: ELE/Q1405	-	20	20	10	-	-	-	-	-	200	200
		Total	**8**	**24**	**32**	**20**	70	70	**140**	**100**	**-**	**200**	**580**

Abbreviation: L- Lecture; **P**- Practical; **H**- Hours; **CR**- Credits; **FA–**Formative Assessment**, SA-**Summative Assessment; **TW** – Term Work; **OR** – Oral Exam, **PR** – Practical Exam.

STRUCTURE FOR IIND YEAR B. Voc. (INTERNET OF THINGS)
SEMESTER III

B. Voc. Structure Sem-III			Teaching Scheme				Examination Scheme						
Course Code	**Course Type**	**Course Name**	**L**	**P**	**H**	**CR**	**FA1**	**FA2**	**SA**	**TW**	**OR**	**PR**	**Total**
VIT23103	MJ	Major Course III: Fundamentals of C & C++ Programming	2	-	2	2	20	20	40	-	-	-	80
VIT23104	MJ	Major Course IV: Fundamentals of C & C++ Programming Lab	-	2	2	1	-	-	-	-	-	50	50
VIT23203	MI	Minor Course III: Basics of Computer Networking	2	-	2	2	20	20	40	-	-	-	80
VIT23204	MI	Minor Course IV: Basics of Computer Networking Lab	-	2	2	1	-	-	-	-	-	50	50
VIT23303	MD	Multidisciplinary Course III: IT Tools II	2	-	2	2	20	20	40	-	-	-	80
VIT23403	AEC	Ability Enhancement Course III: Business Communication I		2	2	1	-	-	-	50	-	-	50
VIT23503	VAC	Value added Course III: Health & Wellness II		2	2	1	-	-	-	50	-	-	50
VIT23603	SEC	Internship III: On Job Training	-	20	20	10	-	-	-	-	-	200	200
		Total	**6**	**28**	**34**	**20**	60	60	**120**	**100**	**-**	**300**	**640**

SEMESTER-IV

B. Voc. Structure Sem-IV			Teaching Scheme				Examination Scheme						
Course Code	**Course Type**	**Course Name**	**L**	**P**	**H**	**CR**	**FA1**	**FA2**	**SA**	**TW**	**OR**	**PR**	**Total**
VIT24104	MJ	Major Course IV: Advanced Microcontroller	3	-	3	3	25	25	50	-	-	-	100
VIT24105	MJ	Major Course IV: Python Programming Lab	-	2	2	1	-	-	-	-	-	50	50
VIT24205	MI	Minor Course V: Introduction to DBMS	2	-	2	2	20	20	40	-	-	-	80
VIT24404	AEC	Ability Enhancement		2	2	1	-	-	-	50	-	-	50

		Course IV: Business Communication II											
VIT24504	VAC	Value added Course IV: Environmental Science		2	2	1	-	-	-	50	-	-	50
VIT24604	SEC	Project I: Mini Project	-	4	4	2	-	-	-	-	-	50	50
VIT24605	SEC	Internship III: On Job Training	-	20	20	10	-	-	-	-	-	200	200
		Total	**5**	**30**	**35**	**20**	45	45	**90**	**100**	**-**	**300**	**580**

Abbreviation: L- Lecture; **P**- Practical; **H**- Hours; **CR**- Credits; **FA–**Formative Assessment**, SA-**Summative Assessment; **TW** – Term Work; **OR** – Oral Exam, **PR** – Practical Exam.

STRUCTURE FOR IIIRD YEAR B. Voc. (INTERNET OF THINGS)

SEMESTER V

B. Voc. Structure		Sem-V	Teaching Scheme				Examination Scheme						
Course Code	**Course Type**	**Course Name**	**L**	**P**	**H**	**CR**	**FA1**	**FA2**	**SA**	**TW**	**OR**	**PR**	**Total**
VIT25106	MJ	Major Course VI: Principles of IOT	3	-	3	3	25	25	50	-	-	-	100
VIT25107	MJ	Major Course VII: Principles of IOT Lab	-	2	2	1	-	-	-	-	-	50	50
VIT25108	MJ	Major Course VIII: Data Analytics for IOT	3	-	3	3	25	25	50	-	-	-	100
VIT25109	MJ	Major Course IX: Data Analytics for IOT	-	2	2	1	-	-	-	-	-	50	50
VIT25206	MI	Minor Course VI: IOT Enabling Technologies	2	-	2	2	20	20	40	-	-	-	80
VIT25606	SEC	Internship V: On Job Training	-	20	20	10	-	-	-	-	-	200	200
		Total	**8**	**24**	**32**	**20**	**70**	**70**	**140**	**-**	**-**	**300**	**580**

SEMESTER-VI

B. Voc. Structure		Sem-VI	Teaching Scheme				Examination Scheme						
Course Code	**Course Type**	**Course Name**	**L**	**P**	**H**	**CR**	**FA1**	**FA2**	**SA**	**TW**	**OR**	**PR**	**Total**
VIT26110	MJ	Major Course X: Languages for IOT	3	-	3	3	25	25	50	-	-	-	100
VIT26111	MJ	Major Course XI: Languages for IOT Lab	-	2	2	1	-	-	-	-	-	50	50
VIT26207	MI	Minor Course VII: IOT System Architecture & Communication Protocol	2	-	2	2	20	20	40	-	-	-	80
VIT26607	SEC	Project II: Project	-	8	8	4	-	-	-	50	150	-	200
VIT26608	SEC	Internship VI: On Job Training	-	20	20	10	-	-	-	-	-	200	200
Total			**5**	**30**	**35**	**20**	**45**	**45**	**90**	**50**	**150**	**250**	**630**

Abbreviation: L- Lecture; **P**- Practical; **H**- Hours; **CR**- Credits; **FA–**Formative Assessment**, SA**-Summative Assessment; **TW** – Term Work; **OR** – Oral Exam, **PR** – Practical Exam.

Course Syllabus
Semester-I

Program:	**B. Voc. (Internet of Things)**				**Semester: I**	
Course:	**Sensor and Signal Conditioning**				**Code: VIT21101**	
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**FA 1**	**FA 2**	**SA**	**Total**
3	**3**	**3**	**25**	**25**	**50**	**100**

Course Objectives:

1. To provide the fundamentals of sensors and signal conditioning.
1. 2. To elaborate principles of various types of sensors.

Course Outcomes:

After learning the course students will be able to;

1. Understand the basic principles of sensors and transducers and recognize their importance in various applications.
2. Explain working principles and applications of resistive, capacitive, inductive etc. sensors.
3. Compare various types of sensors.
4. Apply the concept of signal conditioning to enhance the performance of sensors.
1. Explain the role and functioning of operational amplifiers in instrumentation.

Detailed Syllabus:

Unit	**Description**	**Duration (45 Hrs)**
1	**Introduction** Introduction to sensors and transducers, need of sensors, sensor performance characteristics- static characteristics: Accuracy, Precision, sensitivity, resolution, Hysteresis, drift, repeatability, reproducibility, dynamic characteristics, Dynamic errors, fidelity.	**8**
2	**Sensor – I** Types of sensors. Basic principle of resistive, capacitive and inductive sensors, displacement measurement using resistive, inductive transducers, LVDT	**8**
3	**Sensor – II** Introduction to the principle of photo-emissive sensors: photodiode/phototransistor, photovoltaic, hall effect - flow measurement and optical based sensors.	**8**
4	**Sensor – III** Self-generating sensors-Thermoelectric, Thermocouple temperature sensor, piezoelectric, strain gauge load cell , photovoltaic, electrochemical sensors	**7**
5	**Signal Conditioning -I** Concept of signal conditioning, introduction to AC bridge inductance/capacitance bridge, DC bridge: Wheatstone bridge, Operational amplifier used in instrumentation	**7**
6	**Signal Conditioning – II** Instrumentation amplifier, Introduction to Analog to Digital (ADC): successive approximation and Digital to Analog conversion (DAC): R2R Ladder.	**7**

Text Books:

1. Ramon PallasAreny, John G.Webster, "*Sensors and Signal Conditioning*", 2nd edition, John Wiley and Sons, 2000
2. Doebelin, E.O. and Manic, D.N., "*Measurement Systems: Applications and Design*", McGraw−Hill (2004).
3. Sawhney, A.K. and Sawhney, P., "*A Course in Electrical and Electronic Measurements and Instrumentation*", Dhanpat Rai (2008).

4. Sawhney A K, "*Electrical and Electronics Measurements and Instrumentation*", Dhanpat Rai and Sons,New Delhi (2000).
5. Kalsi H S, "*Electronic Instrumentation*" Tata McGraw Hill, New Delhi, 4th Ed. (2001).
6. Patranabis D, "*Sensors and Transducers*", PHI, New Delhi (2003).
7. Doebelin Ernest O., "*Measurement Systems: Application and Design*", Tata McGraw Hill Ltd., New Delhi (2004).

Reference Books:

1. Murty D V S, "*Transducers & Instrumentation*", PHI, New Delhi (2000)
1. Nakra, B.C. and Chaudhry, K.K., "*Instrumentation, Measurement and Analysis*", Tata McGraw Hill (2003)

Program: B. Voc. (Internet of Things)					**Semester: I**	
Course: Engineering Drawing					**Code: Code: VIT21201**	
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**FA 1**	**FA 2**	**SA**	**Total**
3	**3**	**3**	**25**	**25**	**50**	**100**

Course Objectives:

1. To develop imagination of physical objects to be represented on paper for engineering communication.
2. To develop the interpretation and manual drawing skills.
3. To develop the physical realization and manual drawing skill

Course Outcomes:

After learning the course, students will be able to

1. Understand the drawing sheets, dimensioning and tolerances
2. Understand and draw the projections of point and line on reference planes, inclined planes.
3. Understand the orthographic projections, first and third angle projections methods, draw orthographic views
4. Understand and draw the Isometric scale, construction of Isometric view of simple objects
5. Understand and draw the development of lateral surfaces of simple solids.
6. Understand and draw the free hand sketches of standard components of machine.

Detailed Syllabus:

Unit	**Description**	**Duration (45 Hrs)**
1	**Introduction** Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. Tolerances – methods of representing tolerances, unilateral and bilateral tolerances, tolerance on linear and angular dimensions, geometrical tolerances.	7
2	**Projection of Line and Planes** Introduction, Projection of points – points on the different quadrants and on the reference planes. Projection of straight lines (only first angle projection method) – Line on the reference planes - perpendicular to one plane and parallel to other plane – inclined to one plane and parallel to the other plane – parallel to both the planes –inclined to both the planes. Projection of planes (only first angle projection method) - Types of planes, Projection of planes perpendicular to both the reference planes, Perpendicular to one plane and parallel to other plane, Perpendicular to one plane and inclined to the other plane, Inclined to both planes.	8
3	**Orthographic Projections**	6

	Reference planes, types of orthographic projections – First angle projections, Third angle projections, methods of obtaining orthographic views by First angle method.	
4	**Isometric View** Introduction, Isometric scale, construction of Isometric view of simple objects from given orthographic.	8
5	**Development of Lateral Surfaces of Solids** Introduction, Development of lateral surfaces of Cone, Cylinder, Pyramid and Prism.	8
6	**Freehand Sketching and introduction of AutoCAD software** Free hand sketching -- FV and TV of standard machine parts – Hexagonal headed nut and bolt, foundation bolts, shafts, keys, couplings, springs, human heights, doors, windows	8

Text Books:

1. Bhatt N.D., and Panchal V.M., *Engineering Drawing, Charotar Publishing House*, 2010.
2. Agrawal B., and Agrawal C M "*Engineering drawing*", Tata McGraw Hill Education Private Limited., 2014.

Reference books:

1. Gill P.S., *Engineering drawing*, S.K. Kataria & Sons., 2016.
2. Gopalakrishnan.K.R., *Engineering Drawing*, (Vol.I and Vol.II), Dhanalakshmi publishers, 1970.
3. Venugopal. K, and Sreekanjana G., *Engineering Graphics*, New Age International Publishers. 2019.
4. Natarajan K. V., *A text book of Engineering Drawing Graphics*. Dhanalakshmi Publishers, 2008.

Program:	B. Voc. (Internet of Things)			Semester: I		
Course:	Applied Science			Code: VIT21301		
Teaching Scheme			Evaluation Scheme			
Lecture	Hours	Credit	FA 1	FA 2	SA	Total
2	2	2	20	20	40	80

Course Objectives:

To develop an ability of understanding the phenomena with the help of science concepts and relate them to applications.

Course Outcomes:

After learning the course, students will be able to

1. Understand the quality of water, its softening techniques and quality of fuel and its different types.
2. Interpret the optical phenomena - reflection, refraction, polarization with wave nature of light.
3. Understand what is corrosion, its types and its consequences in environment.
4. Summarize production of ultrasonic waves and their applications.

Detailed Syllabus:

Unit	Description	Duration (30Hrs)
1	**Water** Impurities in water, methods of their removal, hardness of water, its types and units. Chemical analysis of water by determination of hardness by EDTA method and its numericals. Disadvantages of hard water in boilers, Water softening techniques: Permutit Water purification by reverse osmosis **Fuel and their Classification** Definition, characteristics, classification into solid, liquid and gaseous fuel. Calorific value offuels – GCV, NCV and their relation. Coal, its types and their properties, proximate analysis and ultimate analysis. Gaseous fuels- Gaseous fuels: Hydrogen gas as a future fuel, production by steam reforming of methane and coke, storage and transportation. .	8
2	**Optics:** Electromagnetic wave nature of light, electromagnetic spectrum, reflection and refraction of a wave from a plane surface, laws of reflection and refraction, total internal reflection, plane polarized light, Law of Malus.	8
3	**Corrosion** Theory of corrosion. Different types of corrosion: Pitting corrosion, concentration cell corrosion, stress corrosion and soil corrosion. Factors affecting corrosion: nature of metal and nature of environment. Prevention of corrosion by various methods using metallic and non- metallic coatings like – hot dipping, cladding, electroplating and cementation and powder coating.	7
4	**Vibrations &Ultrasonic waves:**	7

	Vibration as simple spring mass system, elementary and qualitative concept of free and forced vibrations, resonance Ultrasonic waves, properties of ultrasonic waves, Productions of ultrasonic waves by magnetostriction and piezo-electric effect,application of ultrasonic in industry	

Text Books:

1. Jain and Jain, Engineering Chemistry, Dhanpat Rai Publishing Co., sixteenth edition ,2016.
2. M. N. Avadhanulu ,P.G. Kshirsagar , A text book of Engineering Physics, S. Chand publication ,revised edition, 2015

Reference books:

1. Wiley Editorial, Engineering Chemistry, Wiley India, 2nd edition, 2012.
2. O.G. Palanna, Engineering Chemistry, Tata McGraw-Hill Education, 2009.
3. R. K. *Gaur*, S. L. *Gupta* , Engineering Physics, Dhanpat Rai Publications, 8th edition ,2001.

