COURSE CURRICULUM

for

FOURTH YEAR B.TECH. DEGREE

in

INFORMATION TECHNOLOGY

(Applicable from the academic session 2024-2025)

Dr. B. C. Roy Engineering College

An Autonomous Institution

Approved by: All India Council for Technical Education (AICTE)

Affiliated to: Maulana Abul Kalam Azad University of Technology, West Bengal (Formerly Known as -WBUT)

Jemua Road, Durgapur, West Bengal, India,713206

Course Name: Internet of Things (IoT) Theory
Course Code: IT-701
(Semester – VII)
Course Broad Category: Professional Core Course

1. Course Prerequisite

- Basic knowledge of Computer Networks.
- Understanding of microcontrollers and embedded systems.
- Basic programming concepts.

2. Course Learning Objectives

- To understand the architecture, components, and enabling technologies of IoT.
- To explore IoT communication models and protocols.
- To analyze edge, fog, and cloud computing integration with IoT systems.
- To understand IoT data acquisition, storage, analytics, and security.

3. Teaching Methodology and Evaluation System

Teaching Methodology:
Lectures, case studies, ICT-enabled learning, demonstrations, and application-based assignments.

Evaluation System:

- Continuous Internal Evaluation (CIE) – 40 Marks
- End-Semester Examination (ESE) – 60 Marks

4. Course Content: Modules

Module	Content
1	**Introduction to IoT** • IoT definition, characteristics, and scope • IoT architecture and reference model • Enabling technologies
2	**Sensors, Actuators and Interfacing** • Types of sensors and actuators • Microcontrollers and interfacing basics • ADC, DAC, signal conditioning
3	**IoT Communication Protocols** • Zigbee, BLE, RFID • MQTT, CoAP, HTTP • IoT wireless technologies
4	**Edge, Fog, and Cloud Computing for IoT** • Edge computing fundamentals • Fog architecture • Cloud platforms (AWS IoT, Azure IoT)
5	**IoT Data and Security** • Data acquisition, storage, analytics • IoT security challenges • Authentication, encryption, access control

5. References

1. Raj Kamal, *Internet of Things*, McGraw Hill.
2. Vijay Madisetti & Arshdeep Bahga, *Internet of Things: A Hands-on Approach.*
3. Pethuru Raj, *The Internet of Things: Enabling Technologies.*
4. Dieter Uckelmann, *Architecting the Internet of Things*, Springer.

6. Course Outcomes (CO)

Course Outcome	**Details**	**Bloom's Taxonomy**	**Level**
PC-IT701.1	Understand IoT architecture, layers, and enabling technologies.	Understand	L2
PC-IT701.2	Describe IoT sensors, actuators, and interfacing mechanisms.	Understand	L2
PC-IT701.3	Apply IoT communication protocols for device interactions.	Apply	L3
PC-IT701.4	Analyze edge, fog, and cloud computing integration for IoT.	Analyze	L4
PC-IT701.5	Evaluate IoT data management and security mechanisms.	Evaluate	L5
PC-IT701.6	Design a complete IoT application.	Create	L6

7. Mapping of Course Outcomes to Course Content (Modules)

Module	CO1	CO2	CO3	CO4	CO5	CO6
1						
2						
3						
4						
5						

8. Mapping of Course Outcomes to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	0	0	0	0	0	0	0	1	0	0
CO2	1	1	0	0	0	0	0	0	0	1	0	0
CO3	2	2	2	1	1	0	0	0	1	2	0	0
CO4	2	2	2	2	1	0	0	1	1	2	0	0
CO5	3	3	2	2	2	1	1	1	1	3	0	1
CO6	3	3	3	2	2	1	1	1	2	3	1	1
AVG.	2	2	2	1.5	1.3	0.3	0.3	0.5	0.8	2	0.3	0.3

9. Mapping to Program Specific Outcomes (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1	1	1	0	0
CO2	1	1	0	0
CO3	2	2	1	0
CO4	2	2	1	1
CO5	3	2	2	1
CO6	3	3	3	2

***** End of Syllabus *****

Course Name : Human Computer Interaction

Course Code: IT-702

(Semester- VII)

Course Broad Category: Professional Core Course

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1. **Course Prerequisite:**

Human computer interaction researchers must also have knowledge of computer programming, databases, operating systems, communication skills etc.

