

**SEMESTER S4**  
**COMPUTER NETWORKS**

<b>Course Code</b>	<b>PEEVT414</b>	<b>CIE Marks</b>	40
<b>Teaching Hours/Week (L: T:P: R)</b>	3:0:0:0	<b>ESE Marks</b>	60
<b>Credits</b>	3	<b>Exam Hours</b>	2 Hrs. 30 Min.
<b>Prerequisites (if any)</b>	None	<b>Course Type</b>	Theory

**Course Objectives:**

1. To give the basic concepts of computer network and working of layers, protocols and interfaces in a computer network.
2. To introduce the fundamental techniques used in implementing secure network communications and give them an understanding of common threats and its defences.

**SYLLABUS**

<b>Module No.</b>	<b>Syllabus Description</b>	<b>Contact Hours</b>
<b>1</b>	<b>Introduction to computer communication:</b> Transmission modes, asynchronous, synchronous, simplex, half duplex, full duplex communication. Switching Network criteria, physical structures, network models, categories of networks, Interconnection of Networks Network models, OSI model, TCP/IP protocol suite.	<b>9</b>
<b>2</b>	<b>Physical layer:</b> Guided and unguided transmission media <b>Data Link Layer:</b> Framing, Flow control (stop and wait , sliding window flow control) Error control, Error detection( check sum, CRC), Bit stuffing, Ethernet (802.3), CSMA/CD, Logical link control, Wireless LAN (802.11), CSMA/CA	<b>9</b>
<b>3</b>	<b>Network Layer:</b> Routing and Forwarding, Static routing and Dynamic routing, IPv4 & IPV6, Address Resolution protocols (ARP, RARP) Routing Algorithms: Distance vector routing algorithm, Routing Protocols: Routing Information protocol (RIP), Networking devices - Hubs, Bridges & Switches <b>Transport Layer:</b> UDP, TCP, Congestion Control & Quality of Service –	<b>9</b>

	Data traffic. <b>Application Layer:</b> Introduction	
<b>4</b>	Information security: common attacks Security at Application Layer (E-MAIL, PGP and S/MIME). Security at Transport Layer (SSL and TLS). Security at Network Layer (IPSec). Firewalls, limitations of firewalls,	<b>9</b>

**Course Assessment Method**  
(CIE: 40 marks, ESE: 60 marks)

**Continuous Internal Evaluation Marks (CIE):**

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written )	Total
<b>5</b>	<b>15</b>	<b>10</b>	<b>10</b>	<b>40</b>

**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions*

Part A	Part B	Total
<ul style="list-style-type: none"> <li>• 2 Questions from each module.</li> <li>• Total of 8 Questions, each carrying 3 marks</li> </ul> <p style="text-align: center;"><b>(8x3 =24marks)</b></p>	<ul style="list-style-type: none"> <li>• Each question carries 9 marks.</li> <li>• Two questions will be given from each module, out of which 1 question should be answered.</li> <li>• Each question can have a maximum of 3 sub divisions.</li> </ul> <p style="text-align: center;"><b>(4x9 = 36 marks)</b></p>	<b>60</b>

**Course Outcomes (COs)**

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
<b>CO1</b>	Summarize the principles and components of computer networks, switching, and the layered network architecture.	<b>K2</b>
<b>CO2</b>	Demonstrate protocols and the functions of different layers.	<b>K2</b>
<b>CO3</b>	Analyse the concept of routing and addressing protocols in the context of computer networking	<b>K3</b>
<b>CO4</b>	Outline the basic concepts of information security at different layers of computer networks.	<b>K2</b>

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

**CO-PO Mapping Table:**

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

<b>Text Books</b>				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Computer Network A Top-down Approach Featuring the Internet	J F Kurose and K W Ross	Pearson Education	3/e, 2010
2	Cryptography & Network Security	Behrouz A. Forouzan	Tata McGraw-HillQ	IV Edition,2008

<b>Reference Books</b>				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Data Communications and Networking	Behrouz A. Forouzan	Tata McGraw-HillQ	IV Edition,2006
2	Computer Network- A System Approach	Larry Peterson and Bruce S Davie	Elsevier India	IV Edition,2011