Program: B. Voc. (Construction & Project Management)					**Semester: I**	
Course: Writing Skills					**Code: Code: VC1T4**	
Teaching Scheme			**Evaluation Scheme**			
Practical	**Hours**	**Credit**	**FA 1**	**FA 2**	**TW**	**Total**
2	**2**	**1**	**-**	**-**	**50**	**50**

Course Objectives:

1) Understand the aspects and characteristics of effective writing skills.
2) Recognize the importance of effective writing skills in various contexts.
3) Demonstrate proficiency in different types of writing, including descriptive, narrative, persuasive, instructional, and formal business writing.
4) Develop the ability to critically evaluate and revise written work for structure, cohesion, coherence, grammar, correctness, completeness, logic, and other aspects of effective writing.
5) Apply effective writing techniques to communicate ideas clearly, persuasively, and professionally in diverse writing tasks.

Course Outcomes:

After learning the course students will;

1) Understand the essential aspects and significance of effective writing skills across personal, academic, and professional contexts.
2) Demonstrate proficiency in descriptive and narrative writing techniques, employing vivid language and sensory details to engage readers.
3) Develop critical thinking skills by summarizing complex material and providing insightful personal responses.
4) Apply persuasive writing strategies effectively and Produce professional written documents in various communication contexts, including letters and emails.

Detailed Syllabus:

SrNo	Description
1	**Introduction to Effective Writing Skills** Aspects and characteristics of writing skills. Importance of effective writing Skills.
2	**Effective Writing** Structure, Cohesion and Coherence, Grammar, Correctness, Completeness, Logic and other aspects of effective writing skills
3	**Write a descriptive paragraph:** Write a descriptive paragraph about a person, place, or object. Encourage them to use sensory details and vivid language to create a picture in the reader's mind.
4	**Write a personal narrative:** Write a personal narrative about a memorable event. Use descriptive language, dialogue, and reflection to make the story come alive.
5	**Write a summary and response:** Read an article or essay and write a summary of the main points, followed by a personal response that explains your thoughts and reactions to the piece.
6	**Writing instructions** Writing clear, concise and compete instructions
7	**Write a persuasive letter**

	Write a persuasive letter to a local or national government representative, expressing your opinions on a current issue or proposing a solution to a problem.
8	**Business email writing:** Write a business email on a given scenario. Write a formal email, using appropriate tone, format, and language.
9	**Report writing assignment:** Write a report on a given topic. Use a clear prompt, a report outline, in a structured and professional format, using appropriate language and terminology.
10	**Job Application/ Cover Letter:** Write a job application in a professional format with all the necessary details.

Instructions:

- The first lab activity is mandatory
- Any six assignments other than the first lab activity to be conducted

References:

1. Seely, John. Oxford Guide to *Effective Writing and Speaking*. OUP 2nd edition, 2005
2. Goins, Jeff. *You Are a Writer* (So Start Acting Like One). Tribe Press
3. Brohaugh, William. *Write Tight: Say Exactly What You Mean with Precision and Power*.
4. Janzer. Anne. *The Writer's Process: Getting Your Brain in Gear*. Cuesta Park Consulting, 2016
5. King, Stephen. *On Writing: A Memoir of the Craft*. Scribner, 2010

Program: B. Voc. (Internet of Things)					**Semester: I**	
Course: Health and wellness I					**Code: Code: VIT21501**	
Teaching Scheme			**Evaluation Scheme**			
Practical	**Hours**	**Credit**	**FA 1**	**FA 2**	**TW**	**Total**
2	**2**	**1**	**-**	**-**	**50**	**50**

Objectives:

1. Prepare graduates to become wellness, health, fitness, nutrition education or foodservice professionals.
2. Prepare students for a variety of careers in wellness, fitness, food and nutrition education and foodservice.

Course Outcomes: After learning the course students will be able to;

1. Students will be able to describe the principles of health and wellness from a multidimensional and interdisciplinary perspective.
2. Students will be able to think and act ethically in the context of health, nutrition and wellness.

Guideline:

Total: Any 5 experiments/assignments to be conducted

Detailed Syllabus:

Sr.No	**Description**
1	**Psychology of happiness:** What is happiness? What makes us happy? Socio-economic factors and happiness; Positive emotions.
2	**Can we become happier?** Genetic set-point and hedonic adaptation; Sustainable happiness model and intentional activities.
3	**Happiness Activities 1:** Expressing gratitude and positive thinking; Love and kindness; Avoiding overthinking and social comparison.
4	**Happiness Activities 2:** Identifying signature strengths; achieving happiness with "Flow".
5	**Is happiness sufficient?** The concept of eudaimonic well-being; Self-determination and motivation.
6	**Meaning and purpose in life:** The concept of meaning in life and logo-therapy; Life goals., correlation with program specific case studies.

Reference Books:

1. W. Weiten, and M. A. Lloyd, *Psychology Applied to Modern Life*: Adjustment in the 21st Century, Wadsworth Publishing, 2007
2. R. Harington, *Stress, Health and well-being:* Thriving in the 21st century, Wadsworth Publishing, 2013.
3. I. Boniwell, *Positive psychology in a nutshell*, McGraw-Hill Education, 2012.
4. S. Lyubomirsky, *The how of happiness*, Penguine Press, 2008.

Program: B. Voc. (Internet of Things)					**Semester: I**	
Course: On Job Training				**Code: VIT21601**		
Teaching Scheme			**Evaluation Scheme**			
Practical	**Hours**	**Credit**	**TW**	**PR**	**OR**	**Total**
20	**20**	**10**	**-**	**200**	**-**	**200**

Objectives:

1. To expose students to the industry environment and enhance their technical skills while working in private/public enterprises, government agencies, research labs, or any other organized technical club.
2. To apply knowledge and abilities relevant to engineering technology concepts, principles, and techniques to real-life industrial work/projects.
3. To develop higher-order thinking skills to work with people of diverse backgrounds and cultures and work effectively within cross-disciplined environments.

Outcomes:

On the completion of the OJT, students will be able to –

1. To apply the theoretical knowledge in real-life applications with new perspectives to problem-solving.
2. To practice communication and teamwork skills while building a professional network of prospective employment.
3. To write technical reports and document the project outcomes along with enhancing the technical presentations skills

Guidelines:

Students will take on job training in the industry in the domain of Internet of Things as per the following job description and personal attributes.

Job Role: IoT Hardware Analyst

	Job Description
	IoT Hardware Analyst prepares complete blueprint of the hardware including schematics and layout. The individual also prepares quality and verification requirements and perform PCB testing in compliance with regulatory standards and records them in a design document. The individual will also be responsible for working and efficient functioning of the system.
	Personal Attributes
	The individual must have attention to details, logical thinking, and ability to execute the project as per client's requirement. This job requires the individual to work collaboratively with diverse teams. The individual should be able to hold interest in technology changes; demonstrate strong technical expertise and possess good oral and written communications skills. The individual should also be comfortable working with deadlines and budgets.

Course Syllabus
Semester II

Program: B. Voc. (Internet of Things)				**Semester: II**		
Course: Introduction to Controllers and Operations				**Code: VIT22102**		
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**FA 1**	**FA 2**	**SA**	**Total**
3	**3**	**3**	**25**	**25**	**50**	**100**

Course Objectives:

1. To introduce the knowledge of microcontrollers and their interfacing
2. To explore the details of C programming
3. To introduce the various microcontroller boards for real time applications.

Course Outcomes:

After learning the course students will be able to;

1. Compare the microcontrollers with microprocessors.
2. Understand how to use development tools for 8051 interfacing.
3. Learn the basic Embedded C programming.
4. Demonstrate the interfacing of peripherals with 8051.
5. Analyze the real-time microcontroller-based applications.
6. To compare the various microcontroller-based development boards.

Detailed Syllabus:

Unit	Description	Duration (45 Hrs)
1	**Introduction to Microprocessors and Microcontrollers** Microprocessor Vs Microcontroller, Applications of Microcontrollers, Features of 8051, Architecture of 8051, Pin diagram of 8051, Memory organization.	8
2	**8051 Peripherals and Development tools** Port structure, Interrupt structure, timers and its modes, serial communication and its modes, Programming environment for microcontrollers, Study of software and hardware development tools.	8
3	**Embedded C Programming** Introduction to Embedded C, Difference between C & Embedded C, Programming style Basic structure of C program, Constants, Variables & Data Types, Arrays and strings, Types of Operators, Bitwise Operators explained, Control structures and loops, functions, Embedded programming issues.	8
4	**Interfacing with 8051 - Part 1** GPIO programming of 8051, Interfacing of: LEDs, Keypad, 16x2 LCD, Interfacing of: Stepper motor (All programs in embedded C)	7
5	**Case study of:** i. Data Acquisition system ii. Robot Control system Both side serial communication between 8051 and PC	7
6	**Advanced Microcontroller Development Boards**	7

	Introduction to SBCs, Arduino open platform, Structure of Arduino programs, introduction to Arduino library, Study of development boards like NodeMCU, Raspberry Pi.	

Text Books:

1. Intel Hand Book on "*Embedded Microcontrollers*", 1st Edition, 1988
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, "*The 8051 Microcontroller and Embedded Systems using Assembly and C*", 2e, Pearson, 2007
3. P.S Manoharan, P.S. Kannan, "*Microcontroller based System Design*", 1st Edition, Scitech Publications 2015
4. Ajay Deshmukh, "*Microcontroller - Theory & Applications*", Tata McGraw Hill, 2017

Reference Books:

1. David Calcutt, Fred Cowan, Hassan Parchizadeh, "*8051 Microcontrollers – An Application based Introduction*", Elsevier 2003
2. Pal Ajit, "*Microcontrollers: Principles and Applications*", EEE, PHI, New Delhi 1st edition, 2011
3. Predko Michael, "*Programming and customizing the 8051 microcontroller*", McGraw-Hill, 1st edition 1999

Program:	B. Voc. (Internet of Things)				Semester: II	
Course:	Basics of Electrical & Electronics				Code: VIT22202	
Teaching Scheme			Evaluation Scheme			
Lecture	Hours	Credit	FA1	FA2	SA	Total
3	3	3	25	25	50	100

Course Objectives:

1. To build strong conceptual understanding and fundamentals of basic electrical circuit, single phase and polyphase AC systems.
2. To impart basic knowledge for conceptual understanding of DC and AC machines
3. To acquire the basic knowledge of digital and analog electronics.
4. Familiarize students with various electrical measuring instruments and drives used in electrical and electronics engineering

Course Outcomes: After learning the course, students will be able to

1. Understand fundamental concepts of electrical engineering, DC circuits and work power and energy.
2. Apply the knowledge of single phase and three phase circuits to determine unknown electrical quantities.
3. Demonstrate the constructional features and operational details of DC and AC machines
4. Understand the concept of a number system and logic gates to implement any logic function.
5. Understand the characteristics and applications of Zener diodes, PN junction diode, LED and Photo diode.
6. Describe the different types of electrical drives and instruments used for voltage, current, and power measurements in various industrial applications.

Detailed Syllabus:

Unit	Description	Duration (45 Hrs)
1	**Elementary Concepts:** Concept of Potential difference. Current and resistance. Series and parallel circuits, Voltage and current dividers, Power and energy calculations, Ohm's law, Kirchhoff's Law, SI units of work Power and Energy, Conversion of energy from one form to another (Electricity bill verification as an activity)	7
2	**Single phase and poly phase A. C. circuits:** Generation of single phase sinusoidal A.C. voltages, AC quantities, phasor representation, Pure R, Pure L, and Pure C circuits, impedance, admittance, concept of active, reactive, apparent power and power factor. **(Verification of power factor for RL and RC circuit on multisim)** Polyphase A.C. Circuits: Introduction to 3 phase supply and its necessity, balance three phase system, relation between line and phase quantities (with phasor diagram), power in three phase circuits for star and delta connection **(Verification of line and phase values for star and delta on simulation platform)**	7

3	**DC and AC machines** **DC Machines:** Construction, working principle of D.C. generator, emf equation of DC generator (derivation not expected), working principle of D.C. motor, types of D.C. motor, Back emf (Numerical), Industrial applications. **(Demonstration of machine parts)** **AC Machines:** Single phase transformers: Construction, operating principle, emf equation, voltage and current ratios. Losses, Efficiency and regulation, Autotransformer. **(Understating of direct loading test on single phase transformer)**	8
4	**Fundamentals of Digital Electronics: Number System:** Introduction to number system, Conversion of number systems, Binary Code, 1's complement and 2's complement, Introduction to Digital Electronics: Basic logic Gates, Boolean Postulates/laws, De-Morgan Theorems. **(Verification of logic gates on digital trainer kit)**	7
5	**Basics of Semiconductor:** The P-N Junction Diode, V-I characteristics, Diode as Rectifier, specifications of Rectifier Diodes, Half Wave, Full wave, Bridge rectifiers, Zener Diode, Characteristics, Specifications, Zener Voltage Regulator, Types of Diodes: LED, Photodiode **(Demonstration of above devices on Virtual labs)**	8
6	**Measuring instrument and drives:** Measurement of Voltage, Current, and Power, Study of Energy meters, Use of CT and PT for measurement of power /energy in single phase and three phase Drives: Advantages of electrical and electronic drives, individual and group drive, selection of drives depending on load characteristics. **(Case study on selection of drive)**	8

Text Books:

1. I. J. Nagrath and Kothari (PHI learning Pvt.Ltd). "*Theory and problems of Basic Electrical Engineering*, Eastern Economy Edition.

