Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Technology

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

Structure & Syllabus of

Final Year B.Tech.

(Instrumentation and Control Engineering)

Pattern 'D24'

Effective from Academic Year 2024-25

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

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

Signed by

Chairman – BOS   Dean Academics   Chairman – Academic Board

Contents

Vision statement of Institute

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

Mission statement of Institute

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

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

Vision statement of Department

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

Mission statement of Department

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

Program Educational Objectives (PEO)
Programme: B. Tech. (Instrumentation and Control Engineering)

The Graduates would demonstrate

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

Program Outcomes

Engineering Graduates will be able to:

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

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

Graduates shall have the ability to:

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

Vishwakarma Institute of Technology

Title : Course Structure

Final Year B.Tech - Instrumentation and Control Engineering Structure for Pattern D-24, Module-7 with effect from Semester-1 of Academic Year 2024-25

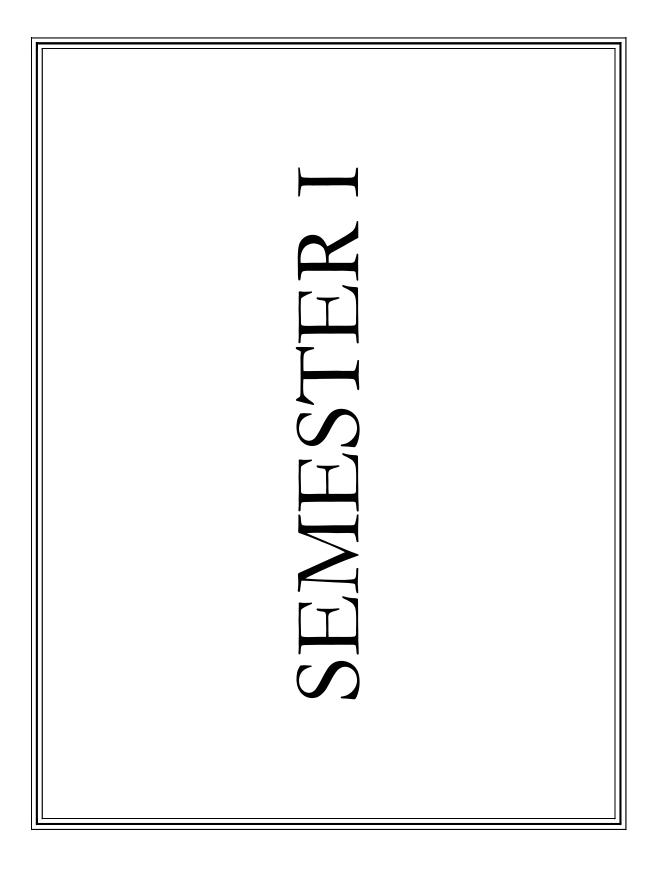| Course Type	Course Code	Course Name	Teaching Learning Scheme (Hrs./Week)				Credits	Assessment Scheme (100 mark scale)													Total
								In Semester Assessment							End Semester Assessment						
			Th	Lab	Tut	Total		Lab 10	CP 20	MSE-MCQ 30	MSE Review 30	Seminar / GD / HA 20			ESE 30			ESE Review 70	CVV 20	100
												Seminar	GD	HA	Written	MCQ	Practical			
S1-OE1	MD4228	IBM Full Stack Software Developer	1	0	0	1	4													Graded
S1-OE1	MD 4229	Meta Back-End Developer																		
S1-OE1	MD4237	IBM Cybersecurity Analyst																		
S1-OE1	MD4240	Google Data Analytics																		
S1-OE1	MD4248	IBM DevOps and Software Engineering																		
S1-OE1	MD4251	IBM Front-End Developer																		
S1-OE1	MD4259	Akamai Network Engineering																		
S1-OE1	MD4260	Google Project Management																		
S1-OE1	MD4267	AWS Cloud Technology Consultant																		
S1-OE1	MD4268	Google UX Design																		
S2-OE2	IC4249	Deep Learning (NPTEL course)	1	0	0	1	2			30				10		30				30	100
S2-OE2	IC4250	Modern Computer Vision (NPTEL course)	1	0	0	1	2			30				10		30				30	100
S3	IC4372	Design Thinking - 7	0	0	1	1	1														Graded
S4	IC4243	Major Project	0	18	0	18	9				30								70		100
		Total	**2**	**18**	**1**	**21**	**16**			**30**	**30**			**10**		**30**			**70**	**30**	**200**

Final Year B.Tech - Instrumentation and Control Engineering Structure for Pattern D-24, Module-8 with effect from Semester-1 of Academic Year 2024-25