<b>Video Links (NPTEL, SWAYAM...)</b>	
Module No.	Link ID
1	<a href="https://youtu.be/O--rkQNKqls?si=ChlxAJyFFuJvPUWc">https://youtu.be/O--rkQNKqls?si=ChlxAJyFFuJvPUWc</a>
2	<a href="https://youtu.be/rGWPOm3ectk?si=4fJ24XFXyAXL9hWo">https://youtu.be/rGWPOm3ectk?si=4fJ24XFXyAXL9hWo</a>
3	<a href="https://youtu.be/5vbPS-KnhvI?si=oRj_WZ209CZQTzhv">https://youtu.be/5vbPS-KnhvI?si=oRj_WZ209CZQTzhv</a>
4	<a href="https://youtu.be/P1uAtSaHfHU?si=EFfnahZex4BFfbZG">https://youtu.be/P1uAtSaHfHU?si=EFfnahZex4BFfbZG</a>

## SEMESTER S3/S4

### ECONOMICS FOR ENGINEERS

<b>Course Code</b>	<b>UCHUT346</b>	<b>CIE Marks</b>	50
<b>Teaching Hours/Week (L: T:P: R)</b>	2:0:0:0	<b>ESE Marks</b>	50
<b>Credits</b>	2	<b>Exam Hours</b>	2 Hrs. 30 Min.
<b>Prerequisites (if any)</b>	None	<b>Course Type</b>	Theory

#### Course Objectives:

1. To provide students with an understanding of fundamental economic principles essential for effective decision-making in engineering contexts.
2. To enable students to apply economic analysis to production decisions, cost management, and market strategies in engineering practice.
3. To equip students with the ability to evaluate macroeconomic scenarios, financial methods, and investment decisions relevant to engineering projects.

#### SYLLABUS

<b>Module No.</b>	<b>Syllabus Description</b>	<b>Contact Hours</b>
<b>1</b>	Basic economic problems – Production Possibility Curve – Utility – Law of diminishing marginal utility –Demand: Factors determining demand – Law of Demand – Demand curve- Price elasticity of demand- measurement of price elasticity and its applications – Supply: factors determining supply - Law of supply – Supply curve- Equilibrium price determination- Changes in demand and supply and its effects on equilibrium price and quantity  Production: Production function - Law of variable proportion –Returns to scale- Cobb-Douglas Production Function	<b>6</b>
<b>2</b>	Cost: Cost concepts – Private cost and social cost – Sunk cost – Opportunity cost -Explicit and implicit cost –Short run cost curves –Long run average cost curve -Revenue concepts – Break-even point  Market: Perfect Competition – Monopoly - Monopolistic Competition (features and equilibrium of a firm) - Oligopoly – Features – Kinked demand model	<b>6</b>

<b>3</b>	National income: Concepts (GDP, GNP and NNP)– Final goods and Intermediate goods - Methods of Estimation –output method – expenditure method-- Difficulties in the measurement of national income.  Inflation: Causes and Effects – Measures to Control Inflation - Monetary and Fiscal policies – Repo and reverse repo rate	<b>6</b>
<b>4</b>	Value Analysis and value Engineering: Cost Value, Exchange Value, Use Value, Esteem Value - Aims, Advantages and Application areas of Value Engineering - Value Engineering Procedure  Capital Budgeting: Time value of money - Net Present Value Method - Benefit Cost Ratio – Internal Rate of Return – Payback – Accounting Rate of Return.	<b>6</b>

**Course Assessment Method**  
(CIE: 50 marks, ESE: 50 marks)

**Continuous Internal Evaluation Marks (CIE):**

Attendance	Assignment/Case Study/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written )	Total
<b>10</b>	<b>15</b>	<b>12.5</b>	<b>12.5</b>	<b>50</b>

**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions*

Part A	Part B	Total
<ul style="list-style-type: none"> <li>• Minimum 1 and Maximum 2 Questions from each module.</li> <li>• Total of 6 Questions, each carrying 3 marks (6x3 =18 marks)</li> </ul>	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 2 sub divisions. Each question carries 8 marks.  (4x8 = 32 marks)	<b>50</b>

## Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
<b>CO1</b>	Understand the fundamentals of various economic issues using laws and learn the concepts of demand, supply, elasticity and production function.	<b>K2</b>
<b>CO2</b>	Develop decision making capability by applying concepts relating to costs and revenue, and acquire knowledge regarding the functioning of firms in different market situations.	<b>K3</b>
<b>CO3</b>	Outline the macroeconomic principles of monetary and fiscal systems and national income.	<b>K2</b>
<b>CO4</b>	Make use of the possibilities of value analysis and engineering, and take investment decisions through capital budgeting techniques.	<b>K3</b>