2. **Course Learning Objectives:**

HCI has its roots in the early days of computing when the primary goal was to make computers more accessible and usable for a wide range of users. Create a interaction between humans and technology that is efficient to meets the needs of the users.

Teaching methodology and evaluation system for the course:

Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System–

A. Mid-Term Exam(20Marks)-Summative Assessment(CIA-1)
B. InternalAssessment(20Marks)-FormativeContinuousAssessment[Continuous Assessment 1(CIA-2)]
C. End-Semester Exam(60 Marks)-Summative Assessment.

3. **Course Content:**

Course Name: Human Computer Interaction

Course Code: IT-702

Hours per Week: 3L: 0T: 0P

Credits: 3

Module number	Topics	Lecture number
1	Introduction to the course and to HCI: What is HCI Its history Relation to Ergonomics Human Factors Problems and challenges Recurrent HCI Themes Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models–frameworks–Ergonomics–styles–elements– interactivity- Paradigms. The human brain vs. the computer: human information processing: Differences between humans and computers Philosophy of mind vs Brains. Circuit Boards The user as an information processing system Human sensation Perception, and cognition Problem solving and reasoning Attention and change blindness Relation of memory to HCI	10
2	Interactive Design basics–process–scenarios–navigation–screen design – Iteration and prototyping HCI in software process–software life cycle – Usability engineering Prototyping in practice– design rationale. Design rules –principles, standards, guidelines, rules. Evaluation Techniques– Universal Design. Cognitive models Socio-Organizational issues Stakeholder requirements Communication and collaboration models-Hypertext,	10
3	Multimedia and WWW. Mobile Ecosystem: Platforms Application frame works Types of Mobile Applications Widgets Applications Games-Mobile Information Architecture Mobile 2.0 Mobile Design: Elements of Mobile Design Mobile design tools Designing Web Interfaces	10

	Web interface Drag & Drop Direct Selection, Contextual Tools, Overlays	
4	Inlays and Virtual Pages, Process Flow. Case Studies. Recent Trends Speech Recognition Speech Translation, Multimodal System Two forms of design evaluation: Expert analysis and user participation Approaches to expert analysis: Cognitive walkthroughs, heuristic evaluation Model based evaluation, and evaluation based on existing research Lab vs. field research Types of user-based evaluation: Observational methods, query techniques, physiological and direct recording, and experimental methods	10

4. References:

Text Book:

- Alan Dix, J Finlay, G D Abowd, R Beale Human Computer Interaction,Prentice Hall, 2003

- **Reference Books:**
  - Jakob Nielsen, Usability Engineering, Morgan Kauffman, 1993
  - Helander, Landauer, Prabhu, Handbook of Human Computer Interaction, 2 nd Edition, Elsevier, 1997.
  - Articles from Nielsen Norman Group relating to Usability and User Experience

5. Course Outcomes(CO):

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
IT702.1	Explain the capabilities of both humans and computers from the viewpoint of human information processing.	Identify	Remember
IT702.2	Describe typical human–computer interaction (HCI) models, styles, and various historic HCI paradigms.	Explain	Understand

IT702.3	Apply an interactive design process and universal design principles to designing HCI systems.	Implement	Apply
IT702.4	Describe and use HCI design principles, standards and guidelines.	Organize	Analyze
IT702.5	Analyze and identify user models, user support, socio-organizational issues, and stakeholder requirements of HCI systems.	Assess	Evaluate
IT702.6	Discuss tasks and dialogs of relevant HCI systems based on task analysis and dialog design.	Construct	Create

6. Mapping of course outcomes to module /course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	2	-	1
2	2	3	-	1	-	1
3	2	3	3	2	-	1
4	3	-	-	2	-	1
5	2	-	-	1	3	1