2. Ashfaq Husain. "*Fundamentals of Electrical Engineering*", 4 th Edition, Dhanpat Rai & Co.),

3. V. N. Mittal and Arvind Mittal,. "*Basic Electrical Engineering*", 2 nd Edition, McGrawHill.

4. V.K. Mehta. "*Basic Electrical Engineering*", 1 st Revised Edition ,S. Chand & Co. Pvt. Ltd. NewDelhi.

5. R.P. Jain, Modern Digital Electronics, Prentice Hall of India,New Delhi 4 th edition

Reference Books:

1. D. C. Kulshreshta . "*Basic Electrical Engineering" ,1 st Edition ,Tata McGraw hill.*

2. B. L. Theraja and A. K. Theraja S. *A textbook of Electrical Technology Vol I S. Chand & Co. Pvt. Ltd. New Delhi,1 st Edition.*

3. B. L. Theraja and A. K. Theraj . *A textbook of Electrical Technology Vol II , S. Chand & Co. Pvt. Ltd. New Delhi,1 st Edition*

4. Edward Hughes. *"Electrical Technology", 10 th Edition ,*Pearson.Ltd..

5. A. K. Sawhney Publisher*: Dhanpat Rai Publications,"* A Course in Electrical and Electronic Measurements and Instrumentation.

6. R. L. Boylestad & Louis Nashlesky *Electronic Devices Circuit Theory,* Pearson Education.

Program:	B. Voc. (Internet of Things)				Semester: II	
Course:	Applied Mathematics				Code: VIT22302	
Teaching Scheme			Evaluation Scheme			
Lecture	Hours	Credit	FA 1	FA 2	SA	Total
2	2	2	20	20	40	80

Course Objectives: This course aims at enabling students,

1. To familiarize with concepts and techniques in Elementary Calculus and Matrices.
2. To get acquainted with statistic and probability techniques.

Course Outcomes: After learning the course, students will be able to

1. Understand concepts of determinants and matrices and apply to solve simultaneous linear equation system.
2. Solve differentiation and integration of different types of functions.
3. Understand the concepts related to algebra of vectors.
4. Apply statistic and probability techniques on different types of numerical data.

Detailed Syllabus:

Unit	Description	Duration (30 Hrs)
1.	**Linear Algebra:** Determinants: Definition and expansion of determinants of order 2 and 3, Cramer's rule to solve simultaneous equations in 2 and 3 unknowns Matrices: Definition of a matrix of order m X n and types of matrices, Algebra of matrices, Transpose of a matrix, Minor, cofactor of an element of a matrix, Adjoint of matrix and inverse of matrix by Adjoint method, Solution of simultaneous equations containing 2 and 3 unknowns by matrix inversion method.	7
2.	**Calculus:** **Differentiation:** Definition of derivatives, notations, Derivatives of standard functions, Rules of differentiation, Differentiation of Trigonometric, Exponential and Logarithmic function, Application of Derivatives: Geometrical meaning of derivative, tangent and normal, Maxima and minima. **Integration:** Definition of integration as anti-derivative. Integration of standard function, Rules of integration.	8
3.	**Vectors and Three-Dimensional Geometry:** Introduction to Three-Dimensional Geometry, Vectors: Definition of vector, position vector, Algebra of vectors (Equality, addition, subtraction and scalar multiplication) Dot (Scalar) product with properties, Vector (Cross) product with properties.	7
4.	**Statistics and Probability:** Measures of central tendency (mean, medium & mode) for ungrouped and grouped frequency distribution, Measures of Dispersion: range, mean deviation, standard deviation, Variance and coefficient of variation. Probability: Random Experiments and Events, Definition of probability, Addition and multiplication theorems of probability.	8

	Total	**30**

Text Books:

1. J.K. Tyagi, S. K. Tyagi, Applied Mathematics-I, Khanna Publishing House, 1st Edition, 2012
2. Reena Garg, Engineering Mathematics,, Khanna Publishing House. 1st Edition, 2021

Reference Books:

1. H. K. Dass, Applied Mathematics for Polytechnics, CBS Publishers, India, 11th Edition, 2019
2. Dr. P. K. Shrivastava, Applied Mathematics – I,, Vayu Education of India, 2016
3. H. K. Dass, Dr. R. Verma, Rajesh Verma, Introduction to Engineering Mathematics, Vol. I, S. Chand Publication, 2018
4. H. K. Dass, Dr. R. Verma, Rajesh Verma, Introduction to Engineering Mathematics, Vol. II, S. Chand Publication, 9th Edition, 2019

Program: B. Voc. (Construction & Project Management)					**Semester: II**	
Course: Soft Skills					**Code: Code: VIT22402**	
Teaching Scheme			**Evaluation Scheme**			
Practical	**Hours**	**Credit**	**FA 1**	**FA 2**	**TW**	**Total**
2	**2**	**1**	**-**	**-**	**50**	**50**

Objectives:

6) Analyze the significance of soft skills, particularly language proficiency, in personal and professional contexts, emphasizing their role in effective communication and interpersonal relationships.
7) Evaluate the distinction between soft skills and hard skills, discerning their respective importance and applicability in diverse situations.
8) Apply advanced listening strategies and techniques to enhance comprehension and communication effectiveness in various contexts.
9) Synthesize information from diverse texts through proficient reading skills, summarizing content accurately and concisely.
10) Create and deliver structured and engaging verbal presentations, utilizing effective speaking techniques to convey ideas convincingly and adaptively to different audiences

Course Outcomes:

After learning the course students will be able to;

1) **Understand** the importance of listening and reading skills
2) **Write** well developed paragraphs and instructions
3) **Develop** skills required for public speaking
4) **Present** themselves effectively in different contexts

Detailed Syllabus:

Sr	Description
1	**Introduction to Soft Skills with special reference to language skills** Importance, need of soft skills, Soft Skills V/s hard skills
2	**Listening Skills** Importance, Types and techniques for effective listening. Assignment:Listen and summarize the content.
3	**Reading Skills** Tips for effective reading, Types of reading. Assignment: Read the given article/text and summarize in your own words
4	**Speaking Skills 1 – Self Introductions** Tips for effective public speaking Assignment: Self introductions and describing job profiles.
5	**Speaking Skills 2 – Group Discussions** Assignment: Dos and Don'ts of a Group Discussion
6	**Speaking Skills 3 – Presentations** Assignment: Presenting ideas and thoughts before an audience.
7	**Communication Skills** Types of communication and barriers to communication.

	Assignment: Role play
8	**Time Management** Time Management prioritizing, urgency and importance, categorizing tasks as high, medium, or low priority, developing a structured daily, weekly, or monthly schedule to manage time efficiently. Assignment: Create a visual schedule or checklist for daily tasks, including schoolwork, chores, and free time.
9	**Problem-Solving Skills** Basics of problem solving, critical thinking, brainstorm ideas and try different approaches to find solutions, Steps in problem solving.

Instructions:

- First lab activity is mandatory
- Any six assignments other than first lab activity to be conducted

References:

1. Rao Prasad N D V, English Grammar and Composition, S. Chand and Co. Pvt.Ltd, 2017.
2. Salaria R.S., and Kumar K.B., Effective Communication Skills, Khanna book publishing co. (P)Ltd, 2020.
3. Patil Z.N., Walke B., Thorat A., and Merchant Z., English For Practical Purposes, Macmillan Publication, 2016.
4. Mishra S., and Muralikrishna C., Communication Skills for Engineers, Pearson India Publication, 2011.
5. Bhatia V., Business Communication, Khanna book publishing co. (P)Ltd, 2013.

Program: B. Voc. (Internet of Things)					**Semester: II**	
Course: IT Tools I					**Code: VIT22502**	
Teaching Scheme			**Evaluation Scheme**			
Practical	**Hours**	**Credit**	**FA 1**	**FA 2**	**TW**	**Total**
2	**2**	**1**	**-**	**-**	**50**	**50**

Course Objectives:

1. To understand use of computer-based system in communication and fundamentals of Internet
2. To learn and understand MS office world using simple tools.

Course Outcomes:

After learning the course, students will be able to

1. Demonstrate the computer components and how they are used for communication and networking.
2. Comprehend the use of MS office and Internet Communication

Guideline:

Total : 6 experiments/assignments to be conducted

Detailed Syllabus:

Sr. No.	**Description**
1	Study of Basic Computer fundamentals.
2	Demonstrate and Study of different types of computer networks and internet.
3	Create and manage professional documents using MS word.
4	Create and manage data using MS excel.
5	Create and manage presentation using power point.
6	Study of Internet Communication: Email, Social Media, etc.

Text Books:

1. Kumar B., *Mastering MS Office: Concise Handbook with screenshots*, V&S Publishers, 2017.
2. Orchids, *Microsoft Office 2007*, MS Office Series, 2018
3. Jain S., Kartika Geeta, *Microsoft Office 2010 Training Guide*, BPB Publications 2015.
4. Kurose James F., and Ross Keith W., *A Computer Networking: A top-down approach featuring the internet*, Pearson Publication, 2017.
5. Thareja Reema, *Fundamentals of Computers*, Oxford University Press, 2019.

Reference Books:

1. Ed Tittel, and Muthukumaran B., *Computer Networking*, Schaum's Outlines, TATA Mcgraw Hill Publications, 2006.
2. Peter Norton, *Introduction to Computers*, Tata Mcgraw Hill Publication, 2005.

Program: B. Voc. (Internet of Things)						**Semester: II**
Course: On Job Training				**Code: VIT22602**		
Teaching Scheme			**Evaluation Scheme**			
Practical	**Hours**	**Credit**	**TW**	**PR**	**OR**	**Total**
20	**20**	**10**	**-**	**200**	**-**	**200**

Objectives:

4. To expose students to the industry environment and enhance their technical skills while working in private/public enterprises, government agencies, research labs, or any other organized technical club.
5. To apply knowledge and abilities relevant to engineering technology concepts, principles, and techniques to real-life industrial work/projects.
6. To develop higher-order thinking skills to work with people of diverse backgrounds and cultures and work effectively within cross-disciplined environments.

Outcomes:

On the completion of the OJT, students will be able to –

4. To apply the theoretical knowledge in real-life applications with new perspectives to problem-solving.
5. To practice communication and teamwork skills while building a professional network of prospective employment.
6. To write technical reports and document the project outcomes along with enhancing the technical presentations skills

Guidelines:

Students will take on job training in the industry in the domain of Internet of Things as per the following job description and personal attributes.

Job Role: IoT Hardware Analyst

	Job Description
	IoT Hardware Analyst prepares complete blueprint of the hardware including schematics and layout. The individual also prepares quality and verification requirements and perform PCB testing in compliance with regulatory standards and records them in a design document. The individual will also be responsible for working and efficient functioning of the system.
	Personal Attributes
	The individual must have attention to details, logical thinking, and ability to execute the project as per client's requirement. This job requires the individual to work collaboratively with diverse teams. The individual should be able to hold interest in technology changes; demonstrate strong technical expertise and possess good oral and written communications skills. The individual should also be comfortable working with deadlines and budgets.

Course Syllabus
Semester III

Program: B. Voc. (Internet of Things)					Semester: III	
Course: Fundamentals of C and C++ Programming					Code: VIT23103	
Teaching Scheme			Evaluation Scheme			
Lecture	Hours	Credit	FA 1	FA 2	SA	Total
2	2	2	20	20	40	80

Course Objectives:

This accelerated introductory course delves into the fundamentals of the C and C++ programming languages. While designed for individuals with limited programming experience, those with prior programming knowledge will find it beneficial as well. The curriculum covers essential C and C++ constructs and concepts, ensuring a comprehensive understanding of these languages.

Course outcomes:

After learning the course, students will be able to

1. Understand the fundamentals of programming through algorithms and flowcharts, gaining proficiency in writing C programs with proper identification, commenting, and compiler directives.
2. Gain a thorough grasp of functions, covering prototypes, definitions, recursion, call by value/reference, along with proficiency in working with structures and unions, including nested structures and arrays.
3. Demonstrate the practical application of OOP concepts in various programming scenarios, adapting them to solve real-world problems efficiently.
4. Apply Function Overloading and Operator Overloading concepts through a case study in C++, showcasing proficiency in designing and implementing overloaded functions and operators.

Detailed Syllabus:

Unit	Description	Duration (30 Hrs)
1	**INTRODUCTION TO C PROGRAMMING** **Introduction:** Art of Programming through Algorithms and Flowcharts. Background, C Programs, Identifiers, Comments, Compiler directive. **Overview of C:** History and importance of C, Basic structure of C program, executing a C program. **Constants, Variable and Data Types:** Introduction, Character Set, C Tokens, Keywords and Identifiers, Constants, Variables, Data Types, Declaration of Variables, Assigning Values to Variables, Defining Symbolic Constants. **Managing Input and Output Operations:** Reading a Character, Writing a Character, Formatted Input, Formatted Output. **Operators and Expressions:** Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operator, Bitwise Operators, Special Operators, Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic Operators, Type Conversions in Expressions, Operator Precedence and Associativity.	8

2	**Control Structures in 'C':** **Decision Making and Branching:** Introduction, Decision Making with IF Statement, Simple IF Statement, the IF-ELSE Statement, Nesting of IF-ELSE Statements, The ELSE IF Ladder, The Switch statement, The ? : Operator. **Decision Making and Looping:** Introduction, The while Statement, The Do while loop statement, The for statement, Jumps in LOOPS. switch-case statement, continue and break statement. **Pointers:** Fundamentals of pointers, Declaration, initialization and dereferencing of pointers, Operations on Pointers, Concept of dynamic memory allocation, Arrays, Strings, Structure and Union. **Functions:** Introduction to functions, Function prototype, Function definition, accessing a function, recursion, call by value and call by reference.	7
3	**Principles of Object-Oriented Programming**: Beginning with C++, Basic concepts of procedure-oriented and object oriented programming, Benefits and Applications of OOP, Structure of C++ program with simple C++ program, C++ data types, Symbolic constants and Reference by variables. Operators in C++ and Operator precedence. C++ Lambda Expression, Difference between Static and Dynamic Memory Allocation in C++.	7
4	**Classes and Objects :** Specifying a class- Defining member functions, Private member functions & Nestingof member functions, Arrays within a class, Memory allocation for objects, Static data members & Static member functions, Arrays of objects, Objects as function arguments, Returning Objects. Scope resolution operator, access specifiers (private, public, protected). Inline function & Default arguments, Function overloading and Operator Overloading. **Case study:** Function Overloading and Operator Overloading Program	8

Text Books:

1. E. Balaguruswamy, "*Programming in ANSI C*", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.
2. Donald E. Knuth, *The Art of Computer Programming* , Vols. 1, Addison-Wesley, ISBN- 13: 978-0201485417, ISBN-10: 0201485419, 2017.
3. Kernighan B.W and Dennis M. Ritchie, "*The C Programming Language*", 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.