Course Type	Course Code	Course Name	Teaching Learning Scheme (Hrs./Week)				Credits	Assessment Scheme (100 mark scale)													Total 100
								In Semester Assessment							End Semester Assessment						
			Th	Lab	Tut	Total		Lab 10	CP 20	MSE-MCQ 30	MSE Review 30	Seminar / GD / HA 20			ESE 30			ESE Review 70	CVV 20	
												Seminar	GD	HA	Written	MCQ	Practical			
S1	IC4211	Industry Internship		30		30	15				30							70		100
S1	IC4224	Global Internship																		
S1	IC4226	Research Internship																		
S1	IC4240	Project Internship																		
S2	IC4372	Design Thinking - 7	0	0	1	1	1													Graded
		Total		30	1	31	16				30							70		100

Note : 1. Students can opt for any module in any semester.

2. Students can register for new courses of module-7 as module-8 courses instead of Internship module-8

3. Design Thinking – 7 is applicable in only semester 7 irrespective of module.

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SEMESTER I

MD42XX :: COURSERA TRACK CERTIFICATE COURSE

MD4228 : IBM Full Stack Software Developer Professional Certificate

Professional Certificate - 15 course series

Introduction to Software Engineering

Course 1•14 hours•4.7(1,477 ratings)

Introduction to Cloud Computing

Course 2•12 hours•4.6(6,376 ratings)

Introduction to HTML, CSS, & JavaScript

Course 3•10 hours•4.4(176 ratings)

Getting Started with Git and GitHub

Course 4•10 hours•4.6(1,207 ratings)

Developing Front-End Apps with React

Course 5•14 hours•4.3(490 ratings)

Developing Back-End Apps with Node.js and Express

Course 6•13 hours•4.4(410 ratings)

Python for Data Science, AI & Development

Course 7•25 hours•4.6(37,177 ratings)

Developing AI Applications with Python and Flask

Course 8•11 hours•4.4(738 ratings)

Django Application Development with SQL and Databases

Course 9•14 hours•4.5(243 ratings)

Introduction to Containers w/ Docker, Kubernetes & OpenShift

Course 10•17 hours•4.4(811 ratings)

Application Development using Microservices and Serverless

Course 11•14 hours•4.6(277 ratings)

Full Stack Application Development Capstone Project

Course 12•16 hours•4.5(143 ratings)

Full Stack Software Developer Assessment

Course 13•6 hours•4.7(211 ratings)

Generative AI: Elevate your Software Development Career

Course 14•17 hours•4.7(56 ratings)

Software Developer Career Guide and Interview Preparation

Course 15•11 hours•4.7(139 ratings)

∞ Meta

<mark>MD 4229 : Meta Back-End Developer</mark> Professional Certificate

Professional Certificate - 9 course series

Introduction to Back-End Development

Course 1•18 hours•4.7(3,171 ratings)

Programming in Python

Course 2•44 hours•4.6(1,439 ratings)

Version Control

Course 3•13 hours•4.6(3,247 ratings)

Introduction to Databases for Back-End Development

Course 4•27 hours•4.6(570 ratings)

Django Web Framework

Course 5•45 hours•4.7(519 ratings)

APIs

Course 6•20 hours•4.4(280 ratings)

The Full Stack

Course 7•24 hours•4.6(178 ratings)

Back-End Developer Capstone

Course 8•20 hours•4.5(130 ratings)

Coding Interview Preparation

Course 9•11 hours•4.6(527 ratings)

MD4237 : IBM Cybersecurity Analyst

Professional Certificate - 14 course series

Introduction to Cybersecurity Careers

Course 1•7 hours•4.6(185 ratings)

Introduction to Cybersecurity Essentials

Course 2•12 hours•4.8(564 ratings)

Introduction to Cybersecurity Tools & Cyberattacks

Course 3•11 hours•4.6(15,520 ratings)

Operating Systems: Overview, Administration, and Security

Course 4•17 hours•4.6(5,450 ratings)

Network Security & Database Vulnerabilities

Course 5•14 hours•4.7(3,134 ratings)

Database Essentials and Vulnerabilities

Course 6•14 hours

Cybersecurity Architecture

Course 7•12 hours•4.9(28 ratings)

Cybersecurity Compliance Framework, Standards & Regulations

Course 8•11 hours•4.7(3,227 ratings)

Penetration Testing, Incident Response and Forensics

Course 9•17 hours•4.6(2,310 ratings)

Cyber Threat Intelligence

Course 10•27 hours•4.7(1,662 ratings)

Cybersecurity Capstone: Breach Response Case Studies

Course 11•13 hours•4.8(1,438 ratings)