7. Mapping of the Course outcomes to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	2	-	-	-	-	-	-	1
CO2	2	2	3	1	-	-	-	-	-	-	-	1
CO3	1	2	2	1	1	-	-	-	-	-	-	1
CO4	1	2	1	1	2	-	-	-	-	-	-	2
CO5	2	2	2	2	3	-	-	-	-	-	-	1
CO6	1	1	1	1	-	-	-	-	-	-	-	1

8. Mapping to Program Specific Outcome(PSO)

	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3	-
CO2	3	1	2	-
CO3	3	2	1	-

CO4	2	1	3	-
CO5	2	-	2	1
CO6	1	-	2	3

***** End of Syllabus*****

Course Name: Operation Research and Optimization
Course Code: IT-703
(Semester VII)
Course Broad Category: Open Elective Course

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1. **Course Prerequisite:**
   Concept of Mathematics in the previous semesters of B. Tech curriculum.

2. **Course Learning Objectives:**
   The primary objective of this course is to introduce students to the fundamental concepts, techniques, and applications of optimization in engineering and decision-making. The course aims to equip students with the knowledge and skills necessary to model, analyze, and solve complex optimization problems across diverse domains. By covering classical and advanced optimization methods, the course ensures a solid understanding of both theoretical concepts and practical applications.

3. **Teaching methodology and evaluation system for the course:**
   Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies, Guest Lectures.

   Evaluation System –

A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
C. End-Semester Exam (60 Marks)- Summative Assessment.

4. **Course Content:**
   Course Name: Operation Research and Optimization
   Course Code: IT-703
   Hours per Week: 3L: 0T: 0P
   Credits: 3

Module	Topics	45L
1.	**Introduction:** Historical Development, Engineering applications of optimization, Statement of an optimization problem, Classification of optimization problems.	4L
2.	**Linear Programming:** Standard form of a linear programming problem, Graphical Method, Simplex method, Charnes' Big-M Method, Duality in linear programming, Transportation Problems and Assignment Problems, Relevant applications.	15L
3.	**Geometric Programming:** Unconstrained and constrained geometric programming problems. **Integer Programming:** Integer programming: Branch and Bound, Cutting Plane Methods. Relevant applications	8L

Module	Topics	45L
4.	**Game Theory:** Introduction, Characteristics of Game Theory, Two Person, zero sum games, Pure strategy. Dominance theory. **Genetic Algorithms:** Introduction, Representation methods, Selection methods, Operators, Replacement methods, Relevant applications.	8L
5.	**Network Analysis:** Critical Path analysis- PERT-CPM. **Inventory Control:** Introduction to EOQ Models of Deterministic and Probabilistic. **Queuing Theory:** Introduction; Basic Definitions and Notations; Axiomatic Derivation of the Arrival & Departure (Poisson Queue). Poisson Queue Models: (M/M/1) and problems.	10L

5. References:

Text Book:

- J.K. Sharma- Operations Research: Theory and Applications, Macmillan India Limited
- H. A. Taha- Operations Research, Pearson Education India.
- P. M. Karak – Linear Programming and Theory of Games, ABS Publishing House
- Ghosh and Chakraborty- Linear Programming and Theory of Games, Central Book Agency
- Hira, Gupta- Operations Research,

Reference Books:

- Rao, S. S., & Rao, S. S., Engineering optimization: theory and practice. John Wiley & Sons.
- Hadley, G., Linear programming, Narosa Publishing house.
- Deb. K, Optimization for engineering design: Algorithms and examples. PHI Learning Pvt. Ltd.
- Kumar, D. N., Multicriteria analysis in engineering and management. PHI Learning Pvt. Ltd.
- Ravindran, Philips and Solberg - Operations Research, Wiley India