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

### CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	-	-	-	-	-	1	-	-	-	-	1	-
<b>CO2</b>	-	-	-	-	-	1	1	-	-	-	1	-
<b>CO3</b>	-	-	-	-	1	-	-	-	-	-	2	-
<b>CO4</b>	-	-	-	-	1	1	-	-	-	-	2	-

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Managerial Economics	Geetika, Piyali Ghosh and Chodhury	Tata McGraw Hill,	2015
2	Engineering Economy	H. G. Thuesen, W. J. Fabrycky	PHI	1966
3	Engineering Economics	R. Paneerselvam	PHI	2012
4	Financial Management	I M Pandey	Vikas Publishing House	2015

<b>Reference Books</b>				
<b>Sl. No</b>	<b>Title of the Book</b>	<b>Name of the Author/s</b>	<b>Name of the Publisher</b>	<b>Edition and Year</b>
<b>1</b>	Engineering Economy	Leland Blank P.E, Anthony Tarquin P. E.	Mc Graw Hill	7 <sup>TH</sup> Edition
<b>2</b>	Indian Financial System	Khan M. Y.	Tata McGraw Hill	2011
<b>3</b>	Engineering Economics and analysis	Donald G. Newman, Jerome P. Lavelle	Engg. Press, Texas	2002
<b>4</b>	Contemporary Engineering Economics	Chan S. Park	Prentice Hall of India Ltd	2001
<b>5</b>	Financial Management: Theory and Practice	Prasanna Chandra	Mc Graw Hill	2007

## **MODEL QUESTION PAPER**

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

**THIRD SEMESTER B. TECH DEGREE EXAMINATION, MONTH AND YEAR**

**Course Code: UCHUT346**

**Course Name: Economics for Engineers**

Max. Marks: 50

Duration: 2 hours 30 minutes

### **PART A**

*Answer all questions. Each question carries 3 marks*

			CO	Marks
1		What are the central problems of an economy?	CO1	(3)
2		Point out any three applications of price elasticity of demand.	CO1	(3)
3		What is the social cost of production?	CO2	(3)
4		What is repo rate?	CO3	(3)
5		What is esteem value?	CO4	(3)
6		Write a short note on time value of money.	CO4	(3)

### **PART B**

*Answer any one full question from each module. Each question carries 8 marks*

#### **Module 1**

9	a)	Suppose a country is producing at a point inside the production possibility curve. Draw a PPC and examine this situation.	CO1	(5)
	b)	State the law of demand. Point out any two exceptions of this law.	CO1	(3)
10	a)	A consumer purchases 10 units of a commodity when its price is Rs.100. Later when its price falls to Rs.90, he purchases 8 units only. Estimate price elasticity. What type of a commodity is this?	CO1	(5)
	b)	State the law of variable proportion.	CO1	(3)

<b>Module 2</b>				
11	a)	What is oligopoly? Why price is rigid under oligopoly?	CO2	(5)
	b)	The cost function of a firm is given as $TC=1000+10Q-6Q^2+Q^3$ . Calculate fixed cost, variable cost and marginal cost when output is 10 units.	CO2	(3)
12	a)	Suppose a firm is earning super normal profit under monopolistic market condition. Explain this situation by drawing a diagram.	CO2	(5)
	b)	Suppose a firm sells its product at a price of Rs.10 per unit and its average variable cost is Rs.6. If the firm spend Ra.10000 as rent and pay Rs. 6000 as interest every month, estimate its break-even level of output.	CO2	(3)
<b>Module 3</b>				
13	a)	What is inflation? How does inflation affect investment and production.	CO3	(5)
	b)	How will you obtain NNP <sub>fc</sub> from GDP <sub>mp</sub> .	CO3	(3)
14	a)	From the data given below (In Rs. Crores) estimate GDP <sub>mp</sub> and national income.  Private final consumption expenditure = 1000, Government expenditure = 500, Invest expenditure = 700, Net exports = 300, Depreciation = 200, NFIA=(-200) and Net indirect tax = 100	CO3	(5)
	b)	What is bank rate? Examine the bank rate policy of the government during inflation.	CO3	(3)
<b>Module 4</b>				
15	a)	Examine the procedures of value engineering.	CO4	(5)
	b)	Examine the application areas of value engineering	CO4	(3)

16	a)	1. Suppose the initial investment of a project is Rs. 3000 (Crores) and the cost of capital or the opportunity cost of capital is 10 percent. Calculate NPV of the project based on the cash flows given below.  Year                    1            2            3            4            5 Cash flow            1000    900    800    700    600 (In Crores)	CO4	(5)
	b)	Point out any three merits of NPV method.	CO4	(3)
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## SEMESTER S3/S4