IBM Cybersecurity Analyst Assessment

Course 12•4 hours•4.8(1,173 ratings)

Generative AI: Boost Your Cybersecurity Career

Course 13•9 hours•4.7(25 ratings)

Cybersecurity Job Search, Resume, and Interview Prep

Course 14•10 hours

Google

MD4240 : Google Data Analytics

Professional Certificate - 8 course series

Foundations: Data, Data, Everywhere

Course 1•18 hours•4.8(104,518 ratings)

Ask Questions to Make Data-Driven Decisions

Course 2•21 hours•4.7(31,858 ratings)

Prepare Data for Exploration

Course 3•24 hours•4.8(20,310 ratings)

Process Data from Dirty to Clean

Course 4•26 hours•4.8(16,269 ratings)

Analyze Data to Answer Questions

Course 5•32 hours•4.6(10,992 ratings)

Share Data Through the Art of Visualization

Course 6•25 hours•4.6(8,860 ratings)

Data Analysis with R Programming

Course 7•34 hours•4.8(10,223 ratings)

Google Data Analytics Capstone: Complete a Case Study

Course 8•13 hours•4.8(15,149 ratings)

MD4248 : IBM DevOps and Software Engineering

Professional Certificate - 14 course series

Introduction to DevOps

Course 1•9 hours•4.8(2,946 ratings)

Introduction to Cloud Computing

Course 2•12 hours•4.6(6,376 ratings)

Introduction to Agile Development and Scrum

Course 3•11 hours•4.9(1,923 ratings)

Getting Started with Git and GitHub

Course 4•10 hours•4.6(1,207 ratings)

Hands-on Introduction to Linux Commands and Shell Scripting

Course 5•14 hours•4.6(1,253 ratings)

Python for Data Science, AI & Development

Course 6•25 hours•4.6(37,177 ratings)

Developing AI Applications with Python and Flask

Course 7•11 hours•4.4(738 ratings)

Introduction to Containers w/ Docker, Kubernetes & OpenShift

Course 8•17 hours•4.4(811 ratings)

Application Development using Microservices and Serverless

Course 9•14 hours•4.6(277 ratings)

Introduction to Test and Behavior Driven Development

Course 10•19 hours•4.8(193 ratings)

Continuous Integration and Continuous Delivery (CI/CD)

Course 11•14 hours•4.7(162 ratings)

Application Security for Developers and DevOps Professionals

Course 12•17 hours•4.8(163 ratings)

Monitoring and Observability for Development and DevOps

Course 13•16 hours•4.5(50 ratings)

DevOps Capstone Project

Course 14•18 hours•4.8(92 ratings)

MD4251 : IBM Front-End Developer

Professional Certificate - 11 course series

Getting Started with Front-End and Web Development

Course 1•14 hours•4.6(205 ratings)

Introduction to Software Engineering

Course 2•14 hours•4.7(1,477 ratings)

Designing User Interfaces and Experiences (UI/UX)

Course 3•18 hours•4.5(157 ratings)

Introduction to HTML, CSS, & JavaScript

Course 4•10 hours•4.4(176 ratings)

Developing Websites and Front-Ends with Bootstrap

Course 5•7 hours•4.4(46 ratings)

Getting Started with Git and GitHub

Course 6•10 hours•4.6(1,207 ratings)

Developing Front-End Apps with React

Course 7•14 hours•4.3(490 ratings)

Intermediate Web and Front-End Development

Course 8•12 hours•4.4(25 ratings)

Get Started with Cloud Native, DevOps, Agile, and NoSQL

Course 9•13 hours•4.8(24 ratings)

Front-End Development Capstone Project

Course 10•20 hours•4.1(20 ratings)

Software Developer Career Guide and Interview Preparation

Course 11•11 hours•4.7(139 ratings)

MD4259 : Akamai Network Engineering

Professional Certificate - 5 course series

Operating Systems Fundamentals
Course 1•30 hours•4.8(63 ratings)
Networking Fundamentals
Course 2•26 hours•4.7(53 ratings)
Managing Relational Databases
Course 3•17 hours•4.7(16 ratings)
Python Scripting Fundamentals
Course 4•33 hours
Introduction to IT Security
Course 5•22 hours•4.8(13 ratings)

Google

MD4260 : Google Project Management

Professional Certificate - 6 course series

Foundations of Project Management

Course 1•18 hours•4.9(84,008 ratings)

Project Initiation: Starting a Successful Project

Course 2•23 hours•4.8(20,727 ratings)

Project Planning: Putting It All Together

Course 3•33 hours•4.8(12,547 ratings)