6. Course Outcomes (CO):

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
IT-703.1	Understand optimization fundamentals, problem classification in relation with real life problems of engineering and applied sciences.	Identify	Remember
IT-703.2	Solve optimization problems using linear and nonlinear programming techniques and their applications.	Explain	Understand
IT-703.3	Apply geometric and integer programming methods to solve constrained and unconstrained linear and non- linear problems.	Implement	Apply
IT-703.4	Utilize game theory and genetic algorithms for strategic decision-making and complex problem-solving.	Organize	Analyze
IT-703.5	Analyze and optimize networks, inventory systems, and queuing models in practical	Assess	Evaluate

	scenarios.		
IT-703.6	Build up logical and analytical skills to create a new idea appreciated by academics, research & emerging trends in industry.	Construct	Create

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	2	-	-	-	1
2	3	3	2	-	-	1
3	2	3	3	1	-	1
4	1	1	2	3	-	1
5	1	-	-	1	3	1

8. Mapping of the Course outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	2	-	-	-	-	-	-	1
CO2	1	2	3	1	-	-	-	-	-	-	-	1
CO3	1	2	2	1	1	-	-	-	-	-	-	1
CO4	1	2	1	1	2	-	-	-	-	-	-	2
CO5	2	2	2	2	3	-	-	-	-	-	-	1
CO6	1	1	1	1	-	-	-	-	-	-	-	1

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				

Course Name: Soft Skills & Interpersonal Communication

Course Code: IT-704

(Semester-VII)

Course Broad Category: Open Elective Course

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1. **Course Prerequisite:**
   NIL

2. **Course Learning Objectives:**
   I. To develop students' interpersonal communication skills for academic, professional, and social contexts.
   II. To enhance self-awareness, empathy, and emotional intelligence in interactions.
   III. To strengthen verbal and non-verbal communication for effective teamwork and leadership.
   IV. To prepare students for interviews, group discussions, and workplace communication.

3. **Teaching methodology and evaluation system for the course:**
   Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies.
   Evaluation System –
   A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
   B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
   C. End-Semester Exam (60 Marks)- Summative Assessment.

4. **Course Content:**
   Course Name: Soft Skills & Interpersonal Communication
   Course Code: IT-704
   Hours per Week: 3L: 0T: 0P
   Credits: 3

Module	Topics	Lectures
1	Fundamentals of Communication: Definition, process, and types of communication, Barriers to communication and overcoming them, Importance of interpersonal communication in academics and workplace	6
2	Verbal & Non-Verbal Communication: Oral communication: clarity, tone, articulation, Non-verbal cues: body language, gestures, eye contact, posture, Cross-cultural communication basics	8

3	Active Listening & Emotional Intelligence: Listening styles and barriers, Empathy and emotional regulation, Building rapport and trust	6
4	Public Speaking & Presentation Skills: Speech organization and delivery, Presentation design and visual aids, Handling stage fear and Q&A sessions	8
5	Teamwork & Conflict Resolution: Group dynamics and collaboration, Negotiation and persuasion skills, Conflict management strategies	6
6	Professional Communication & Career Readiness: Writing professional emails, reports, and resumes, Interview skills and mock sessions, Networking and workplace etiquette	6

5. References:

Text & References Books:

1. Seema Gupta – Soft Skill: Interpersonal & Intrapersonal Skills Development
2. Jason S. Wrench, Narissra M. Punyanunt-Carter & Katherine S. Thweatt – Interpersonal Communication: A Mindful Approach to Relationships
3. Sanjay Kumar & Pushp Lata – Communication Skills
4. Meenakshi Raman & Prakash Singh – Business Communication

6. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
IT-704.CO1	Demonstrate effective verbal and non-verbal communication in academic and professional settings.	Understand	L2
IT-704.CO2	Apply principles of active listening, empathy, and emotional intelligence in interpersonal interactions.	Apply	L3
IT-704.CO3	Exhibit confidence and clarity in public speaking, presentations, and group discussions.	Apply	L3
IT-704.CO4	Collaborate effectively in teams, resolving conflicts through constructive communication.	Analyze	L4
IT-704.CO5	Prepare and deliver professional documents (emails, reports, resumes) with appropriate tone and structure.	Understand	L2
IT-704.CO6	Integrate soft skills into career readiness activities such as interviews, networking, and workplace communication.	Apply	L3