### ENGINEERING ETHICS AND SUSTAINABLE DEVELOPMENT

<b>Course Code</b>	<b>UCHUT347</b>	<b>CIE Marks</b>	50
<b>Teaching Hours/Week (L: T:P: R)</b>	2:0:0:0	<b>ESE Marks</b>	50
<b>Credits</b>	2	<b>Exam Hours</b>	2 Hrs. 30 Min.
<b>Prerequisites (if any)</b>	None	<b>Course Type</b>	Theory

#### Course Objectives:

1. Equip with the knowledge and skills to make ethical decisions and implement gender-sensitive practices in their professional lives.
2. Develop a holistic and comprehensive interdisciplinary approach to understanding engineering ethics principles from a perspective of environment protection and sustainable development.
3. Develop the ability to find strategies for implementing sustainable engineering solutions.

### SYLLABUS

<b>Module No.</b>	<b>Syllabus Description</b>	<b>Contact Hours</b>
<b>1</b>	<p><b>Fundamentals of ethics</b> - Personal vs. professional ethics, Civic Virtue, Respect for others, <b>Profession and Professionalism</b>, Ingenuity, diligence and responsibility, Integrity in design, development, and research domains, Plagiarism, a balanced outlook on law - challenges - case studies, <b>Technology and digital revolution</b>-Data, information, and knowledge, Cybertrust and cybersecurity, Data collection &amp; management, <b>High technologies: connecting people and places</b>-accessibility and social impacts, <b>Managing conflict</b>, Collective bargaining, <b>Confidentiality</b>, Role of confidentiality in moral integrity, <b>Codes of Ethics</b>.</p> <p><b>Basic concepts in Gender Studies</b> - sex, gender, sexuality, gender spectrum: beyond the binary, gender identity, gender expression, gender stereotypes, <b>Gender disparity and discrimination in education</b>,</p>	<b>6</b>

	employment and everyday life, History of women in Science & Technology, Gendered technologies & innovations, <b>Ethical values and practices in connection with gender</b> - equity, diversity & gender justice, <b>Gender policy and women/transgender empowerment initiatives.</b>	
2	<b>Introduction to Environmental Ethics:</b> Definition, importance and historical development of environmental ethics, key philosophical theories (anthropocentrism, biocentrism, ecocentrism). <b>Sustainable Engineering Principles:</b> Definition and scope, triple bottom line (economic, social and environmental sustainability), life cycle analysis and sustainability metrics. <b>Ecosystems and Biodiversity:</b> Basics of ecosystems and their functions, Importance of biodiversity and its conservation, Human impact on ecosystems and biodiversity loss, An overview of various ecosystems in Kerala/India, and its significance. <b>Landscape and Urban Ecology:</b> Principles of landscape ecology, Urbanization and its environmental impact, Sustainable urban planning and green infrastructure.	6
3	<b>Hydrology and Water Management:</b> Basics of hydrology and water cycle, Water scarcity and pollution issues, Sustainable water management practices, Environmental flow, disruptions and disasters. <b>Zero Waste Concepts and Practices:</b> Definition of zero waste and its principles, Strategies for waste reduction, reuse, reduce and recycling, Case studies of successful zero waste initiatives. <b>Circular Economy and Degrowth:</b> Introduction to the circular economy model, Differences between linear and circular economies, degrowth principles, Strategies for implementing circular economy practices and degrowth principles in engineering. <b>Mobility and Sustainable Transportation:</b> Impacts of transportation on the environment and climate, Basic tenets of a Sustainable Transportation design, Sustainable urban mobility solutions, Integrated mobility systems, E-Mobility, Existing and upcoming models of sustainable mobility solutions.	6
4	<b>Renewable Energy and Sustainable Technologies:</b> Overview of renewable energy sources (solar, wind, hydro, biomass), Sustainable technologies in energy production and consumption, Challenges and opportunities in renewable energy adoption. <b>Climate Change and Engineering Solutions:</b> Basics of climate change science, Impact of climate change on natural and human systems, Kerala/India and the Climate crisis, Engineering solutions to mitigate, adapt and build resilience to climate change. <b>Environmental</b>	6

	<p><b>Policies and Regulations:</b> Overview of key environmental policies and regulations (national and international), Role of engineers in policy implementation and compliance, Ethical considerations in environmental policy-making. <b>Case Studies and Future Directions:</b> Analysis of real-world case studies, Emerging trends and future directions in environmental ethics and sustainability, Discussion on the role of engineers in promoting a sustainable future.</p>	
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**Course Assessment Method  
(CIE: 50 marks , ESE: 50)**

**Continuous Internal Evaluation Marks (CIE):**

Continuous internal evaluation will be based on individual and group activities undertaken throughout the course and the portfolio created documenting their work and learning. The portfolio will include reflections, project reports, case studies, and all other relevant materials.