Project Execution: Running the Project

Course 4•30 hours•4.8(8,488 ratings)

Agile Project Management

Course 5•28 hours•4.8(12,486 ratings)

Capstone: Applying Project Management in the Real World

Course 6•47 hours•4.8(8,981 ratings)

MD4267 : AWS Cloud Technology Consultant

Professional Certificate - 9 course series

Introduction to Information Technology and AWS Cloud

Course 1•6 hours•4.8(225 ratings)

AWS Cloud Technical Essentials

Course 2•26 hours•4.8(5,221 ratings)

Providing Technical Support for AWS Workloads

Course 3•7 hours•4.8(46 ratings)

Developing Applications in Python on AWS

Course 4•9 hours•4.6(61 ratings)

Skills for Working as an AWS Cloud Consultant

Course 5•10 hours•4.8(39 ratings)

DevOps on AWS and Project Management

Course 6•8 hours•4.8(64 ratings)

Automation in the AWS Cloud

Course 7•8 hours•4.8(35 ratings)

Data Analytics and Databases on AWS

Course 8•9 hours•4.6(35 ratings)

Capstone: Following the AWS Well Architected Framework

Course 9•11 hours•4.8(16 ratings)

Google

MD4268 : Google UX Design

Professional Certificate - 7 course series

Foundations of User Experience (UX) Design

Course 1•19 hours•4.8(67,364 ratings)

Start the UX Design Process: Empathize, Define, and Ideate

Course 2•21 hours•4.8(15,229 ratings)

Build Wireframes and Low-Fidelity Prototypes

Course 3•17 hours•4.9(8,702 ratings)

Conduct UX Research and Test Early Concepts

Course 4•20 hours•4.8(5,319 ratings)

Create High-Fidelity Designs and Prototypes in Figma

Course 5•29 hours•4.8(4,159 ratings)

Build Dynamic User Interfaces (UI) for Websites

Course 6•22 hours•4.8(3,347 ratings)

Design a User Experience for Social Good & Prepare for Jobs

Course 7•26 hours•4.8(3,722 ratings)

IC4249: DEEP LEARNING

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

Course Objectives:

1. On completion of this course, a student will be familiar with traditional Machine Learning approaches, e.g. Bayesian Classification, Multilayer Perceptron etc.
2. Understand modern Deep Learning architectures like Convolutional Neural Networks, Autoencoders etc
3. Acquire the knowledge of applying Deep Learning techniques to solve various real life problems

Course Relevance: Machine learning, Computer Vision, Machine Vision, Natural language processing

SECTION-1:
Unit -01: (5 Hrs)
Introduction to Deep Learning, Bayesian Learning, Decision Surfaces, Linear Classifiers, Linear Machines with Hinge Loss
Unit:02: (5 Hrs)
Optimization Techniques, Gradient Descent, Batch Optimization, Introduction to Neural Network, Multilayer Perceptron, Back Propagation Learning
Unit:03:(5 Hrs)
Unsupervised Learning with Deep Network, Autoencoders , Convolutional Neural Network, Building blocks of CNN, Transfer Learning
SECTION-2:
Unit:01: (5Hrs)
Revisiting Gradient Descent, Momentum Optimizer, RMSProp, Adam, Effective training in Deep Net- early stopping, Dropout, Batch Normalization, Instance Normalization, Group Normalization
Unit :02: (5 Hrs)
Recent Trends in Deep Learning Architectures, Residual Network, Skip Connection Network, Fully Connected CNN etc., Classical Supervised Tasks with Deep Learning, Image Denoising, Semantic Segmentation, Object Detection etc.
Unit :03: (5 Hrs)
LSTM Networks, Generative Modeling with DL, Variational Autoencoder, Generative Adversarial Network Revisiting Gradient Descent, Momentum Optimizer, RMSProp, Adam

List of Home Assignments:
Students can choose the following topics for Design, Blog writing, Case study and Survey
   1. Applications of NLP
   2. Applications of Health Care
   3. Applications of Computer vision
   4. Applications of Machine Vision

Assessment Scheme:
Online ESE: 30 Marks
Online ESE: 30 Marks
Comprehensive Viva Voce: 100 Marks converted to 30 equivalent Marks
Home Assignment Assessment: 100 Marks converted to 10 Marks

Text and Reference Books:
1.Deep Learning- Ian Goodfelllow, Yoshua Benjio, Aaron Courville, The MIT Press 2.Pattern Classification- Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons Inc.