Reference Books:

1. Lafore Robert, *Object Oriented Programming in Turbo C++*, Galgotia Publications, 2016.
2. Ravichandran D., *Programming with C++*, Tata McGraw- Hill, 2018.
3. Jacqueline A Jones and Keith Harrow, "*Problem Solving with C*", Pearson Education, ISBN: 978-93-325-3800-9.

Program: B. Voc. (Internet of Things)					**Semester: III**	
Course: Fundamentals of C & C++ Programming Lab					**Code: VIT23104**	
Teaching Scheme			**Evaluation Scheme**			
Practical	**Hours**	**Credit**	**FA 1**	**FA 2**	**PR**	**Total**
2	**2**	**1**	**_**	**_**	**50**	**50**

Course Objectives:

1. Explain and demonstrate the basics of C and C++ Programming language.
2. Equip students with the ability to develop C programs that address common mathematical problems, such as quadratic equation roots, digit extraction, and Fibonacci number generation.
3. 3. Master C++ programming by exploring variable swapping, flexible constructor overloading, function overloading in a Shape class, access specifier usage, student information management, and practical application of function and operator overloading in a case study.

Course outcomes:

After learning the course, students will be able to

1. Develop problem-solving skills in C programming for determining the roots of a quadratic equation with non-zero coefficients.
2. Demonstrate a high level of proficiency in C++ programming, showcasing competence in tasks such as variable swapping, flexible constructor overloading, and effective use of function and operator overloading.
3. 3. Develop strong problem-solving skills through practical application, particularly in scenarios involving class-based data management, demonstrating a comprehensive understanding of C++ concepts and methodologies.

Detailed Syllabus:

Part A: C Programming (Any four)

Assignment No.	**Description**
1	Develop a C program to determine the roots of a given quadratic equation with non-zero coefficients.
2	Create a C program to compute the sum of positive even numbers and the sum of negative odd numbers from a given set of input numbers.
3	Develop a C program to verify whether a given number is a perfect number. A perfect number exhibits the property that the sum of its factors, including 1 but excluding the number itself, equals the original number.
4	Create a C program to extract and display the individual digits of a 4-digit integer input.
5	Develop a C program to generate the first 20 Fibonacci numbers.

6	Create a C program to store a set of N data samples in an array and subsequently compute the mean, mode, and median of the data.
Part B: C++ (Any four)	
7	Develop a C++ program to swap the values of two variables using the call by reference method.
8	Develop a C++ program showcasing constructor overloading while assuming desired parameters for flexibility and customization.
9	Develop a C++ program that defines a Shape class and incorporates function overloading to compute and return perimeters for various shapes.
10	Develop a C++ program showcasing the usage of public, protected, and private access specifiers within class parameters.
11	Develop a C++ program to exhibit the names, roll numbers, and grades of three students who participated in an examination. Declare a class containing attributes such as name, roll number, and grade. Utilize an array of class objects to read and display the information stored in the array.
12	Implement a case study using function overloading and operator overloading in a C++ program.

Reference Books:

1. E. Balaguruswamy, "*Programming in ANSI C*", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.
2. Ravichandran D., *Programming with C++*, Tata McGraw- Hill, 2018.
3. Jacqueline A Jones and Keith Harrow, "*Problem Solving with C*", Pearson Education. ISBN: 978-93-325-3800-9.

Program:	**B. Voc. (Internet of Things)**				**Semester: III**	
Course:	**Basics of Computer Networks**				**Code: VIT23203**	
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**FA 1**	**FA 2**	**SA**	**Total**
2	**2**	**2**	**20**	**20**	**40**	**80**

Course Objectives:

1. To introduce the fundamental types of computer networks.
2. To demonstrate the TCP/IP & OSI model merits & demerits.
3. To know the role of various protocols in Networking

Course outcomes: After learning the course, students will be able to

1. Explore the basics of Computer Networks and relate to various Protocols.
2. Demonstrate a comprehensive understanding of the ISO-OSI Reference Model, TCP/IP Protocol suite, and key networking devices.
3. Apply the knowledge of IP addressing to diagnose and troubleshoot issues in IP based networks.
4. Apply knowledge of various application layer protocols for effective design and implementation of network applications.

Detailed Syllabus:

Unit	**Description**	**Duration (30 Hrs)**
1	**Introduction to Computer Networking**: Data Communication system, Data Flow, need of computer networking, Peer to Peer, Client-Server model, Types of Networks: LAN, MAN, WAN, PAN, Network Topologies: Star, Mesh, Bus, Ring, Hybrid, Transmission Media: Guided & Unguided.	8
2	**Networking Models & Devices**: ISO-OSI Reference Model, TCP/IP Protocol suite and Protocols, Networking devices: Modem, Repeaters, Hubs, Bridges, Switches, Routers, Gateways.	6
3	**Datalink, Network Layer & Protocols**: Introduction to Datalink Layer, Roles, Responsibilities, MAC Address, Introduction to Network layer, Roles, Responsibilities, Internet Protocol (IPv4), Subnet Mask, Classful and Classless IP addressing, Private address space, IPv4 header format, Subnetting, NAT, IPv6, TCP, UDP	9
4	**Application Layer, Security and Cloud**: Introduction to the Application layer, Application layer protocols: WWW, HTTP/HTTPS, DNS, DHCP, FTP, E-mail, Network Security: Firewall, Introduction to Cloud	7
	Total	**30**

Text Books:

1. Behrouz A. Forouzan, "*Data Communication and Networking*", Tata McGraw Hill, Fifth Edition, 2018.
2. Behrouz A. Forouzan, "*TCP/IP Protocol Suite*", Tata McGraw Hill, Fourth Edition, 2017
3. Andrew Tanenbaum, "*Computer Networks*", Pearson, Sixth Edition, 2022

Reference Books:

1. *An Engineering Approach to Computer Networks* - S. Keshav, 5th Edition, Pearson Education,2022
2. *Understanding communications and Networks*, 3rd Edition, W. A. Shay, Cengage Learning.2008
3. *Computer Networking: A Top-Down Approach Featuring the Internet*, James F. Kurose, K. W. Ross, 7th Edition, Pearson Education 2022.

Program: B. Voc. (Internet of Things)					**Semester: III**	
Course: Basics of Computer Networks Lab					**Code: VIT23204**	
Teaching Scheme			**Evaluation Scheme**			
Practical	**Hours**	**Credit**	**FA 1**	**FA 2**	**PR**	**Total**
2	**2**	**1**	**-**	**-**	**50**	**50**

Objectives:

1. To acquire a strong grasp of the networking concepts covered in the course, practical demonstrations will be employed for hands-on learning.
2. Have working knowledge of the protocols to be used at various levels of architecture.

Course Outcomes: After learning the course, students will be able to

1. Explain the fundamental underlying principles of computer networking and functionality of layered network architecture.
2. Acquainted with various networking commands for troubleshoot the network.
3. Implement any topology using network devices/network simulator.
4. Design a Wi-Fi network using networking tools/network simulator.

Detailed Syllabus:

Total: 8 assignments to be conducted using any appropriate simulation tool.

Assignment No.	**Description**
1	Create Straight through and Crossover LAN cable using appropriate networking tool kit.
2	Practical use of networking commands: Ipconfig, Ping, pathping, Hostname, getmac, tracert, systeminfo, net, netstat, nslookup, telnet, ssh, ftp.
3	Implementation of Star topology & troubleshoot the connectivity.
4	Sharing the folder/printer in LAN and remotely access it using its IP address.
5	Implementation and configuration of subnetting using IP addressing in LAN.
6	Practical demonstration and configuration of networking devices.
7	Configure any network topology using packet tracer tool.
8	Configuration of Wi-Fi Network using packet tracer tool.
9	Configuration of Wi-Fi Network using Wi-Fi Router.

Reference Books:

1. Behrouz A. Forouzan, "*Data Communication and Networking*", Tata McGraw Hill, Fifth Edition, 2018.
2. Behrouz A. Forouzan, "*TCP/IP Protocol Suite*", Tata McGraw Hill, Fourth Edition, 2017
3. Andrew Tanenbaum, "*Computer Networks*", Pearson, Sixth Edition, 2022
4. *An Engineering Approach to Computer Networks* - S. Keshav, 5th Edition, Pearson Education,2022
5. *Understanding communications and Networks,* 3rd Edition, W. A. Shay, Cengage Learning.2008
6. *Computer Networking: A Top-Down Approach Featuring the Internet,* James F. Kurose, K. W. Ross, 7th Edition, Pearson Education 2022.

Program: B. Voc. (Internet of Things)					**Semester: III**	
Course: IT Tools II					**Code: VIT23303**	
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**FA 1**	**FA 2**	**SA**	**Total**
2	**2**	**2**	**20**	**20**	**40**	**80**

Course Objectives:

1. To develop advanced skills in using word processing and spreadsheet software for complex tasks and automation.
2. To introduce students to digital multimedia tools for image, audio, video editing, and screen casting.

Course outcomes:

After learning the course, students will be able to

1. Use word processors to Create and manage long documents with tables of contents, indexing, cross-references, and footnotes.
2. Utilize advanced spreadsheet features like VLOOKUP, nested functions, data validation, scenarios, and basic macros/VBA.
3. Perform basic image editing, audio/video editing, screen recording, and use online multimedia tools.
4. Collaborate effectively using cloud storage, file sharing, online office suites, and project management tools.

Detailed Syllabus:

Unit	Description	Duration (30 Hrs)
1	**Advanced Word Processing** Working with long documents (Table of contents, indexing, cross-references, footnotes), Using mail merge for bulk emails/letters, collaborating on documents (Track changes, comments), Protecting and securing documents	8 Hrs
2	**Advanced Spreadsheet Features** Advanced functions (VLOOKUP, IF, Nested IFs, etc.), Data validation and data entry forms, Scenarios and goal seek analysis, Introduction to macros and VBA, Data visualization.	8 Hrs
3	**Digital Multimedia** Image editing basics, Audio/video editing introduction, Screen recording and screen casting, Online multimedia tools	8 Hrs
4	**Collaboration and Cloud Tools** Cloud storage (Google Drive, OneDrive), File sharing and collaboration, Online office suites, Introduction to project management tools (JIRA, Trello), Timesheet management, AI-based automation	6 Hrs

Text Books:

1. Shelly Cashman Series. 2019. Office 365 & Office 2019 Introductory, 1st Edition, Cengage Learning, Boston.
2. Jennifer Duffy. 2018. Multimedia Foundations: Core Concepts for Digital Design, 2nd Edition, Focal Press, Burlington.

Reference Books:

1. Joan Lambert and Joyce Cox. 2013. Microsoft Word 2013 Step by Step, Microsoft Press, Redmond.
2. Curtis Frye. 2013. Microsoft Excel 2013 Step by Step, Microsoft Press, Redmond.
3. David W. Beskeen, et al. 2015. Microsoft Office 2016 Illustrated Introductory, First Course, Cengage Learning, Boston.
4. Katherine Murray. 2018. Modern Desktop Environments for Virtual, Cloud, and Mobile Users, Pearson Education, London.

Program: B. Voc. (Internet of Things)					**Semester: III**	
Course: Business Communication - I					**Code: VIT23403**	
Teaching Scheme			**Evaluation Scheme**			
Practical	**Hours**	**Credit**	**FA 1**	**FA 2**	**TW**	**Total**
2	**2**	**1**	**-**	**-**	**50**	**50**

Objectives:

1. Analyze the role and significance of business communication in professional and personal contexts.
2. Evaluate various types of communication and identify principles and barriers affecting effective communication.
3. Demonstrate effective interpersonal communication skills including active listening, empathy, and conflict resolution.
4. Apply non-verbal communication techniques, including body language, to enhance communication effectiveness in business scenarios.
5. Develop proficiency in professional business correspondence, including writing formal letters and resumes, and demonstrate persuasive communication skills in mock business meetings.

Course Outcomes:

After learning the course students will be able to;

1. **Apply** knowledge of fundamentals of communication in given situations
2. **Communicate** effectively using non-verbal codes
3. **Write** professional letters
4. **Demonstrate** business and social skills.

Detailed Syllabus:

Sr No	Description
1	**Role and importance of Business Communication** Introduction to the art of Business Communication, Role and importance in professional and personal life, Ice-breaking activities for various scenarios, Professional Greetings, Making & Responding to Requests.
2	**Introduction to Business Communication** Types of Communication, Principles and Barriers to Communication, Overcoming Barriers to communication **Assignment:** Explain different types of communication. Provide examples of barriers to communication from your own experiences and suggest ways to overcome it.
3	**Talking about opinions and perceptions** Get recognized in the crowd: Introducing self in business environment Understand purpose of introduction, tailor self-introduction for gaining attention, find out USP (individuality, skills etc) and emphasize, assertive and expressive, Express opinions confidently in business environment, Speak with purpose, use persuasive communication.