- The students should be grouped into groups of size 4 to 6 at the beginning of the semester. These groups can be the same ones they have formed in the previous semester.
- Activities are to be distributed between 2 class hours and 3 Self-study hours.
- The portfolio and reflective journal should be carried forward and displayed during the 7th Semester Seminar course as a part of the experience sharing regarding the skills developed through various courses.

Sl. No.	Item	Particulars	Group/ Individual (G/I)	Marks
1	Reflective Journal	Weekly entries reflecting on what was learned, personal insights, and how it can be applied to local contexts.	I	5
2	Micro project  (Detailed documentation of the project, including methodologies, findings, and reflections)	1 a) Perform an Engineering Ethics Case Study analysis and prepare a report  1 b) Conduct a literature survey on 'Code of Ethics for Engineers' and prepare a sample code of ethics	G	8
		2. Listen to a TED talk on a Gender-related topic, do a literature survey on that topic and make a report citing the relevant papers with a specific analysis of the Kerala context	G	5
		3. Undertake a project study based on the concepts of sustainable development* - Module II, Module III & Module IV	G	12
3	Activities	2. One activity* each from Module II, Module III & Module IV	G	15
4	Final Presentation	A comprehensive presentation summarising the key takeaways from the course, personal reflections, and proposed future actions based on the learnings.	G	5
Total Marks				<b>50</b>

\*Can be taken from the given sample activities/projects

**Evaluation Criteria:**

- **Depth of Analysis:** Quality and depth of reflections and analysis in project reports and case studies.
- **Application of Concepts:** Ability to apply course concepts to real-world problems and local contexts.
- **Creativity:** Innovative approaches and creative solutions proposed in projects and reflections.
- **Presentation Skills:** Clarity, coherence, and professionalism in the final presentation.

### Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
<b>CO1</b>	Develop the ability to apply the principles of engineering ethics in their professional life.	<b>K3</b>
<b>CO2</b>	Develop the ability to exercise gender-sensitive practices in their professional lives	<b>K4</b>
<b>CO3</b>	Develop the ability to explore contemporary environmental issues and sustainable practices.	<b>K5</b>
<b>CO4</b>	Develop the ability to analyse the role of engineers in promoting sustainability and climate resilience.	<b>K4</b>
<b>CO5</b>	Develop interest and skills in addressing pertinent environmental and climate-related challenges through a sustainable engineering approach.	<b>K3</b>

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

### CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>						3	2	3	3	2		2
<b>CO2</b>		1				3	2	3	3	2		2
<b>CO3</b>						3	3	2	3	2		2
<b>CO4</b>		1				3	3	2	3	2		2
<b>CO5</b>						3	3	2	3	2		2

<b>Reference Books</b>				
<b>Sl. No</b>	<b>Title of the Book</b>	<b>Name of the Author/s</b>	<b>Name of the Publisher</b>	<b>Edition and Year</b>
1	Ethics in Engineering Practice and Research	Caroline Whitbeck	Cambridge University Press & Assessment	2nd edition & August 2011
2	Virtue Ethics and Professional Roles	Justin Oakley	Cambridge University Press & Assessment	November 2006
3	Sustainability Science	Bert J. M. de Vries	Cambridge University Press & Assessment	2nd edition & December 2023
4	Sustainable Engineering Principles and Practice	Bhavik R. Bakshi,	Cambridge University Press & Assessment	2019
5	Engineering Ethics	M Govindarajan, S Natarajan and V S Senthil Kumar	PHI Learning Private Ltd, New Delhi	2012
6	Professional ethics and human values	RS Naagarazan	New age international (P) limited New Delhi	2006.
7	Ethics in Engineering	Mike W Martin and Roland Schinzinger,	Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi	4" edition, 2014

### **Suggested Activities/Projects:**

#### **Module-II**

- Write a reflection on a local environmental issue (e.g., plastic waste in Kerala backwaters or oceans) from different ethical perspectives (anthropocentric, biocentric, ecocentric).
- Write a life cycle analysis report of a common product used in Kerala (e.g., a coconut, bamboo or rubber-based product) and present findings on its sustainability.
- Create a sustainability report for a local business, assessing its environmental, social, and economic impacts
- Presentation on biodiversity in a nearby area (e.g., a local park, a wetland, mangroves, college campus etc) and propose conservation strategies to protect it.
- Develop a conservation plan for an endangered species found in Kerala.
- Analyze the green spaces in a local urban area and propose a plan to enhance urban ecology using native plants and sustainable design.
- Create a model of a sustainable urban landscape for a chosen locality in Kerala.

