St. Thomas College of Engineering & Technology
Vellilode, Sivapuram PO. Mattanur. Kannur District, Kerala
Approved by AICTE New Delhi, Govt. Of Kerala and Affiliated to APJ Abdul Kalam Technological University

COURSE HANDOUT

(B. Tech - Semester 3)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COLLEGE VISION

To be an Institute of repute recognized for excellence in education, innovation, and social contribution.

COLLEGE MISSION

M1: Infrastructural Relevance - Develop, maintain and manage our campus for our stakeholders.
M2: Life-Long Learning - Encourage our stakeholders to participate in lifelong learning through industry and academic interactions.
M3: Social Connect - Organize socially relevant outreach programs for the benefit of humanity.

DEPARTMENT VISION

To produce professionally competent, ethically sound and socially responsible Electronics and Communication Engineers.

DEPARTMENT MISSION

M1: Provide excellent infrastructure and lab facilities for quality education.

M2: Promote industry-academic interactions to keep up with technological advancements.

M3: Develop interpersonal skills and social responsibility among students through project-based and team-based learning.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

Graduates of B. Tech ECE program after graduation will:

PEO1: Exemplify technical competence in designing, analyzing, testing and fabricating electronic circuits.

PEO2: Acquire leadership qualities, rapport, communication skills in the organization and adapt to changing professional and societal needs.

PEO3: Work effectively as individuals and as team members in multidisciplinary projects

PROGRAM OUTCOMES (POS)

Engineering Graduates will be able to:

PO1 Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 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.

PO3 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.

PO4 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.

PO5 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.

PO6 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.

PO7 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.

PO8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 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.

PO11 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.

PO12 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 (PSO)

PSO1: Define, design, implement, model, and test electronic circuits and systems that perform signal processing functions.

PSO2: Segregate and select appropriate technologies for implementation of a modern communication system.

CONTENTS

COURSE INFORMATION SHEETS OF SEMESTER 3 COURSES

G

UCHUT347

ENGINEERING ETHICS AND SUSTAINABLE DEVELOPMENT

COURSE INFORMATION SHEET

PROGRAMME: ECE (UG)	**DEGREE**: BTECH
COURSE: ENGINEERING ETHICS AND SUSTAINABLE DEVELOPMENT	**SEMESTER: 3** **L-T-P-CREDITS**: 2-0-0-2
COURSE CODE: **REGULATION**: UCHUT347: 2024 SCHEME	**COURSE TYPE**: NON- CORE
COURSE AREA/DOMAIN: HUMANITIES AND SOCIAL SCIENCES	**CONTACT HOURS**: 2
CORRESPONDING LAB COURSE CODE (IF ANY): NIL	**LAB COURSE NAME**: NIL

SYLLABUS

MODULE	DETAILS	HOURS
I	Fundamentals of ethics - Personal vs. professional ethics, Civic Virtue, Respect for others, Profession and Professionalism, Ingenuity, diligence and responsibility, Integrity in design, development, and research domains, Plagiarism, a balanced outlook on law - challenges - case studies, Technology and digital revolution-Data information, and knowledge, Cybertrust and cybersecurity, Data collection & management, High technologies: connecting people and places-accessibility and social impacts, Managing conflict, Collective bargaining Confidentiality, Role of confidentiality in moral integrity, Codes of Ethics. Basic concepts in Gender Studies - sex, gender, sexuality, gender spectrum: beyond the binary, gender identity, gender expression, gender stereotypes, Gender disparity and discrimination in education, employment and everyday life, History of women in Science & Technology, Gendered technologies & innovations, Ethical values and practices in connection with gender - equity, diversity & gender justice, Gender policy and women/transgender empowerment initiatives.	6

II	Introduction to Environmental Ethics: Definition, importance and historical development of environmental ethics, key philosophical theories (anthropocentrism, biocentrism, ecocentrism). Sustainable Engineering Principles: Definition and scope, triple bottom line (economic, social and environmental sustainability), life cycle analysis and sustainability metrics. Ecosystems and Biodiversity: 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. Landscape and Urban Ecology: Principles of landscape ecology, Urbanization and its environmental impact, Sustainable urban planning and green infrastructure.	6
III	Hydrology and Water Management: Basics of hydrology and water cycle, Water scarcity and pollution issues, Sustainable water management practices, Environmental flow disruptions and disasters. Zero Waste Concepts and Practices: Definition of zero waste and its principles, Strategies for waste reduction, reuse, reduce and recycling, Case studies of successful zero waste initiatives. Circular Economy and Degrowth: 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. Mobility and Sustainable Transportation: 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
IV	Renewable Energy and Sustainable Technologies: Overview of renewable energy sources (solar, wind, hydro, biomass), Sustainable technologies in energy production and	6

	consumption, Challenges and opportunities in renewable energy adoption. Climate Change and Engineering Solutions: 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. Environmental Policies and Regulations: Overview of key environmental policies and regulations (national and international), Role of engineers in policy implementation and compliance, Ethical Considerations in environmental policy-making. Case Studies and Future Directions: 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.	
Total hours		**24**

TEXT BOOKS/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
R1	Ethics in Engineering Practice and Research ,Caroline Whitbeck ,Cambridge University Press & Assessment ,2nd edition & August 2011
R2	Sustainable Engineering Principles and Practice Bhavik R. Bakshi, Cambridge University Press & Assessment 2019
R3	Engineering Ethics,M Govindarajan, S,Natarajan and V S,Senthil Kumar,PHI

	Learning Private Ltd,New Delhi 2012
R4	Ethics in Engineering Mike W Martin and Roland Schinzinger, Tata McGraw Hill Publishing Pvt Ltd, Delhi 4" edition, 2014

COURSE PREREQUISITES: NIL

COURSE CODE	COURSE NAME	DESCRIPTION	SEMESTER

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.