Moocs Links and additional reading material:
1. Deep Learning NPTEL Course by Prof. Prabir Kumar Biswas, IIT Kharagpur. https://onlinecourses.nptel.ac.in/noc23_ee131/preview

Course Outcomes: The student will be able to –
1. Comprehend concepts of Machine learning and classification
2. Apply neural networks and back propagation
3. Understand building blocks of CNN and Autoencoders for different real time applications
4. Identify different types of optimizers and types of Normalization
5. Analyze recent Deep Learning Architectures for various real time applications
6. Explore LSTM networks, Generative Adversarial Network etc.. for various real time applications

CO PO Map:

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

CO attainment levels

CO No.	IC4242_CO1	IC4242_CO2	IC4242_CO3	IC4242_CO4	IC4242_CO5	IC4242_CO6
Attainment Level	3	3	4	4	3	3

Job Mapping: Machine Learning engineer, Computer vision expert

IC4250 : MODERN COMPUTER VISION (NPTEL COURSE)

https://onlinecourses.nptel.ac.in/noc24_ee21/preview

Week 1: Course introduction, Introduction to deep learning, Introduction to neuron

Week 2: Multilayer perceptron (MLP), Gradient descent, Backpropagation in MLP

Week 3: Optimization and regularization, Regularization and preprocessing, Convolutional neural network (CNN)

Week 4: CNN properties, CNN architectures, Introduction to recurrent neural network (RNN), Encoder-Decoder models in RNN

Week 5: Low-level vision, Spatial and frequency domain filtering, Edge detection

Week 6: Line detection, Feature detectors, Harris corner detector

Week 7: Blob detection, SIFT, Feature descriptors, SURF

Week 8: Single-view geometry, 2D Geometric transformations, Camera intrinsics and extrinsics

Week 9: Two-view stereo, Algebraic representation of epipolar geometry, Fundamental matrix computation

Week 10: Structure from motion, Batch processing in SFM, Dense 3D reconstruction

Week 11: Deepnets for stereo and SFM, Mid-level vision, Image segmentation

Week 12: Deepnets for segmentation, High-level vision, Deepnets for object detection

Books and references

R. Szeliski, Computer Vision: Algorithms and Applications, Springer, 2010 (online draft)

Course Outcomes

1) Compute the mathematics behind functioning of artificial neural networks

2) Understand concept of Multilayer perceptron, training a neural network. compute gradient descent, compute Back Propagation in MLP

3) Understand building blocks of CNN and Autoencoders for different real time applications

4) Apply spatial and frequency domain filter for images, Learn Edge detection, line detection

5) Apply 2D geometric transforms to images, Understand Algebraic representation of epipolar geometry, Fundamental matrix computation

6) Understand Deepnets for Stereo and SFM, Mid-level vision, Image segmentation, High-level vision, and Deepnets for object detection

<div align="right">**FF No. : 654**</div>

IC4372:: DESIGN THINKING -7

Course Objectives:

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

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

- What is Research?
- Importance of Paper Publications and Patents
- Structure of Paper
- Journal Publication
- Publication in Conference
- Literature Review
- Research Paper Writing
- Journal Ratings and Evaluation (How to rate a Journal?)
- Intellectual property (IP)
- Research Ethics
- Entrepreneurship

Course Outcomes:

The student will be able to

1. IC4372_CO1 Understand the importance of doing Research

2. IC4372_CO2 Interpret and distinguish different fundamental terms related to Research

3. IC4372_CO3 Apply the methodology of doing research and mode of its publication

4. IC4372_CO4 Write a Research Paper based on project work

5. IC4372_CO5 Understand Intellectual property rights

6. IC4372_CO6 Use the concepts of Ethics in Research

7. IC4372_CO7 Understand the Entrepreneurship and Business Planning

CO-PO Mapping :

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

CO attainment levels :

CO No.	IC4372_CO1	IC4372_CO2	IC4372_CO3	IC4372_CO4	IC4372_CO5	IC4372_CO6	IC4372_CO7
Attainment Level	2	2	3	6	2	3	2