### **Module-III**

- Study a local water body (e.g., a river or lake) for signs of pollution or natural flow disruption and suggest sustainable management and restoration practices.
- Analyse the effectiveness of water management in the college campus and propose improvements - calculate the water footprint, how to reduce the footprint, how to increase supply through rainwater harvesting, and how to decrease the supply-demand ratio
- Implement a zero waste initiative on the college campus for one week and document the challenges and outcomes.
- Develop a waste audit report for the campus. Suggest a plan for a zero-waste approach.
- Create a circular economy model for a common product used in Kerala (e.g., coconut oil, cloth etc).
- Design a product or service based on circular economy and degrowth principles and present a business plan.
- Develop a plan to improve pedestrian and cycling infrastructure in a chosen locality in Kerala

### **Module-IV**

- Evaluate the potential for installing solar panels on the college campus including cost-benefit analysis and feasibility study.
- Analyse the energy consumption patterns of the college campus and propose sustainable alternatives to reduce consumption - What gadgets are being used? How can we reduce demand using energy-saving gadgets?
- Analyse a local infrastructure project for its climate resilience and suggest improvements.
- Analyse a specific environmental regulation in India (e.g., Coastal Regulation Zone) and its impact on local communities and ecosystems.
- Research and present a case study of a successful sustainable engineering project in Kerala/India (e.g., sustainable building design, water management project, infrastructure project).
- Research and present a case study of an unsustainable engineering project in Kerala/India highlighting design and implementation faults and possible corrections/alternatives (e.g., a housing complex with water logging, a water management project causing frequent floods, infrastructure project that affects surrounding landscapes or ecosystems).

**SEMESTER S4**  
**LINEAR INTEGRATED CIRCUITS LAB**

<b>Course Code</b>	<b>PCECL407</b>	<b>CIE Marks</b>	50
<b>Teaching Hours/Week (L: T:P: R)</b>	0:0:3:0	<b>ESE Marks</b>	50
<b>Credits</b>	2	<b>Exam Hours</b>	2 Hrs. 30 Min.
<b>Prerequisites (if any)</b>	None	<b>Course Type</b>	Lab

**Course Objectives:**

1. To study the design and implementation of various Linear Integrated Circuits.
2. To familiarize the simulation of basic Linear Integrated Circuits...

**Details of Experiment**

<b>Expt. No</b>	<b>Experiments</b>
	<b>Part A – List of Experiments using Op Amps (Minimum seven experiments mandatory)</b>
<b>1</b>	Familiarization of Operational amplifiers - Inverting and Non inverting amplifiers, Integrator, Differentiator - frequency response, Adder, Comparators
<b>2</b>	Measurement of Op-Amp parameters
<b>3</b>	Difference Amplifier and Instrumentation amplifier
<b>4</b>	Schmitt trigger circuit
<b>5</b>	Astable and Monostable multivibrators
<b>6</b>	Waveform generators using Op Amps - Triangular and Sawtooth
<b>7</b>	Wien bridge oscillator - without & with amplitude stabilization
<b>8</b>	RC Phase shift Oscillator
<b>9</b>	Active first and second order filters (LPF, HPF, BPF and BRN)
<b>10</b>	Active Notch filter to eliminate the 50Hz power line frequency
<b>11</b>	Precision rectifiers
<b>Expt. No</b>	<b>Part B – Application circuits using ICs [Minimum three experiments are to be done]</b>
<b>1</b>	Astable and Monostable multivibrator using Timer IC NE555

2	DC power supply using IC 723: Low voltage and high voltage configurations, Short circuit and Fold-back protection.
3	A/D converters- counter ramp and flash type.
4	D/A Converters - R-2R ladder circuit
5	Study of PLL IC: free running, frequency lock range and capture range
<b>Expt No.</b>	<b>Part C – Simulation experiments</b> [The experiments shall be conducted using open tools such as QUCS, KiCad or variants of SPICE]
1	Simulation of any three circuits from experiments 3, 5, 6, 7, 8, 9, 10 and 11 of section I
2	Simulation of experiments 3 or 4 from section II