7. **Mapping of course outcomes to module / course content**

Module	CO1	CO2	CO3	CO4	CO5	CO6
1						
2						
3						
4						
5						
6						

8. **Mapping of the Course Outcomes to Program Outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

9. **Mapping to PSO**

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				

***** End of Syllabus*****

Course Name: Essence of Indian Knowledge Tradition

Course Code: IT-705

(Semester-VII)

Course Broad Category: Open Elective Course

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1. **Course Prerequisite:**
   NIL

2. **Course Learning Objectives:**
   I. To introduce students to the philosophical, cultural, and scientific foundations of Indian knowledge traditions.
   II. To explore the holistic worldview embedded in Indian texts, practices, and heritage.
   III. To understand the relevance of Indian knowledge systems in contemporary life and professional domains.
   IV. To cultivate appreciation for India's contributions to philosophy, science, arts, and social thought.

3. **Teaching methodology and evaluation system for the course:**
   Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies.
   Evaluation System –
   A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
   B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
   C. End-Semester Exam (60 Marks)- Summative Assessment.

4. **Course Content:**
   Course Name: Essence of Indian Knowledge Tradition
   Course Code: IT-705
   Hours per Week: 3L: 0T: 0P
   Credits: 3

Module	Topics	Lectures
1	Introduction to Indian Knowledge Systems: Concept of knowledge in Indian tradition, Sources: Vedas, Upanishads, Smritis, Puranas, Holistic worldview: Dharma, Artha, Kama, Moksha	6
2	Philosophical Foundations: Six schools of Indian philosophy (Shad Darshanas), Concepts of self, consciousness, and reality, Ethics and values in Indian thought	8

3	Scientific & Mathematical Traditions: Contributions in mathematics: Aryabhata, Brahmagupta, Astronomy and cosmology in Indian texts, Ayurveda and holistic health practices	6
4	Arts, Literature & Aesthetics: Sanskrit literature and regional knowledge traditions, Natya Shastra and aesthetics (Rasa theory), Music, dance, and architecture as knowledge systems	6
5	Social & Cultural Dimensions: Education systems: Gurukula, Nalanda, Takshashila, Social harmony and community practices, Role of women and inclusivity in traditions	6
6	Contemporary Relevance: Indian knowledge traditions and sustainability, Yoga, meditation, and wellness practices, Relevance in modern professional and personal life	6

5. References:

Text & References Books:

1. Essence of Indian Knowledge Tradition by NPTEL/AICTE model curriculum
2. Kapil Kapoor – Indian Knowledge Systems
3. Debi Prasad Chattopadhyaya – History of Science, Philosophy and Culture in Indian Civilization

6. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
IT-705.CO1	Explain the philosophical foundations of Indian knowledge traditions and their holistic worldview.	Understand	L2
IT-705.CO2	Identify key contributions of Indian thinkers in philosophy, science, mathematics, medicine, and arts.	Understand	L2
IT-705.CO3	Analyze the ethical and value-based dimensions of Indian traditions in personal and social contexts.	Analyze	L4
IT-705.CO4	Demonstrate awareness of Indian cultural practices, literature, and heritage as knowledge systems.	Apply	L3
IT-705.CO5	Relate Indian knowledge traditions to contemporary challenges in sustainability, wellness, and social harmony.	Understand	L2
IT-705.CO6	Apply insights from Indian knowledge traditions to professional and personal development.	Apply	L3

7. **Mapping of course outcomes to module / course content**

Module	CO1	CO2	CO3	CO4	CO5	CO6
1						
2						
3						
4						
5						
6						

8. **Mapping of the Course Outcomes to Program Outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

9. **Mapping to PSO**

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				

***** End of Syllabus*****

Course Name: Economics for Engineers

Course Code: IT-706

(Semester-VII)

Course Broad Category: Value Added Course

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1. **Course Prerequisite:**
   Engineering Mathematics and Statistics.