IC4243 :: MAJOR PROJECT

Credits: 9   **Teaching Scheme:** Lab: 18 Hours/Week

- Major project should be real time and research based problems based on the courses studied.
- Project to be completed with detailed design, implementation, test case preparations, testing and demonstration
- It is having Group formation, discussion with faculty advisor, formation of the project statement, resource requirement, identification and implementation and Time scheduling of the project.
- continuous assessment for the activities mentioned has been carried out throughout the semester
- The student should prepare a consolidated report in LaTeX /word and submit it before term end.
- Project consists of presentation and oral examination based upon the project work demonstration of the fabricated/designed equipment or software developed for simulation. The said examination will be conducted by a panel of examiners, consisting of preferably guide working as internal examiners and another external examiner preferably from an industry or university.
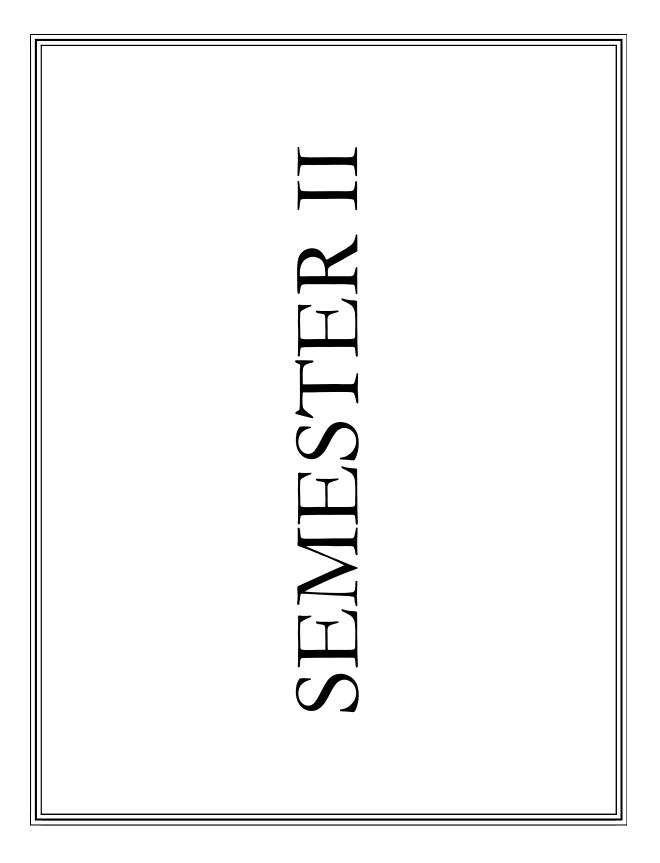
List of Project areas:
1. Control
2. Sensor
3. Embedded
4. Automotive
5. Automation (PLC, SCADA)
6. Process Instrumentation
7. Healthcare
8. Signal Processing
9. Image processing
10. Artificial Intelligence
11. IOT
12. Software

Course Outcomes:
Students will be able to
1. IC4243_CO1: Design solutions for given engineering problem [4] (PO-1,2,3,4,5,6,7 PSO- 1,2,3)
2. IC4243_CO2: Demonstrate practical knowledge by constructing models/algorithms for real time applications [4] (PO-1,2,3,4,5,6,7 PSO- 1,2,3)
3. IC4243_CO3: Express effectively in written and oral communication. [3] (PO-8,10,12 PSO- 1)
4. IC4243_CO4: Exhibit the skills to work in a team [2] (PO- 8,9,12 PSO-2)
5. IC4243_CO5: Prepare a time chart and financial record for execution of the project[1] (PO-8,11,12 PSO-3)

SEMESTER II

IC4211:: INDUSTRY INTERNSHIP

Credits: 15   **Teaching Scheme:** Working in Industry 30 Hours / Week

- Gain practical experience within the industry environment.
- Acquire knowledge of the industry in which the internship is done.
- Apply knowledge and skills learned in the classroom in a work setting.
- Develop a greater understanding about career options while more clearly defining personal career goals.
- Experience the activities and functions of business professionals.
- Develop and refine oral and written communication skills.
- Identify areas for future knowledge and skill development.

Course Outcomes:

IC4211_CO1 : Technical and Analytical Competencies : Ability to	
a)	Seek knowledge, select appropriate technologies, and apply it to different areas
b)	Develop a technical artifact requiring new technical skills.
c)	Improve problem-solving and critical thinking skills.
d)	Acquire and evaluate information
e)	Analyze or visualize data to create information

[5] PO-1, PO-3, PO-4, PO-6 PSO-1, PSO-2 PSO-3

IC4211_CO2: Skill Development / Modern Tool Usage : Ability to	
a)	learn modern engineering tools
b)	Effectively utilize appropriate software tool to complete a task
c)	Effectively utilize modern engineering tools necessary for engineering practices

[4] PO-5 PSO-1, PSO-2

IC4211_CO3: Communication & Presentation Skills: Ability to	
a)	Communicate ideas orally and in written form
b)	Report effectively the status of task completion
c)	Effectively Participate as a team member
d)	Listen effectively
e)	Present effectively

[3] PO-9, PO-10

IC4211_CO4: Professionalism: Ability to	
a)	Demonstrate understanding of professional customs and practices.
b)	Organize and maintain information
c)	Identify, understand and work with professional standards
d)	Behave professionally and ethically