### Course Assessment Method (CIE: 50 Marks, ESE 50 Marks)

#### Continuous Internal Evaluation Marks (CIE):

Attendance	Preparation/Pre-Lab Work, experiments, Viva and Timely completion of Lab Reports / Record. (Continuous Assessment)	Internal Exam	Total
5	25	20	50

#### End Semester Examination Marks (ESE):

Procedure/ Preparatory work/Design/ Algorithm	Conduct of experiment/ Execution of work/ troubleshooting/ Programming	Result with valid inference/ Quality of Output	Viva voice	Record	Total
10	15	10	10	5	50

#### Mandatory requirements for ESE:

1. Submission of Record: Students shall be allowed for the end semester examination only upon submitting the duly certified record.
2. Endorsement by External Examiner: The external examiner shall endorse the record.

## Course Outcomes (COs)

**At the end of the course the student will be able to:**

Course Outcome		Bloom's Knowledge Level (KL)
<b>CO1</b>	Design and implement basic linear integrated circuits using Op Amps.	<b>K4</b>
<b>CO2</b>	Design and implement basic linear integrated circuits using linear ICs.	<b>K4</b>
<b>CO3</b>	Design and simulate the functioning of basic linear integrated circuits and linear ICs. using simulation tools.	<b>K4</b>
<b>CO4</b>	Effectively troubleshoot a given circuit and analyze it	<b>K4</b>

*K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

## CO-PO Mapping Table

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	3	2						3			3
<b>CO2</b>	3	3	2						3			3
<b>CO3</b>	3	3	2		3				3			3
<b>CO4</b>	3	3	2						3			3

*1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), : No Correlation*

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
<b>1</b>	Linear Integrated Circuits	D. Roy Choudhary and Shail B Jain	New Age International Private Limited	6 <sup>th</sup> edition, 2021
<b>2</b>	Introduction to Pspice Using Orcad for Circuits and Electronics	M. H. Rashid	Pearson	3 <sup>rd</sup> edition, 2015

## **Continuous Assessment (25 Marks)**

### **1. Preparation and Pre-Lab Work (7 Marks)**

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

### **2. Conduct of Experiments (7 Marks)**

- Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

### **3. Lab Reports and Record Keeping (6 Marks)**

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

### **4. Viva Voce (5 Marks)**

- Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

*Final Marks Averaging: The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.*

## **Evaluation Pattern for End Semester Examination (50 Marks)**

### **1. Procedure/Preliminary Work/Design/Algorithm (10 Marks)**

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.

- Algorithm Development: Correctness and efficiency of the algorithm related to the experiment.
- Creativity and logic in algorithm or experimental design.

## **2. Conduct of Experiment/Execution of Work/Programming (15 Marks)**

- Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

## **3. Result with Valid Inference/Quality of Output (10 Marks)**

- Accuracy of Results: Precision and correctness of the obtained results.
- Analysis and Interpretation: Validity of inferences drawn from the experiment or quality of program output.

## **4. Viva Voce (10 Marks)**

- Ability to explain the experiment, procedure results and answer related questions
- Proficiency in answering questions related to theoretical and practical aspects of the subject.

## **5. Record (5 Marks)**

- Completeness, clarity, and accuracy of the lab record submitted

**SEMESTER S4**  
**MICROCONTROLLERS LAB**

<b>Course Code</b>	<b>PCECL408</b>	<b>CIE Marks</b>	50
<b>Teaching Hours/Week (L: T:P: R)</b>	0:0:3:0	<b>ESE Marks</b>	50
<b>Credits</b>	2	<b>Exam Hours</b>	2 Hrs. 30 Min.
<b>Prerequisites (if any)</b>	PCECL307-Logic Circuit Design and Simulation Lab	<b>Course Type</b>	Lab

**Course Objectives:**

1. To learn Microcontroller Programming using Assembly and C language
2. To learn Microcontroller interfaces to various modules
3. To learn any advanced microcontrollers like ARM or higher.
4. To learn Embedded System Design