2. **Course Learning Objectives:**
   I. Understand the role and scope of Engineering Economics and the process of economic decision making
   II. Understand the different concepts of cost and different cost estimation techniques
   III. Appreciation of the role of uncertainty in future events and using different concepts from probability to deal with uncertainty
   IV. Understand the concepts of Depreciation and Replacement analysis along with their methods of calculation
   V. Familiarization with the phenomenon of inflation and the use of price indices in engineering Economics
   VI. Introduction to basic concepts of Accounting and Financial Management

3. **Teaching methodology and evaluation system for the course:**
   Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies.
   Evaluation System –
   A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
   B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
   C. End-Semester Exam (60 Marks)- Summative Assessment.

4. **Course Content:**
   Course Name: Economics for Engineers
   Course Code: IT-706
   Hours per Week: 3L: 0T: 0P
   Credits: 3

Module	Topics	Lectures
1	Economic Decisions Making– Overview, Problems, Role, Decision making process, Engineering Costs & Estimation – Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring and Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life - Cycle Costs; Types Of Estimate,	9

	Estimating Models – Per Unit Model, Segmenting Model, Cost Indexes, Power Sizing Model, Improvement & Learning Curve, Benefits.	
2	Cash Flow, Interest and Equivalence: Cash Flow – Diagrams, Categories & Computation, Time Value of Money, Debt repayment, Nominal& Effective Interest. Cash Flow & Rate of Return Analysis – Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate of Return, Calculating Rate of Return, Incremental Analysis; Best Alternative Choosing an Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity and Breakeven Analysis. Economic Analysis in the Public Sector - Quantifying and Valuing Benefits & Drawbacks.	9
3	Inflation and Price Change – Definition, Effects, Causes, Price change with Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes in Engineering Economic Analysis, Cash Flows that inflate at different Rates. Present Worth Analysis: End-Of- Year Convention, Viewpoint of Economic Analysis Studies, Borrowed Money Viewpoint, Effect of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives. Uncertainty In Future Events - Estimates and Their Use in Economic Analysis, Range of Estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk, and Risk vs Return, Simulation, Real Options.	9
4	Depreciation - Basic Aspects, Deterioration & Obsolescence, Depreciation and Expenses, Types of Property, Calculation, Depreciation Fundamentals, Depreciation and Capital Allowance Methods, Straight-Line Depreciation Declining Balance Depreciation, Common Elements of Tax Regulations for Depreciation and Capital Allowances. Replacement Analysis - Replacement Analysis Decision Map, Minimum Cost Life of a New Asset, Marginal Cost, Minimum Cost Life Problems. Accounting – Function, Balance Sheet, Income Statement, Financial Ratios, Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost Allocation.	9

5. References:

Text & References Books:

1. James L. Riggs, David D. Bedworth, Sabah U. Randhawa: Economics for Engineers 4e, Tata McGraw Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle: Engineering Economics Analysis, OUP

3. John A. White, Kenneth E. Case, David B. Pratt: Principle of Engineering Economic Analysis, John Wiley
4. Sullivan and Wicks: Engineering Economy, Pearson
5. R. Paneer Seelvan: Engineering Economics, PHI

6. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
IT-706.CO1	Analyze problems, identify relevant costs (fixed, variable, sunk, opportunity, incremental, life cycle), and utilize estimation models (per-unit, segmenting, cost indexes, power sizing, learning curve) to support rational economic decisions.	Understand	L2
IT-706.CO2	Demonstrate the ability to construct cash flow diagrams, compute time value of money, debt repayment schedules, and apply rate of return methods (IRR, incremental analysis, benefit-cost ratio, sensitivity and breakeven analysis) to select optimal alternatives in both private and public sector contexts	Understand	L2
IT-706.CO3	Use price indexes, present worth techniques, and multiple alternative comparisons to assess the effects of inflation, taxes, and borrowed money viewpoints on engineering projects under uncertain future events.	Apply	L3
IT-706.CO4	Model probability distributions, expected values, decision trees, and simulations to evaluate risk-return tradeoffs and real options in project evaluation.	Apply	L3
IT-706.CO5	Calculate depreciation using straight-line, declining balance, and other capital allowance methods, and apply replacement analysis techniques to determine minimum cost life and optimal asset replacement strategies.	Analyze	L4
IT-706.CO6	Explain accounting functions, prepare and interpret balance sheets and income statements, compute financial ratios, and distinguish between direct and indirect costs for effective cost allocation and decision-making.	Apply	L3