4	**Non-Verbal communication &Body Language** Importance of Non-Verbal Communication, Non-Verbal Codes, Kinesics, Haptics, Proxemics, Chronemics, Para-language, Artifacts **Assignment:** Case Study of the role of body languagein a givensituation
5	**Interpersonal Communication Skills** Developing active listening and empathy skills in business interactions, Managing conflict and difficult conversations in the workplace
6	**Business Correspondence** Art of writing Business Letters (Understand different formats, writing with purpose, difference between day-to-day language and formal language)Write a professional resume or CV. Use a professional format. Highlight skills, experiences, and qualifications relevant to the target job or industry. **Assignment:**Developing formal business letters for different purposes
7	**Mock Business Meetings** Self- Grooming, Art of persuasion, Techniques of Short Speech & Effective Delivery of Extempore & Debate.
8	**Professional Etiquette and Networking** Understanding and practicing professional etiquette in various business settings, Building and maintaining professional relationships through networking.
9	**Emotional & Social Skills** Situational Conversations & Rapport Building through Role Play, Emotional Intelligence: Testing and Improving EI **Assignment:** Provide step by step solutions in the form of practical examples for the given case studies.

Instructions:

- All assignments are suggestive however, course teacher may devise another assignments to evaluate students
- First lab activity is mandatory

Reference Books:

1. Rao Prasad N D V, *English Grammar and Composition*, S. Chand and Co. Pvt.Ltd, 2017.
2. Salaria R.S., and Kumar K.B., *Effective Communication Skills*, Khanna book publishing co. (P)Ltd, 2020.
3. Patil Z.N., Walke B., Thorat A., and Merchant Z., *English For Practical Purposes*, Macmillan Publication, 2016.
4. Mishra S., and Muralikrishna C., *Communication Skills for Engineers*, Pearson India Publication, 2011.
5. Bhatia V., *Business Communication*, Khanna book publishing co. (P) Ltd, 2013.

Program:	**B. Voc. (Internet of Things)**				**Semester: III**	
Course:	**Health and Wellness II**				**Code: VIT23503**	
Teaching Scheme			**Evaluation Scheme**			
Practical	**Hours**	**Credit**	**FA 1**	**FA 2**	**TW**	**Total**
2	**2**	**1**	**-**	**-**	**50**	**50**

Objectives:

1. Prepare graduates to become wellness, health, fitness, nutrition education or foodservice professionals.
2. Prepare students for a variety of careers in wellness, fitness, food and nutrition education and foodservice.

Course Outcomes:

After learning the course students will be able to;

1. Students will be able to describe the principles of health and wellness from a multidimensional and interdisciplinary perspective.
2. Students will be able to think and act ethically in the context of health, nutrition and wellness.

Detailed Syllabus:

Assignment No.	**Description**
1	Positive psychology: what do you understand by positive psychology? What are benefits of positive psychology.
2	Identifying strengths: what do you understand by strengths? Classification of strengths, developmental assets. Identifying your personal strengths
3	Living well at every stage: what is resilience? positive youth development, Life tasks of adulthood.
4	Self-efficacy: Definition, the neurobiology of self-efficacy, self-efficacy's influence in life arenas.
5	Mnemonics: method of loci, peg word system, key word method, Recall of Name, Recall of words.
6	Optimism: learned optimism -Seligman, primary prevention, primary enhancement.

Instructions:

- Any 5 practical assignments to be conducted.

References Books:

1. W. Weiten, and M. A. Lloyd, Psychology Applied to Modern Life: Adjustment in the 21st Century, Wadsworth Publishing, 2007
2. R. Harington, Stress, Health and well-being: Thriving in the 21st century, Wadsworth Publishing, 2013.
3. Boniwell, Positive psychology in a nutshell, McGraw-Hill Education, 2012.
4. S. Lyubomirsky, The how of happiness, Penguine Press, 2008.

Program:	B. Voc. (Internet of Things)			Semester: III		
Course:	Internship III: On Job Training ((Embedded Product Designer - Technical Lead))			Code: VIT23603		
Teaching Scheme			Evaluation Scheme			
Practical	Hours	Credit	TW	PR	OR	Total
20	20	10	-	200	-	200

Course Objectives:

1. To interpret major components that constitute an embedded system.
2. To learn the method of designing and program an Embedded Systems for real time applications using techniques and tools

Course Outcomes: After learning the course, students will be able to

After learning the course, students will be able to

1. Design embedded electronic products.
2. Develop and test software solutions for embedded products.
3. Test and rectify malfunctions in the prototype of the embedded product.
4. Apply health and safety practices at the workplace

Guidelines: Students will take on job training in the industry in the domain of Internet of Things as per the following job description and personal attributes.

Job Description

An Embedded Product designer - Technical lead designs, develops and debugs embedded systems based products as per the given requirement specifications, system architecture and feasibility analysis. The candidate leads and performs the assigned responsibilities independently and exemplifies good logical reasoning, thorough technical analysis, proper negotiation/ communication and clear/ concise documentation skills. He/ she also ensures that relevant occupational health and safety parameters, intellectual property confidentiality, and trade compliance rules are followed while carrying out the work

Personal attributes

Must exhibit good customer service attributes—courteous, solution-oriented, polite, reliable, good decision-making skills, etc. Must be focused on quality outcomes and possess an analytical bent of mind. Should be responsible for own outcomes and be able to interface and interact with multiple teams (H/w, Customer Unit, Systems, third-party vendors, etc.)

Reference Books:

1. Embedded Product Designer - Technical Lead, ELE/Q1403, Version 1.0., NSQF Level 6, Electronics Sector Skill Council of India

Course Syllabus

Semester-IV

Program: B. Voc. (Internet of Things)					**Semester: IV**	
Course: Advanced Microcontrollers					**Code: VIT24105**	
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**FA 1**	**FA 2**	**SA**	**Total**
3	**3**	**3**	**25**	**25**	**50**	**100**

Course Objectives:

1. To comprehend advanced concepts and applications of microcontrollers.
2. To develop skills in programming and interfacing advanced microcontrollers with various peripherals.

Course outcomes:

After learning the course, students will be able to

1. Understand PIC microcontroller architecture and identify different PIC variants.
2. Set up and utilize PIC programming environment and version control.
3. Develop basic PIC microcontroller programs and interface with I/O devices
4. Program advanced features of PIC microcontrollers.
5. Interface PIC microcontrollers with analog and motor control devices
6. Understand and apply real-time operating systems (RTOS) concepts

Detailed Syllabus:

Unit	**Description**	**Duration (45 Hrs)**
1	**Introduction to PIC architecture** PIC microcontroller families and features, PIC hardware architecture and memory organization (RAM, ROM, memory types), Identifying PIC variants and their specifications	**7**
2	**PIC Programming Environment** Develop toolchain (compiler, IDE, debugger), study of CCS-PICC 'C' compiler and MPLAB IDE, Create and manage source files, and program the target device, Introduction to version control systems (Git)	8
3	**Basic PIC Programming and I/O Operations** Standard I/O functions, File I/O operations, Standard preprocessor directives, GPIO programming and port manipulation, Internal and external interrupts, Interrupt service routines (ISR), 16x2 LCD, Keypad Interfacing	**8**
4	**Advanced PIC Programming: Part 1** Timer modules and advanced timer operations, Capture/compare modules, UART, SPI, and I2C communication protocols, Using Flash and EEPROM memories for data storage	**7**
5	**Advanced PIC Programming: Part 2** ADC and DAC interfacing, Watchdog timer, Real-world data logging case study, Stepper Motor Interfacing and Control, DC Motor control with PWM.	**7**
6	**Real-Time Operating Systems**	**8**

	Difference between OS and RTOS, Process management and synchronisation, Memory and I/O management, Introduction to a specific RTOS for PIC microcontrollers, RTOS scheduling algorithms	
	Total	**45**

Text Books:

1. Mazidi, Muhammad Ali, McKinlay, Rolin D., and Causey, Danny, "*PIC Microcontroller and Embedded Systems: Using Assembly and C for PIC18*", Pearson, 2nd Edition, 2021, New York.
2. Ajay V Deshmukh, *Microcontroller Theory and Applications*, Tata M/c Graw Hill, 2nd Edition, 2017.
3. Iovine, John, "*PIC Microcontroller Project Book*", McGraw-Hill Education, 2nd Edition, 2011, New York.

Reference Books:

4. Ibrahim, Dogan, "*PIC Microcontroller Projects in C: Basic to Advanced*", Newnes, 1st Edition, 2014, Boston.
5. Bates, John, "*PIC Microcontrollers: An Introduction to Microelectronics*", Butterworth-Heinemann, 3rd Edition, 2011, Oxford.
6. Predko, Myke, "*Programming and Customizing PIC Microcontrollers*", Tata McGraw-Hill, 1st Edition, 1998, New York.
7. Gaonkar, Ramesh, "*Fundamentals of Microcontrollers and Applications in Embedded Systems*", Penram International, 1st Edition, 2010.

Program:	**B. Voc. (Internet of Things)**				**Semester: IV**	
Course:	**Python Programming Lab**				**Code: VIT24106**	
Teaching Scheme			**Evaluation Scheme**			
Practical	**Hours**	**Credit**	**FA 1**	**FA 2**	**PR**	**Total**
2	**2**	**1**	**-**	**-**	**50**	**50**

Course Objectives:

1. To introduce basic python programs using problem-solving aspects, programming and debugging.
2. To acquaint to python functions to achieve code reuse.
3. To aware students about problems based on strings and its operation using python.

Course Outcomes:

After learning the course, students will be able to

1. **Acquire** problem solving and basic programming skills in Python.
2. **Apply** decision control structures in python programming.
3. **Build** program using functions, modules to facilitate code reuse.

Detailed Syllabus:

General Guidelines:

1) 10 experiments covering Course Outcomes.
2) Experiments from the following list need to be completed using any Python Compiler /IDE
3) Basics of Python Programming, Decision Control Statements, Functions and Modules

Assignment No.	**Description**
1	**Basics of Python Programming:** Give the values of the variables x, y and z. Write a program to rotate their values such that x has the value of y, y has the value of z and z has the value of x.
2	1.To add one integer and floating type number. 2.To accept the total number of minutes as input and then output as hrs + minutes. Ex:- 90 minutes=1hr 30 mins
3	To accept an object mass in kilograms and velocity in meters per second and display its momentum. Momentum is calculated as p=mv where m is the mass of the object and v is its velocity.
4	To accept details entered by a user display name, age, gender and height.
5	**Decision Control Statements:** To accept marks of five courses of students and compute his/her result. Student is passing if he/she scores marks equal to and above 40 in each course. If student scores aggregate greater than 75%, then the grade is Distinction. If aggregate is 60>= and <75 then the grade is First division. If aggregate is 50>= and <60, then the grade is Second division. If aggregate is 40>= and <50, then the grade is Third division.
6	To read the coordinates (x, y) (in Cartesian system) and find the quadrant to which it belongs (Quadrant -I, Quadrant -II, Quadrant -III, Quadrant -IV).

7	To calculate the salary of an employee given his basic pay (take input from user). Calculate salary of employee. Let HRA be 10 % of basic pay and TA be 5% of basic pay. Let employees pay professional tax as 2% of total salary. Calculate salary payable after deductions
8	**Loop Control Statements:** To check whether the input number is Armstrong number or not. An Armstrong number is an integer with three digits such that the sum of the cubes of its digits is equal to the number itself. Ex. 371.
9	To calculate the sum and average of first 10 numbers.
10	**Import math, List:** Accept number from 1 to 12 and print equivalent month of a year.
11	To simulate a simple calculator that performs basic tasks such as addition, subtraction, multiplication and division with special operations like computing $x_y$and x!.
12	To accept the number and Compute a) square root of number, b) Square of number, c) Cube of number d) check for prime, d) factorial of number, e) prime factors.
13	To convert five different Celsius value in a list into Fahrenheit value.
14	**Functions and Modules:** Trainer is conducting a session for all 20 employees. She has employee ids of all employees represented in 6-digit numbers. She wants to make two groups of employees based on even number employee ID or odd number employee ID. Identify the steps to solve the problem and implement it
15	A hotel has a pricing policy as follows: 2 people: 2500Rs. 3 people: 3500Rs. 4 people: 4500Rs. Additional people: 1000Rs. per person If the customer is staying on company business, there is a 20% discount. If the customer is over 60-year age, there is a 15% discount. A customer does not receive both discounts. Given the above data, print the cost of the room.

Text Books:

1. R. G. Dromey,"*How to Solve it by Computer*", First edition, Pearson Education,2015
2. ReemaThareja,"*Python Programming Using Problem Solving Approach*", Second edition Oxford University Press.2019
3. R. Nageswara Rao, "*Core Python Programming*", Second edition, Dreamtech Press, 2016

Reference Books:

1. Maureen Spankle, "*Problem Solving and Programming Concepts*",11th edition, Pearson,2012
2. Paul Barry,"*Head First Python- A Brain Friendly Guide*", 2nd Edition,2016
3. "*Python: The Complete Reference", Martin C, fourth edition Brown*, McGraw Hill Education,2018
4. Ashok Namdev Kamthane,"*Programming and Problem Solving with Python*",, McGraw Hill Education,2020

Program:	**B. Voc. (Internet of Things)**				**Semester: IV**	
Course:	**Introduction to DBMS**				**Code: VIT24205**	
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**FA 1**	**FA 2**	**SA**	**Total**
2	**2**	**2**	**20**	**20**	**40**	**80**

Course Objectives:

1. To explain the basic elements of database management systems
2. To define Entity Relationship data models with its features.
3. To make students aware of structures of Relational data models.
4. To introduce principles of database transaction management, database recovery

Course outcomes:

After learning the course, students will be able to:

1. Describe the fundamental components of database management systems.
2. Define the Entity Relationship (ER) data model and its key components, including entities, attributes, and relationships.
3. Explain the structure and principles of relational data models.
   Comprehend the principles and importance of database transaction management.