[2] PO-8, PO-12

IC4211_CO5: Technical Writing: Ability to	
a)	Write requirements documentation
b)	Write Maintenance and troubleshoot report
c)	Prepare documentation of task completed

[2] PO-10, PO-12

IC4224:: GLOBAL INTERNSHIP

Credits: 15   **Teaching Scheme:** Working in Industry 30 Hours / Week

- Gain practical experience within the industry/ Institute environment.
- Acquire knowledge of the industry/ Institute in which the internship is done.
- Apply knowledge and skills learned in the classroom in a work setting.
- Develop a greater understanding about career options while more clearly defining personal career goals.
- Experience the activities and functions of business professionals.
- Develop and refine oral and written communication skills.
- Identify areas for future knowledge and skill development.
- If applicable the students should complete the following & document as applicable: Literature Review, Problem scope, Problem Definition, Requirement Analysis, Methodology to solve problem, Implementation, Preliminary results, Implementation, Observations, Results, Conclusion.

Course Outcomes

IC4224_CO1 : Technical and Analytical Competencies : Ability to		
a)	**S**eek knowledge, select appropriate technologies, and apply it to different areas	[5] PO-1, PO-3, PO-4, PO-6
b)	Develop a technical artifact requiring new technical skills.	PSO-1, PSO-2
c)	Improve problem-solving and critical thinking skills.	PSO-3
d)	Acquire and evaluate information	
e)	Analyze or visualize data to create information	
IC4224_CO2: Skill Development / Modern Tool Usage : Ability to		
a)	learn modern engineering tools	[4] PO-5
b)	Effectively utilize appropriate software tool to complete a task	PSO-1, PSO-2
c)	Effectively utilize modern engineering tools necessary for engineering practices	
IC4224_CO3: Communication & Presentation Skills: Ability to		
a)	Communicate ideas orally and in written form	[3] PO-9, PO-10
b)	Report effectively the status of task completion	
c)	Effectively Participate as a team member	
d)	Listen effectively	
e)	Present effectively	
IC4224_CO4: Professionalism: Ability to		
a)	Demonstrate understanding of professional customs and practices.	[2] PO-8, PO-12
b)	Organize and maintain information	
c)	Identify, understand and work with professional standards	
d)	Behave professionally and ethically	
IC4224_CO5: Technical Writing: Ability to		
a)	Write requirements documentation	[2] PO-10, PO-12
b)	Write Maintenance and troubleshoot report	
c)	Prepare documentation of task completed	

IC4226:: RESEARCH INTERNSHIP

Credits: 15   **Teaching Scheme:** Working in Industry 30 Hours / Week

Section 1

- Should complete the following
- Literature Review
- Problem scope
- Problem Definition
- Requirement Analysis
- Methodology to solve problem

Section 2

- Implementation
- Preliminary results
- Implementation
- Observations
- Results
- Conclusion

Course Outcomes

	IC4226_CO1 : Technical and Analytical Competencies : Ability to	
a)	Seek knowledge, select appropriate technologies, and apply it to different areas	[5] PO-1, PO-3, PO-4, PO-6 PSO-1, PSO-2 PSO-3
b)	Develop a technical artifact requiring new technical skills.	
c)	Improve problem-solving and critical thinking skills.	
d)	Acquire and evaluate information	
e)	Analyze or visualize data to create information	
	IC4226_CO2: Skill Development / Modern Tool Usage : Ability to	
a)	learn modern engineering tools	[4] PO-5 PSO-1, PSO-2
b)	Effectively utilize appropriate software tool to complete a task	
c)	Effectively utilize modern engineering tools necessary for engineering practices	
	IC4226_CO3: Communication & Presentation Skills: Ability to	
a)	Communicate ideas orally and in written form	[3] PO-9, PO-10
b)	Report effectively the status of task completion	
c)	Effectively Participate as a team member	
d)	Listen effectively	
e)	Present effectively	
	IC4226_CO4: Professionalism: Ability to	
a)	Demonstrate understanding of professional customs and practices.	[2] PO-8, PO-12
b)	Organize and maintain information	
c)	Identify, understand and work with professional standards	
d)	Behave professionally and ethically	
	IC4226_CO5: Technical Writing: Ability to	
a)	Write requirements documentation	[2] PO-10, PO-12
b)	Write Maintenance and troubleshoot report	
c)	Prepare documentation of task completed	

IC4240:: PROJECT INTERNSHIP

Credits: 15   **Teaching Scheme:** Working in Industry 30 Hours / Week

Section 1

- Should complete the following
- Literature Review
- Problem scope
- Problem Definition
- Requirement Analysis
- Methodology to solve problem