7. **Mapping of course outcomes to module / course content**

Module	CO1	CO2	CO3	CO4	CO5	CO6
1						
2						
3						
4						
5						
6						

8. **Mapping of the Course Outcomes to Program Outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

9. **Mapping to PSO**

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				

***** End of Syllabus*****

Course Name: Internet of Things Laboratory
Course Code: IT-791
(Semester – VII)
Course Broad Category: Professional Core Course

1. Course Prerequisite

- Basic knowledge of IoT theory and concepts.
- Familiarity with microcontrollers (Arduino/ESP32/NodeMCU).
- Basics of programming (Python/C/C++).
- Fundamental understanding of networking and communication protocols.

2. Course Learning Objectives

- To develop hands-on skills in IoT hardware and sensor interfacing.
- To implement IoT communication protocols such as UART, SPI, I2C, Wi-Fi, MQTT.
- To integrate IoT devices with cloud platforms (Firebase, ThingsBoard, ThingSpeak).
- To design dashboards for real-time visualization and analytics.
- To complete IoT mini-projects while following ethical and safety norms. **Open Source Tools:** Arduino IDE, Python/Thonny, Node-RED, Mosquitto MQTT, Firebase, ThingsBoard.

3. Teaching Methodology and Evaluation System

Teaching Methodology:
Hands-on laboratory practice, mini-projects, demonstrations, presentations, interactive discussions, and real-world IoT case studies.

Evaluation System:

- Internal Assessment (PCIA) – 60 Marks
- End-Semester Practical Exam – 40 Marks

4. Course Content: Experiments

Experiment	Content
1	Study of Arduino/ESP32/Raspberry Pi pin configuration and environment setup
2	Interfacing LED, buzzer, relay, servo motor, and LCD with microcontrollers
3	Interfacing sensors: temperature, humidity, IR, ultrasonic, LDR, gas sensors
4	Implement UART, SPI, and I2C communication protocols
5	Wi-Fi programming and MQTT publish–subscribe using Mosquitto broker
6	Data logging to cloud platforms: ThingSpeak / Firebase
7	Build IoT dashboards using Node-RED or ThingsBoard
8	Sending alert notifications (SMS/Email/Telegram Bot)
9	Home automation using ESP32/NodeMCU with mobile app control
10	Environmental monitoring system with live dashboard
11	Smart irrigation system with sensor-based actuation
12	Mini project: smart parking / health monitoring / energy meter / smart door lock
13	Documentation: report preparation, hardware diagrams, code repository
14	Final project presentation and demonstration

5. References

Textbooks

1. Raj Kamal, *Internet of Things*, McGraw Hill.
2. Vijay Madisetti and Arshdeep Bahga, *Internet of Things: A Hands-on Approach.*

Reference Books

1. Pethuru Raj, *The Internet of Things: Enabling Technologies.*
2. Dieter Uckelmann, *Architecting IoT*, Springer.

E-Resources

- NPTEL: Introduction to IoT
- Cisco IoT Fundamentals
- IEEE IoT Journal Articles

6. Course Outcomes (CO)

Course Outcome	**Details**	**Bloom's Taxonomy**	**Level**
PCIT791.1	Demonstrate interfacing of sensors and actuators with microcontrollers	Understand	L2
PCIT791.2	Implement IoT communication protocols (UART, SPI, I2C, Wi-Fi, MQTT)	Apply	L3
PCIT791.3	Develop IoT applications using ESP32/Raspberry Pi with cloud platforms	Apply	L3
PCIT791.4	Design dashboards for IoT data visualization and analytics	Analyze	L4
PCIT791.5	Execute and document complete IoT mini-projects with ethical norms	Evaluate	L5
PCIT791.6	Apply IoT concepts to design innovative real-world solutions	Create	L6