Detailed Syllabus:

Unit	**Description**	**Duration (30 Hrs)**
1	**Introduction to Database Concepts:** Purpose of Database Systems, Database System Concepts(Data Models, Schema, instances, views), Approaches to building a database systems, Database System architecture and its components, data independence, classification of DBMS SQL Fundamentals: Basic SQL queries: SELECT, INSERT, UPDATE, DELETE Constraints, indexing, and normalization	**6**
2	**Database Model: Entity Relationship Model(ER Model)** Introduction to ER Model, Entities, attributes, and relationship,-Entity types, Entity sets, attributes, keys; ER Diagrams, ERD Issues, weak entity sets, ER features –generalization, specialization, inheritance, aggregation, design of ER Database schema	**8**
3	**Relational database model:** Structure of relational databases, Logical view of data, keys, integrity rules. Relational algebra operators (Unary and Binary) and queries, relational algebra operators from set theory, ER to Relational mapping Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF).	**8**
4	**Advance Database Concepts:** Transaction Management: Concepts of transactions and concurrency control; ACID properties; Concurrency issues and locking techniques. deadlock handling(deadlock prevention, detection and recovery), Multiple granularity, Timestamp protocol, isolation, intent locking, Recovery and Atomicity ,Log Based Recovery, Recovery with Concurrent Transactions	**8**

Total	**30**

Text Books:

1. Raghurama Krishnan, Johannes Gehrke. *Data base Management Systems,* TATA McGraw Hill 3rd Edition.
2. A Silberschatz, H F Korth and S Sudarshan, *"Database System Concepts"*, McGRAW Hill, Sixth Edition

Reference Books:

1. C. J. Date, A. Kennan, and S. Swamynathan, *"An Introduction to Database Systems"*, Person Education,8th Edition.
2. Elmasri, Navathe, *Fundamentals of Database Systems* Pearson Education,6th Edition

Program:	**B. Voc. (Internet of Things)**				**Semester: IV**	
Course:	**Business Communication - II**				**Code: Code: VIT24404**	
Teaching Scheme			**Evaluation Scheme**			
Practical	**Hours**	**Credit**	**FA 1**	**FA 2**	**TW**	**Total**
2	**2**	**1**	**-**	**-**	**50**	**50**

Objectives:

1. Analyse effective strategies for handling customer inquiries and complaints in a timely and courteous manner to maintain customer satisfaction.
2. Evaluate various digital and visual communication tools for their suitability in business contexts, and apply them effectively to enhance communication impact.
3. Explore the concept of social networking for professional purposes, including the creation of a comprehensive LinkedIn profile, to expand professional connections and opportunities.
4. Develop interview skills through research, preparation, and practice, including crafting tailored responses to common interview questions and formulating insightful questions for the interviewer.
5. Apply storytelling techniques to craft compelling narratives for business communication, and understand the importance and structure of common business documents in various contexts, including negotiation simulations and business plan presentations.

Course Outcomes:

After learning the course students will be able to;

1. **Demonstrate** the skills of handling customer and clients
2. **Use** digital tools effectively to present or communicate as per situation
3. **Appear** confidently for business meetings and interviews
4. **Write** professional drafts and proposals.

Detailed Syllabus:

Sr No	Description
1	
2	**Handling Customer Inquiries and Complaints** Strategies for responding to customer inquiries promptly and courteously, Techniques for addressing customer complaints effectively to maintain customer satisfaction **Assignment**:Develop a comprehensive response plan for handling customer inquiries and complaints, focusing on promptness, courtesy, and satisfaction maintenance.
3	**Digital and Visual Communication Tools** Utilizing digital tools and platforms for effective business communication. **Assignment**:Create a visually engaging presentation or document using digital tools, demonstrating effective communication techniques to enhance impact.
4	**Social Networking** Content: What is Social networking; networking through social media platforms like LinkedIn, Indeed, for professional purposes. **Assignment**: Create and launch a full-fledged LinkedIn profile with all relevant details. Submit printouts of LinkedIn Bio, Qualifications and Other important sections.

5	**Interview Skills** Researching the company and role, practicing responses to common questions, and preparing questions to ask the interviewer. **Assignment:**Develop a set of interview questions tailored to a specific job role, considering both traditional and behavioral-based questions.
6	**Business Storytelling** Crafting compelling stories and using storytelling techniques for business communication.
7	**Understanding Business Documents** Introduction to common business documents (e.g., invoices, receipts).
	Negotiation Simulation: Negotiation exercise, practicing persuasive communication, active listening, and conflict resolution skills. **Assignment:** Compose a pitch /oral presentation on the given topic and submit the write-up of the same. (Evaluation will be based on both oral and written content.)
8	**Business Plan: Writing & Presentation** Content: Elevator pitch, Business plan proposal, presenting a business proposal **Assignment**: Create a basicbusiness plan proposal and present it in the form of an Elevator pitch.
9	**Advanced Business Writing Skills** Techniques for writing business documents, such as proposals, executive summaries, and business plans, Incorporating data and research into written communication effectively **Assignment**: Create proposal for business purpose in a professional format.

Instructions:

- All assignments are suggestive however; course teacher may devise other assignments to evaluate students.
- Any five assignments are mandatory

References:

6. Rao Prasad N D V, *English Grammar and Composition*, S. Chand and Co. Pvt. Ltd, 2017.
7. Salaria R.S., and Kumar K.B., *Effective Communication Skills*, Khanna book publishing co. (P)Ltd, 2020.
8. Patil Z.N., Walke B., Thorat A., and Merchant Z., *English For Practical Purposes*, Macmillan Publication, 2016.
9. Mishra S., and Muralikrishna C., *Communication Skills for Engineers*, Pearson India Publication, 2011.
10. Bhatia V., *Business Communication*, Khanna book publishing co. (P)Ltd, 2013.

Program:	**B. Voc. (Internet of Things)**				**Semester: IV**	
Course:	**Environmental Science**				**Code: VIT24504**	
Teaching Scheme			**Evaluation Scheme**			
Practical	**Hours**	**Credit**	**FA 1**	**FA 2**	**TW**	**Total**
2	**2**	**1**	**-**	**-**	**50**	**50**

Objectives:

To study components of the environment, their function, quality, issues related to the environment, the effect of quality degradation on human beings, and their solutions.

Course Outcomes:

After learning the course, students will be able to

1. Measure atmospheric metrological parameters and interpret the results.
2. Determine water quality parameters and interpret the results.
3. Distinguish different component of the environment and their function and sustainable development.

Detailed Syllabus:

Assignment No.	**Description**
	Any Five experiments from assignments 1 to 9.
1	**Experiment Name –** Measurement and interpretation of metrological parameters of the atmosphere. **Content** Use a weather sensor or weather station to measure metrological parameters such as temperature, wind direction, wind speed, humidity, rainfall, air pressure, solar radiation, etc**.**
2	**Experiment Name –** Determine the water quality of a given location using a water monitoring kit. **Content** Determine the water quality, such as pH, Temperature, Total Dissolved Solids (TDS), Electrical Conductivity (EC), Turbidity, etc., of a given location using a water monitoring kit. Compare results with BIS standards.
3	**Experiment Name –** Determine total hardness of water sample. **Content** Determine total hardness of various types of water samples. Compare results with standards and write observations/conclusions.
4	**Experiment Name –** Prepare water audit report of the college/house/locality/colony/ industry. **Content** Prepare a water audit report of the college/house/locality/colony/ industry for water quantity and quality with observations and recommendations.
5	**Experiment Name –** Visit a Water Treatment Plant (WTP) or Sewage Treatment Plant (STP).

	Content Study various unit's operations and processes of water and wastewater treatment.
6	**Experiment Name –** Inspect solid and liquid discharge of the college/colony/industry and develop a management plan. **Content** Inspect solid and liquid discharge of the college/colony/industry and develop a management plan with schematic diagrams and photographs.
7	**Experiment Name –** Determine the noise level to find out its direct exposure to communities. **Content** Determine noise level using a sound level meter or noise dosimeter at various locations. Compare the results with standards and write observations/conclusions.
8	**Experiment Name –** Propose a model for pollutant removal. **Content** Propose a model for the treatment or removal of any type of contaminant or pollutant from water/ wastewater/air/soil. Demonstrate the mechanism of working and its application.
9	**Assignment Name –** Calculate environmental footprint. **Content** Calculate environmental footprint such as water footprint/ carbon footprint/ energy footprint, etc.

Text Books:

1. *Water Supply Engineering,* S. K. Garg, Khanna Publishers, New Delhi, 35th Edition (2015).
2. *Environmental Science: A Practical Manual* Author: G. Swarajya Lakshmi
   ISBN: 9788178002286

Reference Books:

1. *Standard Methods for examination of water and wastewater*, Mary Franson, American Public Health Association.
2. IS 10500:2012 Drinking water specifications.
3. IS 3025: 2013, *Methods of Sampling and Test (Physical, Chemical and Biological) for Water and Waste Water*, Bureau of Indian Standards, New Delhi.
4. *Water Supply and Sanitary Engineering,* G. S. Birdie and J. S. Birdie, Dhanpat Rai Publishing Company, New Delhi, 9th Edition, (2010).

Program: B. Voc. (Internet of Things)				**Semester: IV**		
Course: Mini Project				**Code: VIT24604**		
Teaching Scheme			**Evaluation Scheme**			
Practical	**Hours**	**Credit**	**TW**	**PR**	**OR**	**Total**
4	**4**	**2**	**-**	**50**	**-**	**50**

Course Objectives:

1. To develop practical skills required for designing IoT based Electronics Projects.
2. To make students acquainted with the electronics, including reading and implementation of schematics.

Course outcomes:

After learning the course, students will be able to

1. Identify the real-world problems through a rigorous literature survey and formulate/set relevant aim and objectives.
2. Choose suitable solution based on the fundaments of electronics and communication technology by possibly the integration of previously acquired knowledge.
3. Illustrate the technology used in proposed work in oral and written form.

Guidelines to the Students:

1. Group Size: The student will carry the project work individually or by a group of students. Optimum group size is in 3 students. However, if project complexity demands a maximum group size of 4 students, the review committee should be convinced about such complexity and scope of the work.
2. Selection and approval of Topic: Topic preferably related to real life applications/ Thrust areas in the above application fields/ prototype development/ testing/ Numerical Simulation/ Analysis

Note: The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by internal/external guides. Project report must be submitted in the prescribed format only. No variation in the format will be accepted.

Detailed Syllabus:

A Project based learning approach will be followed for this course and hence the experiments will be a small project built by the students with the help of any microcontroller for the following application fields (Thrust areas).

The thrust areas are as follows:

Agricultural, Health and Hygiene, Industry automation, Smart Cities, Logistics, Energy, Transportation, Communication and Networking, Cyber security, Robotics, Quality Education, Digital India etc.

Project Schedule

Sr. No.	**Description**

1	Brainstorming for ideas, identifying problem statements, forming groups, and assigning project activities based on group discussions.
2	Conducting a project-related survey via journals, patents, or field visits, performing feasibility checks, identifying innovation gaps, creating concept diagrams, gathering prerequisites for project development, and preparing a synopsis and survey report in accordance with the given guidelines.
3	Initiating project development, prototyping the project at the model/simulation level, and conducting testing and validation of the model.
4	Implementing/deploying the project physically, conducting physical testing and validation, and documenting experimental results and test cases.
5	Preparing reports according to guidelines, submitting the final project report, along with additional documents such as posters, presentation copies, activity certificates, etc.
6	Assessing and evaluating the project in accordance with the provided guidelines.
7	Dissemination of project work in poster/paper presentation/other events etc.

Program:	B. Voc. (Internet of Things)				Semester: IV	
Course:	On Job Training (Embedded Product Designer - Technical Lead)				Code: VIT24605	
Teaching Scheme			Evaluation Scheme			
Practical	Hours	Credit	TW	PR	OR	Total
20	20	10	-	200	-	200

Course Objectives:

1. To interpret major components that constitutes an embedded system.
2. To learn the method of designing and program an Embedded Systems for real time applications using techniques and tools

Course Outcomes: After learning the course, students will be able to

After learning the course, students will be able to

1. Design embedded electronic products.
2. Develop and test software solutions for embedded products.
3. Test and rectify malfunctions in the prototype of the embedded product.
4. Apply health and safety practices at the workplace

Guidelines: Students will take on job training in the industry in the domain of Internet of Things as per the following job description and personal attributes.

Job Description

An Embedded Product designer - Technical lead designs, develops and debugs embedded systems based products as per the given requirement specifications, system architecture and feasibility analysis. The candidate leads and performs the assigned responsibilities independently and exemplifies good logical reasoning, thorough technical analysis, proper negotiation/ communication and clear/ concise documentation skills. He/ she also ensures that relevant occupational health and safety parameters, intellectual property confidentiality, and trade compliance rules are followed while carrying out the work

Personal attributes

Must exhibit good customer service attributes—courteous, solution-oriented, polite, reliable, good decision-making skills, etc. Must be focused on quality outcomes and possess an analytical bent of mind. Should be responsible for own outcomes and be able to interface and interact with multiple teams (H/w, Customer Unit, Systems, third-party vendors, etc.)

Reference Books:

Embedded Product Designer - Technical Lead, ELE/Q1403, Version 1.0., NSQF Level 6, Electronics Sector Skill Council of India

Course Syllabus
Semester V

Program: B. Voc. (Internet of Things)					**Semester: V**	
Course: Principles of IoT					**Code: VIT25106**	
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**FA1**	**FA2**	**SA**	**Total**
3	**3**	**3**	**25**	**25**	**50**	**100**

Course Objectives:

1. To make students understand the basics of IoT
2. To explore the need/role of sensors and actuators in the field of IoT
3. To make students aware of the IoT architecture, framework, and security for developing the IoT applications.