Section 2

- Implementation
- Preliminary results
- Implementation
- Observations
- Results
- Conclusion

Course Outcomes

IC4240_CO1 : Technical and Analytical Competencies : Ability to		
a)	Seek knowledge, select appropriate technologies, and apply it to different areas	[5] PO-1, PO-3, PO-4, PO-6 PSO-1, PSO-2 PSO-3
b)	Develop a technical artifact requiring new technical skills.	
c)	Improve problem-solving and critical thinking skills.	
d)	Acquire and evaluate information	
e)	Analyze or visualize data to create information	
IC4240_CO2: Skill Development / Modern Tool Usage : Ability to		
a)	learn modern engineering tools	[4] PO-5 PSO-1, PSO-2
b)	Effectively utilize appropriate software tool to complete a task	
c)	Effectively utilize modern engineering tools necessary for engineering practices	
IC4240_CO3: Communication & Presentation Skills: Ability to		
a)	Communicate ideas orally and in written form	[3] PO-9, PO-10
b)	Report effectively the status of task completion	
c)	Effectively Participate as a team member	
d)	Listen effectively	
e)	Present effectively	
IC4240_CO4: Professionalism: Ability to		
a)	Demonstrate understanding of professional customs and practices.	[2] PO-8, PO-12
b)	Organize and maintain information	
c)	Identify, understand and work with professional standards	
d)	Behave professionally and ethically	
IC4240_CO5: Technical Writing: Ability to		
a)	Write requirements documentation	[2] PO-10, PO-12
b)	Write Maintenance and troubleshoot report	
c)	Prepare documentation of task completed	

IC4372:: DESIGN THINKING -7

Course Objectives:

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

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

- What is Research?
- Importance of Paper Publications and Patents
- Structure of Paper
- Journal Publication
- Publication in Conference
- Literature Review
- Research Paper Writing
- Journal Ratings and Evaluation (How to rate a Journal?)
- Intellectual property (IP)
- Research Ethics
- Entrepreneurship

Course Outcomes:

The student will be able to

1. IC4372_CO1 Understand the importance of doing Research

2. IC4372_CO2 Interpret and distinguish different fundamental terms related to Research

3. IC4372_CO3 Apply the methodology of doing research and mode of its publication

4. IC4372_CO4 Write a Research Paper based on project work

5. IC4372_CO5 Understand Intellectual property rights

6. IC4372_CO6 Use the concepts of Ethics in Research

7. IC4372_CO7 Understand the Entrepreneurship and Business Planning

CO-PO Mapping :

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

CO attainment levels :

CO No.	IC4372_CO1	IC4372_CO2	IC4372_CO3	IC4372_CO4	IC4372_CO5	IC4372_CO6	IC4372_CO7
Attainment Level	2	2	3	6	2	3	2

IC4244:: MAJOR PROJECT

Credits: 9   **Teaching Scheme:** Lab: 18 Hours/Week

- Major project should be real time and research based problems based on the courses studied.
- Project to be completed with detailed design, implementation, test case preparations, testing and demonstration
- It is having Group formation, discussion with faculty advisor, formation of the project statement, resource requirement, identification and implementation and Time scheduling of the project.
- continuous assessment for the activities mentioned has been carried out throughout the semester
- The student should prepare a consolidated report in LaTeX /word and submit it before term end.
- Project consists of presentation and oral examination based upon the project work demonstration of the fabricated/designed equipment or software developed for simulation. The said examination will be conducted by a panel of examiners, consisting of preferably guide working as internal examiners and another external examiner preferably from an industry or university.

List of Project areas:
1. Control
2. Sensor
3. Embedded
4. Automotive
5. Automation (PLC, SCADA)
6. Process Instrumentation
7. Healthcare
8. Signal Processing
9. Image processing
10. Artificial Intelligence
11. IOT
12. Software

Course Outcomes:
Students will be able to
1. IC4244_CO1: Design solutions for given engineering problem [4] (PO-1,2,3,4,5,6,7 PSO- 1,2,3)
2. IC4244_CO2: Demonstrate practical knowledge by constructing models/algorithms for real time applications [4] (PO-1,2,3,4,5,6,7 PSO- 1,2,3)
3. IC4244_CO3: Express effectively in written and oral communication. [3] (PO-8,10,12 PSO- 1)
4. IC4244_CO4: Exhibit the skills to work in a team [2] (PO- 8,9,12 PSO-2)
5. IC4244_CO5: Prepare a time chart and financial record for execution of the project[1] (PO-8,11,12 PSO-3)