7. Mapping of Course Outcomes to Course Content

Experiment	CO1	CO2	CO3	CO4	CO5	CO6
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						

8. Mapping of Course Outcomes to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	2	1	1	1	2	2	2	1
CO2	3	3	3	2	3	1	1	1	2	2	2	1
CO3	3	3	3	2	3	2	1	1	3	3	2	1
CO4	2	2	2	3	3	2	1	1	2	3	3	1
CO5	3	3	3	3	3	3	2	2	3	3	3	2
CO6	3	3	3	3	3	3	3	2	3	3	3	2
AVG.	2.8	2.8	2.7	2.3	3.0	2.0	1.7	1.5	2.5	2.8	2.5	1.7

9. Mapping to Program Specific Outcomes (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	
CO2	3	1	3	
CO3	3	2	3	
CO4	3	2	3	
CO5	3	2	3	
CO6	3	2	3	

***** End of Syllabus *****

Course Name: Human Computer Interaction Laboratory

Course Code: IT-792

(Semester- VII)

Course Broad Category: Professional Core Course

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1. **Course Prerequisite:**
   Programming experience to solve various problem.

2. **Course Learning Objectives:**
   The purpose of image processing is to enhance visual quality, extract useful information.
3. **Teaching methodology and evaluation system for the course:**
   Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System–

A. Internal Assessment(60Marks)-Formative Continuous Assessment
B. End-Semester Exam(40Marks)-Summative Assessment.

4. **Course Content:**

Course Name: Image Processing Lab

Course Code: IT-691

Hours per Week: 0L: 0T: 4P

Credits: 2

Number of Experimants	Experimants
1	To understand the trouble of interacting with machines
2	Paper prototype-Design elements of GUI
3	Implement GOMS modeling technique to model user's behaviour in given scenario
4	GOMS model - Adding items to a cart of e-shopping website..
5	Design a user interface in Python.
6	To Redesign existing Graphical User Interface with screen complexity

5. References:

Text Book:

- Human-Computer Interaction (Hardcover) by Alan Dix
- Measuring the User Experience: Collecting, Analyzing, and Presenting Usability Metrics (Interactive Technologies)

Reference Books:

Fundamentals of Digital Image Processing (Paperback) by Anil K. Jain

6. Course Outcomes(CO):

Course Outcomes	**Details/Statement**	**Action Verb**	**Knowledge Level**
IT792.1	User centric design approaches that contribute to the development of usable interface and interaction are focused.	Identify	Remember

IT792.2	User interface GUI creation.	Explain	Understand
IT792.3	Modeling techniques implementation.	Implement	Apply
IT792.4	Shopping website creation.	Organize	Analyze
IT792.5	Redesign for GUI.	Assess	Evaluate
IT792.6	GUI complexity measurement.	Construct	Create

7. Mapping of course outcomes to module /course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	2	-	1
2	2	3	-	1	-	1
3	2	3	3	2	-	1
4	3	-	-	2	-	1
5	2	-	-	1	3	1

8. Mapping of the Course outcomes to Program Outcomes (PO)

	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	1	2	1	1	2	-	-	-	-	-	-	1
CO2	2	2	3	1	-	-	-	-	-	-	-	1
CO3	1	2	2	1	1	-	-	-	-	-	-	1
CO4	1	2	1	1	2	-	-	-	-	-	-	2
CO5	2	2	2	2	3	-	-	-	-	-	-	1
CO6	1	1	1	1	-	-	-	-	-	-	-	1

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1	2	1	3	-

CO2	3	1	2	-
CO3	3	2	1	-
CO4	2	1	3	-
CO5	2	-	2	1
CO6	1	-	2	3

***** End of Syllabus*****