Course outcomes:

After learning the course, students will be able to

1. Understand building blocks of Internet of Things and characteristics.
2. Explain the Architecture of IoT
3. Utilize IoT programming frameworks to develop applications and solutions for IoT systems.
4. Define the concepts of reliability, security and privacy in the context of IoT system.
5. Understand the application areas of IoT

Detailed Syllabus:

Unit	**Description**	**Duration (45 Hrs)**
1	IOT Eco System and Concepts and Architecture: Introduction, Definition, Emergence, Industrial IOT, IOT Architecture, IOT Data management and Analysis, Communication protocols and Applications.	**07**
2	Architecture: Open IOT Architecture, IOT Services Lifecycle, Device/cloud collaboration framework, Fog Computing: Principles, Architecture and Applications.	**08**
3	Programming Frameworks for IOT Embedded device programming languages, Message passing in devices, IOT Programming frameworks, Cloud assisted Cyber-physical systems.	**07**
4	IOT Reliability, Security and Privacy: Concepts, IOT Security Overview, Security frameworks for IOT, Privacy in IOT Networks, Reliability Issues.	**08**
5	IOT Applications I: Applied Internet of Things, Sensor to Gateway communication, Data Transmission, Internet of Vehicles and Applications: Characteristics and Challenges of IOV.	**07**
6	IOT Applications II: Smart Homes: Characteristics and Challenges and other Applications, Industrial IoT, Smart Transportation System.	**08**

Text Books:

1. A. King, *Programming the Internet of Things: An Introduction to Building Integrated, Device-to-Cloud IoT Solutions*. Sebastopol, CA: O'Reilly Media, 2021.
2. G. Smart, *Practical Python Programming for IoT: Build Advanced IoT Projects Using a Raspberry Pi 4, MQTT, RESTful APIs, WebSockets, and Python 3*. Birmingham, UK: Packt Publishing, 2020.
3. R. Buyya and A. V. Dastjerdi, Eds., *Internet of Things: Principles and Paradigms*. Amsterdam, Netherlands: Elsevier, 2016.
4. Adrian McEwen,Hakim Cassimally: *Designing the Internet of things*, Willy Publication 2014

Reference Books:

1. M. Gupta and R. Sandhu, *Access Control Models and Architectures for IoT and Cyber-Physical Systems*. Cham, Switzerland: Springer, 2022.
2. V. Hahanov and R. Hahanov, *Cyber Physical Computing for IoT-driven Services*. Cham, Switzerland: Springer, 2018.

Program: B. Voc. (Internet of Things)					**Semester: V**	
Course: -: Principles of IoT Lab					**Code: VIT25107**	
Teaching Scheme			**Evaluation Scheme**			
Practical	**Hours**	**Credit**	**FA1**	**FA2**	**PR**	**Total**
2	**2**	**1**	**-**	**-**	**50**	**50**

Objectives:

1. To familiarize students with Arduino, Raspberry Pi, and NodeMCU for embedded system programming and IoT applications.
2. To develop skills in sensor interfacing, wireless communication, and cloud-based data management for real-time IoT applications.

Course Outcomes:

After learning the course, students will be able to

1. Demonstrate proficiency in programming and interfacing various sensors and actuators with Arduino, Raspberry Pi, and NodeMCU.
2. Implement IoT-based applications using cloud services, wireless communication protocols, and automation techniques.
3. Analyze and troubleshoot embedded system components for real-world IoT applications such as home automation and remote monitoring.

Guidelines:

1. Total 8 experiments/assignments to be conducted.

Detailed Syllabus:

Assignment	**Description**
1	Familiarization of Arduino/Raspberry Pi and perform necessary software installation.
2	Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud
3	To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.
4	To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 secs.
5	To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when ‘1’/’0’ is pressed from smart phone using Bluetooth.
6	Interface an Ultrasonic sensor (HC-SR04) with Arduino/Raspberry Pi and write a program to measure distance and display it on a serial monitor.
7	Interface electrical appliances (bulb, fan) via relay module with Node MCU and write a program for remote control via Wi-Fi.
8	Interface a PIR sensor with NodeMCU and write a program to detect motion and trigger an alert (LED/Buzzer notification).
9	Interface a soil moisture sensor with NodeMCU and write a program to monitor soil moisture levels via a cloud dashboard.
10	Use Google Assistant/Alexa and NodeMCU to control home appliances via voice commands.

Reference Books:

1. R. H. Barnett, *Arduino and Raspberry Pi Sensor Projects for the Evil Genius*. New York, NY, USA: McGraw-Hill Education, 2017.
2. R. Gayakwad, *Internet of Things with Raspberry Pi and Arduino*. Boca Raton, FL, USA: CRC Press, 2020.
3. R. Grimmett, *Arduino Robotic Projects*. Birmingham, UK: Packt Publishing, 2014.
4. D. Norris, *The Internet of Things: Do-It-Yourself Projects with Arduino, Raspberry Pi, and BeagleBone Black*. New York, NY, USA: McGraw-Hill Education, 2015.
5. M. Ashwin, *Raspberry Pi and Arduino Projects*. New York, NY, USA: Apress, 2014.
6. M. K. Das, The Internet of Things Using NodeMCU. New Delhi, India: BPB Publications, 2021.
7. R. Thakur, NodeMCU ESP8266 Communication Methods and Protocols. Independently published, 2018.
8. E. Kurniawan, ESP8266: Programming NodeMCU Using Arduino IDE – Get Started with ESP8266. Independently published, 2015.
9. G. Blokdyk, NodeMCU A Complete Guide. 5STARCooks, 2022.

Program:	**B. Voc. (Internet of Things)**				**Semester: V**	
Course:	Data Analytics for IoT				**Code: VIT25109**	
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**FA1**	**FA2**	**SA**	**Total**
3	**3**	**3**	**25**	**25**	**50**	**100**

Course Objectives:
1. To introduce data analytics concepts using MATLAB and Python.
2. To familiarize applicability using statistical analysis of data analytics.
3. To introduce Graphical Analysis using Data Processing and Visualization.
4. To introduce to the basics concept of Machine Learning.

Course outcomes:
After learning the course, students will be able to
1. Demonstrate the data analytics concepts using MATLAB and Python.
2. Apply and Analyze algorithms using statistical methods
3. Demonstrate the applicability of graphical analysis using Data processing and Visualization.
4. Understand and apply the concept of Regression, Classification and clustering algorithms
5. Understand the Basics of machine learning
6. Demonstrate the need for AI in IoT

Detailed Syllabus

Unit	**Description**	**Duration (45 Hrs.)**
1	**Introduction to MATLAB for Data analytics:** Data Analytics Introduction, Understanding the data, accessing data set Introduction to MATLAB for Data analytics: MATLAB libraries for Data analytics, importing & exporting data in MATLAB	**8**
2	**Introduction to Python for Data analytics:** Python packages for Data analysis: Pandas, NumPy, matplotlib, importing & exporting data in Python.	**7**
3	**Introduction to Statistical Methods:** Overview of statistical analysis, Introduction to descriptive statistics and data distributions. Visualizing Data Sets, Measures of Centrality: Mean, Median, Mode, Spread and Distributions, bias and variance.	**7**
4	**Data Processing and Visualization:** Overview of the Content-Importing Hurricane Data, Getting Started with the Data, Preprocessing data- Importing data from multiple files -Read extensive data stored in multiple files using data stores, Introduction to visualization tools (Pandas, seaborn, PowerBI).	**8**
5	**Introduction to Machine Learning:** Introduction to Machine Learning example and its applications, Supervised Learning: Regression and Classification, Unsupervised Learning: Clustering.	**8**
6	**Fundamentals of AI:** What is artificial Intelligence, Foundation of AI, History of AI, agents, Applications of AI, Future of AI, Issues in Design of search programs: Blind Search or depth first search, Breadth first search.	**7**

Text Books:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer 2009.
2. Wes McKinney and O'Reilly, "Python for Data Analysis", 3rd Edition. 2022.

Reference Books:

1. EthemAlpaydın, "Introduction to Machine Learning", Second Edition, MIT Press 2010.
2. Jake Vander Plas and O'Reilly, "Python Data Science Handbook: Essential Tools for Working with Data"2010
3. Joel Grus and O'Reilly, "Data Science from Scratch: First Principles with Python".2012

Online Courses:

1. https://www.mathworks.com/academia/courseware/teaching-data-science-with-matlab.html
2. https://swayam.gov.in/nd1_noc20_cs46/
3. https://onlinecourses.nptel.ac.in/noc21_cs33/

Program:	**B. Voc. (Internet of Things)**				**Semester: V**	
Course:	**Data Analytics for IoT Lab**				**Code: VIT25109**	
Teaching Scheme			**Evaluation Scheme**			
Practical	**Hours**	**Credit**	**FA1**	**FA2**	**PR**	**Total**
2	**2**	**1**	**-**	**-**	**50**	**50**

Objectives:

This course aims at enabling students,

1. To develop an IoT data pipeline by acquiring sensor data, storing it in a database, and performing data preprocessing.
2. To analyze and visualize IoT datasets using Python libraries such as Pandas, NumPy, and Matplotlib.
3. To implement machine learning techniques for IoT analytics, including regression, anomaly detection, and classification.
4. To design interactive IoT dashboards that provide insights into sensor data trends and real-time analytics.

Course Outcomes:

After learning the course, students will be able to

1. Develop a functional IoT data pipeline by collecting sensor data, storing it in a database, and applying basic preprocessing techniques.
2. Analyze the IoT data by visualizations using PowerBI and apply machine learning for predictive analysis.

Guidelines:

1. Min 8 experiments need to be performed.

Detailed Syllabus:

Assignment	**Description**
Module 1: Introduction to IoT Data Analytics	
1	Setting Up an IoT Data Pipeline – Collect data from an IoT device (e.g., DHT11 temperature sensor) and store it in a database.
2	Exploring IoT Datasets – Load and explore IoT-generated datasets using Python (Pandas, NumPy)
3	Data Cleaning and Preprocessing – Handle missing values, outliers, and duplicate records in an IoT dataset
Module 2: IoT Data Acquisition and Storage	
4	Acquiring IoT Data– Publish and subscribe IoT sensor data
5	Storing IoT Data in a Database – Save real-time IoT data to a database
6	Using Cloud Services for IoT Data Storage – Store sensor data in a cloud database
Module 3: Data Analysis and Visualization	
7	Time Series Analysis of IoT Data – Analyze and visualize temperature and humidity trends over time.

8	Visualization with Matplotlib(Python) – Create line charts, bar graphs, and scatter plots of IoT sensor data.
9	Building Dashboards– Create an interactive IoT dashboard.
Module 4: Machine Learning for IoT Analytics	
10	Predicting IoT Sensor Values using Regression – Build a Linear Regression model to predict future sensor readings.
11	Classifying IoT Events using Machine Learning – Implement Decision Trees or SVM for event classification in IoT applications.

Text Books:

1. Rajkumar Buyya, Amir Vahid Dastjerdi, Morgan Kaufmann, "Internet of Things: Principles and Paradigms" – 2016.
2. Jesus Rogel-Salazar , "Data Science for IoT" –, Packt Publishing, 2020.
3. Amita Kapoor , "Hands-On Machine Learning for IoT: Implementing Smart and Connected Systems" – Packt Publishing, 2019.
4. Jake VanderPlas , "Python Data Science Handbook" – O'Reilly Media, 2016.

Reference Books:

1. Maciej Kranz , "Building the Internet of Things: Implement New Business Models, Disrupt Competitors, and Transform Your Industry" – Wiley, 2016.
2. David Hanes, Gonzalo Salgueiro, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things" –Cisco Press, 2017.
3. Aileen Nielsen, "Practical Time Series Analysis: Prediction with Statistics and Machine Learning" –O'Reilly Media, 2019.
4. Rahul Kumar, "Machine Learning for IoT: Unlock actionable insights from IoT data using Artificial Intelligence techniques" –Packt Publishing, 2021.

Program:	**B. Voc. (INTERNET OF THINGS)**				**Semester: V**	
Course:	**IoT Enabling Technologies**				**Code: VIT25206**	
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**FA1**	**FA2**	**SA**	**Total**
2	**2**	**2**	**20**	**20**	**40**	**80**

Course Objectives:

1. To make students understand the various IoT enabling technologies.
2. To make students aware of the fundamentals of embedded system.
3. To make students understand the various applications in the field of industrial IoT.

Course outcomes:

After learning the course, students will be able to

1. Explore the concepts of Wireless Sensor Networks (WSN) and various wireless protocols.
2. Explore various cloud platforms for IoT.
3. To understand big data, its characteristics, data handling technologies, and the flow of data.
4. Understand the role of IoT in the field of Industry.