<b>Expt. No</b>	<b>Experiment</b>
	<b>PART A – Data manipulation experiments using Assembly language (Min 4 has to be completed)</b>
<b>1</b>	Multiplication of two 16-bit numbers.
<b>2</b>	Largest/smallest from a series.
<b>3</b>	Sorting (Ascending/Descending) of data.
<b>4</b>	Matrix addition.
<b>5</b>	LCM and HCF of two 8-bit numbers.
<b>6</b>	Code conversion – Hex to Decimal/ASCII to Decimal and vice versa.
	<b>PART B - Interface to Microcontroller Assembly/C language (Min 3 has to be completed)</b>
<b>1.</b>	Time delay generation and relay interface.
<b>2.</b>	Display (LED/Seven segments/LCD) and keyboard interface.
<b>3.</b>	ADC interface.
<b>4.</b>	DAC interface with waveform generation.
<b>5.</b>	Stepper motor and DC motor interface.
	<b>PART C - Interface with Advanced Microcontroller using C language (Min 3 has to be completed)</b>
<b>1.</b>	PWM generation for DC motor control.
<b>2.</b>	Object/Visitor Counter.

3.	UART interface to Bluetooth.
4.	SPI/I2C interface to display.
5.	Real-time clock.

**Course Assessment Method (CIE: 50 Marks, ESE 50 Marks)**

**Continuous Internal Evaluation Marks (CIE):**

Attendance	Preparation/Pre-Lab Work, experiments, Viva and Timely completion of Lab Reports / Record. (Continuous Assessment)	Internal Exam	Total
5	25	20	50

**End Semester Examination Marks (ESE):**

Procedure/ Preparatory work/Design/ Algorithm	Conduct of experiment/ Execution of work/ troubleshooting/ Programming	Result with valid inference/ Quality of Output	Viva voice	Record	Total
10	15	10	10	5	50

**Mandatory requirements for ESE:**

- Submission of Record: Students shall be allowed for the end semester examination only upon submitting the duly certified record.
- Endorsement by External Examiner: The external examiner shall endorse the record.

**Course Outcomes (COs)**

**At the end of the course the student will be able to:**

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Develop 8051 Microcontroller programs	K5
CO2	Design and implement various interfaces to the 8051 Microcontroller	K6
CO3	Design and implement an Embedded System using a 8051 microcontroller	K6
CO4	Design and implement an Embedded System using an ARM processor	K6

*K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

## CO-PO Mapping Table

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	2	2	2								2
<b>CO2</b>	3	3	3	2	3			2				2
<b>CO3</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>CO4</b>	3	3	3	3	3	3	3	3	3	3	3	3

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<b>Text Books</b>				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
<b>1</b>	The 8051 Microcontroller and Embedded Systems Using Assembly and C	Muhammad Ali Mazidi Janice Gillispie Mazidi Rolin D. McKinlay	Printice Hall -Inc	Second, 2007
<b>2</b>	The 8051 Microcontroller Architecture, Programming and Applications	Kenneth J Ayala Dhananjay V Gadre	Cengage Learning	2010

<b>Reference Books</b>				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
<b>1</b>	8051 Hardware Description	Datasheet	Intel Corporation	1992
<b>2</b>	Microprocessors and Microcontrollers	Lyla B. Das	Pearson Education	2011
<b>3</b>	ARM System-on-Chip Architecture	Steve Furber	Addison-Wesley Educational Publishers Inc	2000
<b>4</b>	System-on-Chip Design with Arm(R) Cortex(R)-M Processors	Joseph Yiu	ARM Education Media	2019

<b>Video Links (NPTEL, SWAYAM...)</b>	
<b>Sl. No.</b>	<b>Link ID</b>
<b>1</b>	Microprocessors and Microcontrollers - <a href="https://nptel.ac.in/courses/106108100">https://nptel.ac.in/courses/106108100</a>
<b>2</b>	Microcontrollers and Applications - <a href="https://nptel.ac.in/courses/117104072">https://nptel.ac.in/courses/117104072</a>
<b>3</b>	Embedded System Design With ARM - <a href="https://onlinecourses.nptel.ac.in/noc22_cs93">https://onlinecourses.nptel.ac.in/noc22_cs93</a>

### **Continuous Assessment (25 Marks)**

#### **1. Preparation and Pre-Lab Work (7 Marks)**

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- Accuracy of Results: Precision and correctness of the obtained results.
- Analysis and Interpretation: Validity of inferences drawn from the experiment or quality of program output.

### **4. Viva Voce (10 Marks)**

- Ability to explain the experiment, procedure results and answer related questions
- Proficiency in answering questions related to theoretical and practical aspects of the subject.

### **5. Record (5 Marks)**

- Completeness, clarity, and accuracy of the lab record submitted.

# **SEMESTER 5**

**Electronics Engineering (VLSI Design and  
Technology)**