Detailed Syllabus:

Unit	**Description**	**Duration (30 Hrs)**
1	**Wireless Sensor Network** What is WSN? WSN node, Anatomy of the network node, Architecture of WSN, Types of WSN, WSN standards: IEEE 802.15.4, Low rate WPAN, Zigbee, Wireless HART, 6LOWPAN, Zwave, BLE, LoRA. Protocol stack of WSNs	**08**
2	**Cloud Computing** Introduction to Cloud Computing(concept, architecture, working) Introduction to Cloud service models- SaaS, PaaS, IaaS, NaaS, IdaaS, DbaaS Cloud Platforms: Google App Engine, Amazon Web Services, Microsoft Azure Cloud services, Windows Azure Platform Appliance. Distributed Computing: Need, Distributed computing vs. Cloud computing	**07**
3	**Big Data** Introduction to Big data, Types of data, Characteristics of Big data, Data handling technologies, Flow of data, Data acquisition, Data storage, Introduction to Hadoop, Introduction to Data Analytics, Types of data analytics-Local Analytics, Cloud analytics and applications	**07**
4	**Industrial IoT Applications** Home Automation, Industrial IoT, Logistics, Driver assistance, collision impact, Inventory Management & Quality Control, Smart Cities, Environmental Protection, Lavatory maintenance, Water quality, Power Plants Food, Warehouse, Retail, Energy management, Agriculture, Health and Lifestyle , Facility Management	**08**

Text Books:

1. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press,2017
2. Olivier Hersent, David Boswarthick, and Omar Elloumi, ―The Internet of Things: Key Applications and Protocols‖, WileyPublications, 2012
3. Giacomo Veneri Antonio Capasso, "Hands-On Industrial Internet of Things", Packtr Publications, January 2018

Reference Books:

1. Hakima Chaouchi, ― The Internet of Things Connecting Objects to the Web‖ ISBN : 978-1- 84821-140-7, Wiley Publications, 2013
2. Kazem Sohraby, Daniel Minoli and TaiebZnati, ― Wireless Sensor Networks Technology,
3. Protocols, and Applications―, John Wiley & Sons, 2010.
4. Holger Karl and Andreas Willig, ―Protocols and Architectures for Wireless Sensor Networks‖, John Wiley & Sons, Ltd, 2007.
5. Daniel Minoli, ―Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications‖, ISBN: 978-1-118-47347-4, Wiley Publications, 2013

MOOC Courses:

1. NPTEL course on "Components and Applications of IoT" by Dr. Sanjoy Parida,
2. https://onlinecourses.swayam2.ac.in/arp19_ap52/preview
3. Coursera Course "Introduction to IoT and Embedded systems" by Ian Harris,
4. https://www.coursera.org/learn/iot
5. NPTEL Course "Sensors and Actuators" by Prof. Hardik Pandya
6. https://nptel.ac.in/courses/108108147

Program:	**B. Voc. (Internet of Things)**				**Semester: V**	
Course:	**Internship V: On Job Training (ELE/Q980)**				**Code: VIT25606**	
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**TW**	**PR**	**OR**	**Total**
20	**20**	**10**	**-**	**200**	**-**	**200**

Guidelines:
Students will take on job training in the industry in the domain of Internet of Things as per the following job description and personal attributes

Job Description:

Introduction and orientation to the role of a Project Manager, Process of carrying out project initiation and planning, Process of carrying out execution, monitoring, control and closure of the project, Soft Skills and Work Ethics, Basic Health and Safety Practice

Personal Attributes:

Describe the size and scope of the Electronics industry and its subsectors. • Discuss the role and responsibilities of a Project Manager. • Describe various employment opportunities for a Project Manager

Course Syllabus
Semester VI

Program:	**B. Voc. (Internet of Things)**				**Semester: VI**	
Course:	**Programming Languages for IoT**				**Code: VIT26110**	
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**FA1**	**FA2**	**SA**	**Total**
3	**3**	**3**	**25**	**25**	**50**	**100**

Course Objectives:

1. To make students understand the basics of Python, C/C++, Java Script and PHP.
2. To enable students to develop IoT applications using sensor data collection, data analysis, data visualization, and automation techniques.
3. To help students implement IoT-based solutions using Arduino, Raspberry Pi, and various IoT libraries for real-world applications.

Course outcomes:

After learning the course, students will be able to

1. Understand and apply Python in the context of IoT.
2. Leverage C/C++ for creating IoT applications, specifically for resource-constrained devices.
3. Understand and implement standard IoT protocols in their IoT applications.
4. Utilize JavaScript and Node.js for building interactive IoT applications.
5. Implement secure coding practices and understand the security aspects of IoT programming.
6. Apply advanced topics such as edge computing and machine learning in IoT and implement a real-world IoT application.

Detailed Syllabus:

Unit	**Description**	**Duration (45 Hrs)**
1	**Unit 1: Python for IoT** Python basics: data types, variables, operators, control flow, Advanced Python: functions, modules, exceptions, file handling, Python libraries for IoT: PyMata, MQTT Python, RPi. GPIO, IoT applications: sensor data collection, data analysis, data visualization, automation.	7
2	**Unit 2: C/C++ for IoT** C/C++ basics: data types, variables, operators, control flow, Advanced C/C++: functions, pointers, structures, dynamic memory, IoT applications: working with Arduino, sensors, data handling, Introduction to C/C++ libraries for IoT. Introduction to programming for point-to-point communication.	8
3	**Unit 3: JavaScript and Node.js for IoT** JavaScript basics: syntax, variables, data types, functions Asynchronous programming in JavaScript Introduction to Node.js, event-driven programming Applications using Node-RED, creating IoT flows, integrating services.	7
4	**Unit 4: PHP for IoT**	8

	PHP basics: syntax, variables, data types, control structures and database connectivity using MySQL. Advanced PHP: RESTful APIs for IoT devices communication, PhP based IoT dashboards for sensor data visualization.	
5	**Unit 5: IoT Security Understanding IoT security:** common threats and challenges Secure coding practices in Python and C/C++ Implementing authentication and encryption in IoT applications Case study: analyzing and mitigating security risks in IoT applications	7
6	**Unit 6: Advanced Topics in IoT Programming:** Introduction to edge computing in IoT Basics of machine learning in IoT Case studies: analysis of advanced IoT applications	8

Text Books:

1. Severance, Charles R. "Python for Everybody: Exploring Data in Python 3." Amazon Digital Services LLC - Kdp Print Us, 2016.

2. Vine, Michael. "C Programming for the Absolute Beginner, Second Edition." Premier Press, 2007.

3. Flanagan, David. "JavaScript: The Definitive Guide: Master the World's Most-Used Programming Language." 7th ed. O'Reilly Media, 2020.

4. L. Ullman, *PHP and MySQL for Dynamic Web Sites: Visual QuickPro Guide*, 5th ed. Peachpit Press, 2018.

Reference Books:

1. Norris, Donald. "Python for Microcontrollers: Getting Started with MicroPython." McGraw-Hill Education TAB, 2016.
2. Kernighan, Brian W., and Ritchie, Dennis M. "C Programming Language." 2nd ed. Pearson, 1988.
3. Haverbeke, Marijn. "Eloquent JavaScript, 3rd Edition: A Modern Introduction to Programming." No Starch Press, 2018.
4. Wilson, Jim. "Programming Node.js: A Comprehensive Guide to Writing Clean, Maintainable Servers in JavaScript." O'Reilly Media, 2022.
5. Balani, Navveen. "Mastering IoT: Build modern IoT solutions using MQTT, CoAP, RESTful APIs, WebSockets, and Python." Packt Publishing, 2020. 6. Gierke, Oliver, Wolff, Eberhard, and Darimont, Thomas. "Machine Learning for the Internet of Things: Enhancing IoT Innovation with Data-Driven Techniques." O'Reilly Media, 2022.

Program: B. Voc. (Internet of Things)					**Semester: V**	
Course: -: Programming Languages for IoT Lab					**Code: VIT26111**	
Teaching Scheme			**Evaluation Scheme**			
Practical	**Hours**	**Credit**	**FA1**	**FA2**	**PR**	**Total**
2	**2**	**1**	**-**	**-**	**50**	**50**

Objectives:

1. To make students understand and implement fundamental programming concepts.
2. To introduce students about problem solving skills using functions and modular programming.
3. To make students aware about how to apply decision and loop control statements to real-life scenarios.

Course Outcomes:

After learning the course, students will be able to

1. Apply fundamental programming concepts to perform arithmetic operations, decision-making, and looping for solving real-world problems.
2. Develop modular programs using functions and control structures to enhance code reusability and efficiency.
3. Implement problem-solving techniques in scenarios like salary computation, grading systems, and hotel pricing using programming logic.

Guidelines: Total 8 experiments/assignments to be conducted.

Detailed Syllabus:

Assignment	**Description**
1	A. To add one integer and floating type number. B. To accept the total number of minutes as input and then output as hrs + minutes. Ex:- 90 minutes=1hr 30 mins
2	To accept an object mass in kilograms and velocity in meters per second and display its momentum. Momentum is calculated as p=mv where m is the mass of the object and v is its velocity.
3	Decision Control Statements: To accept marks of five courses of students and compute his/her result. Student is passing if he/she scores marks equal to and above 40 in each course. If student scores aggregate greater than 75%, then the grade is Distinction. If aggregate is 60>= and <75, then the grade is Distinction, If aggregate is 50>= and <60, then the grade is second division.. If aggregate is 40 >= and <50, then the grade is 3rd vision.
4	To calculate the salary of an employee given his basic pay (take input from user). Calculate salary of employee. Let HRA be 10 % of basic pay and TA be 5% of basic pay. Let employees pay professional tax as 2% of total salary. Calculate salary payable after deductions
5	Loop Control Statements: To check whether the input number is Armstrong number or not. An Armstrong number is an integer with three digits such that the sum of the cubes of its digits is equal to the number itself. Ex. 371.

6	To calculate the sum and average of first 10 numbers.
7	Find addition of all odd numbers between 1 to 20 using while and for loop.
8	Functions and Modules: Trainer is conducting a session for all 20 employees. She has employee ids of all employees represented in 6-digit numbers. She wants to make two groups of employees based on even number employee ID or odd number employee ID. Identify the steps to solve the problem and implement it
9	Find factorial of given number using function.
10	A hotel has a pricing policy as follows: 2 people: 2500Rs. 3 people: 3500Rs. 4 people: 4500Rs. Additional people: 1000Rs. per person If the customer is staying on company business, there is a 20% discount. If the customer is over 60-year age, there is a 15% discount. A customer does not receive both discounts. Given the above data, print the cost of the room.

Reference Books:

1. Norris, Donald. "Python for Microcontrollers: Getting Started with MicroPython." McGraw-Hill Education TAB, 2016.
2. Kernighan, Brian W., and Ritchie, Dennis M. "C Programming Language." 2nd ed. Pearson, 1988.
3. 3. Haverbeke, Marijn. "Eloquent JavaScript, 3rd Edition: A Modern Introduction to Programming." No Starch Press, 2018.
4. 4. Wilson, Jim. "Programming Node.js: A Comprehensive Guide to Writing Clean, Maintainable Servers in JavaScript." O'Reilly Media, 2022.

Program:	**B. Voc. (Internet of Things)**				**Semester: VI**	
Course:	**IoT System Architecture and Communication Protocols**				**Code: VIT26207**	
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**FA1**	**FA2**	**SA**	**Total**
2	**2**	**2**	**20**	**20**	**40**	**80**

Course Objectives:

1. To make students understand Architectural Overview of IoT.
2. To make students understand various IoT Protocols.

Course outcomes:

After learning the course, students will be able to

1. Describe IoT architecture, reference models, and various architectural views
2. Differentiate between IoT connectivity technologies based on their features and applications.
3. Assess IoT communication protocols and their suitability for constrained networks.
4. Examine real-world IoT case studies across various domains to understand their implementation and impact.

Detailed Syllabus:

Unit	**Description**	**Duration (30 Hrs)**
1	**IoT Architecture:-** Introduction, State of the art, IoT reference Model - IoT Reference Architectures, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.	7 Hrs
2	**IoT Connectivity Technologies:-** RFID , NFC, Wi-Fi, Bluetooth low energy, IEEE 802.15.4, Zigbee, Thread, Wireless HART, LoRa, NB-IoT	8Hrs
3	**IoT Communication Technologies:-** Constrained nodes, Constrained networks, Types of constrained devices, Low power and lossy networks, Infrastructure protocols, IPv4, IPv6, Content-centric networking (CCN), Discovery Protocols, Data Protocols, MQTT, CoAP, AMQP, XMPP.	8Hrs
4	**IoT Case Study:-** Case Studies: Smart Agriculture System, Smart Healthcare Monitoring system, Environment Monitoring System, Industrial IoT Applications etc.	7Hrs

Textbooks:

1. V. Madisetti and A. Bahga, *Internet of Things: A Hands-On Approach*. 1st edition, Universities Press, 2014.
2. R. Kamal, *Internet of Things: Architecture and Design Principles*. 2nd edition, McGraw-Hill Education, 2017.

Reference Books:

1. D. Minoli, *Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications*. 1st edition, Wiley, 2013.
2. P. Raj and A. C. Raman, *The Internet of Things: Enabling Technologies, Platforms, and Use Cases*. 1st edition, CRC Press, 2017.
3. H. Zhou, *The Internet of Things in the Cloud: A Middleware Perspective*. 1st edition, CRC Press, 2012.
4. McEwen and H. Cassimally, *Designing the Internet of Things*. 1st edition, Wiley, 2013.

Program:	**B. Voc. (Internet of Things)**				**Semester: VI**	
Course:	**Project II: Project**				**Code: VIT26607**	
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**TW**	**PR**	**OR**	**Total**
8	**8**	**4**	**50**	**-**	**150**	**200**

Guidelines to the Students:

The project course allows students to apply their knowledge and skills learned throughout the B. Voc. IoT program. The project should be based on the principles and technologies of IoT and must exhibit a clear understanding and application of these principles.

- The project can be done individually or in small groups, per the department's guidelines.
- Regular meetings with assigned project supervisors must be maintained.
- The project will be assessed on the final product and the planning, management, and development process, including documentation.
- The project must include a written report and an oral presentation.

Detailed Syllabus:

Task	**Description**
1	Project Proposal Select a topic related to IoT spaces by conducting an in-depth search within a specific thrust area like Smart city, Healthcare, Infrastructure, Transportation, Agriculture, etc. The proposal should clearly state the problem, the proposed solution, the technologies to be used, and a rough timeline for the project.
2	Detailed Planning and Design Create a detailed plan of the project, including software design (UML diagrams, data flow diagrams, etc.) and hardware design.
3	Implementation This is the development phase where the design from Task 2 is implemented. Regular updates should be provided to the project supervisor. Students are encouraged to work on FOSS (Free and Open-Source Software) Tools and opensource hardware platforms
4	Testing and Debugging Test the project thoroughly to find and fix any bugs. This includes unit testing, integration testing, and system testing.
5	Documentation Develop a detailed report of the project, including problem statement, design, implementation, testing, results, and conclusions.
6	Presentation and Viva Prepare a project presentation to be given in front of the evaluation panel. Be ready to answer questions and defend the decisions made during the project's development.

Program:	**B. Voc. (Internet of Things)**				**Semester: VI**	
Course:	**Internship VI: On Job Training (ELE/Q9801)**				**Code: VIT26608**	
Teaching Scheme			**Evaluation Scheme**			
Lecture	**Hours**	**Credit**	**TW**	**PR**	**OR**	**Total**
20	**20**	**10**	**-**	**200**	**-**	**200**

Guidelines:
Students will take on job training in the industry in the domain of Internet of Things as per the following job description and personal attributes

Job Description:

Introduction and orientation to the role of a Project Manager, Process of carrying out project initiation and planning, Process of carrying out execution, monitoring, control and closure of the project, Soft Skills and Work Ethics, Basic Health and Safety Practice

Personal Attributes:

Describe the size and scope of the Electronics industry and its subsectors.
- Discuss the role and responsibilities of a Project Manager.
- Describe various employment opportunities for a Project Manager