COURSE OUTCOMES:

After the completion of the course, the student will be able to

COs / CO-PO/PSO MAPPING. /BLOOM'S TAXONOMY LEVEL	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
UCHUT347.1	Develop the ability to apply the principles of engineering ethics in their professional life)													
						3	**2**	**3**	**3**	**2**		**2**		
	APPLY													
UCHUT347.2	Develop the ability to exercise gender-sensitive practices in their professional lives													
		1				**3**	**2**	**3**	**3**	**2**		**2**		
	ANALYSE													
UCHUT347.3	Develop the ability to explore contemporary environmental issues and sustainable practices.													
						3	**3**	**2**	**3**	**2**		**2**		
	EVALUATE													
UCHUT347.4	Develop the ability to analyse the role of engineers in promoting sustainability and climate													

	resilience.													
		1				**3**	**3**	**2**	**3**	**2**		**2**		
	ANALYSE													
UCHUT347.5	Develop interest and skills in addressing pertinent environmental and climate-related challenges through a sustainable engineering approach.													
						3	**3**	**2**	**3**	**2**		**2**		
	APPLY													
MAPPING AVERAGE		**1.00**				**3**	**2.6**	**2.4**	**3**	**2**		**2**		

JUSTIFICATION FOR CO-PO/PSO MAPPING:

CO	PO/PSO	MAPPING LEVEL	JUSTIFICATION
UCHUT347.1	PO6	**3**	Evaluates the societal and environmental impact of engineering choices.
	PO7	**2**	Connects ethical practices with sustainable development goals.
	PO8	**3**	Demonstrates strong awareness of professional ethics and responsibility.
	PO9	**3**	Works ethically in teams with respect for diversity
	PO10	**2**	Communicates ethical concerns effectively.
	PO12	**2**	Recognizes the need for lifelong ethical learning.
UCHUT347.2	PO2	**1**	Applies basic logical understanding
	PO6	**3**	Considers gender equity in societal impact.
	PO7	**2**	Evaluates sustainable development with inclusivity and equity
	PO8	**3**	Demonstrates ethical behavior inclusive of gender sensitivity.
	PO9	**3**	Encourage teamwork with gender balance and mutual respect
	PO10	**2**	Communicates effectively and inclusively.
	PO12	**2**	Engages in continuous learning for social responsibility and equity.
UCHUT347.3	PO6	**3**	Understands the impact of engineering on society and environment.

	PO7	**3**	Recognizes the importance of sustainability in engineering decisions.
	PO8	**2**	Applies ethics in environmental protection.
	PO9	**3**	Collaborates to achieve sustainable goals.
	PO10	**2**	Communicates environmental findings effectively.
	PO12	**2**	Pursues lifelong learning on environment advancements.
UCHUT347.4	PO2	**1**	Critically analyses sustainability and resilience challenges.
	PO6	**3**	Evaluates social/environmental impact in the climate context.
	PO7	**3**	Understands the broader goals of sustainability and resilience.
	PO8	**2**	Acts ethically in climate-sensitive decisions.
	PO9	**3**	Works with stakeholders to promote sustainability.
	PO10	**2**	Shares insights and awareness about resilience.
	PO12	**2**	Develops continuous interest in addressing climate issues.
UCHUT347.5	PO6	**3**	Assesses the long-term impact of engineering solutions.
	PO7	**3**	Promotes sustainability and climate-resilient designs.
	PO8	**2**	Practices ethical and environmental accountability.
	PO9	**3**	Collaborates in multidisciplinary teams on climate projects.
	PO10	**2**	Presents climate solutions in a socially relevant manner.
	PO12	**2**	Continually adapts to new development in sustainability

CORRELATION Levels: 3- Substantial (High) 2- Moderate (Medium) 1-Slight (Low)

GAPS IN THE SYLLABUS-TO MEET INDUSTRY/PROFESSION REQUIREMENTS

SL NO:	DESCRIPTION	PROPOSED ACTIONS	RELEVANCE WITH POS /PSOS
1			

CONTENT BEYOND THE SYLLABUS/ADVANCED TOPICS/DESIGN

SL NO:	DESCRIPTION	PROPOSED ACTIONS	RELEVANCE WITH POS /PSOS
1	Conduct Interdisciplinary Workshops	Guest Talk	PO6, PO8, PO10, PO12

WEB SOURCE REFERENCES:

SL NO:	DESCRIPTION
1	Sustainable development & 21st century engineering | Vk Saraswat | TEDxIITHyderabad

DELIVERY TECHNOLOGIES

CLASSROOM WITH BLACK BOARD/WHITE BOARD/SMART BOARD	✔	**ICT TOOLS**	✔
CLASSROOM WITH LCD PROJECTOR		**ELECTRONIC CLASSROOM**	

INSTRUCTION METHODS

FACE TO FACE INSTRUCTION	Direct	✔	**FLIPPED CLASSROOM**	✔
	Project-based instruction	✔	**BLENDED LEARNING**	✔
	Problem-based instruction		**ONLINE COURSES/MOOCs**	
	Technology enhanced learning		**OTHERS (IF ANY)**	

	Experiential learning			
	Participative learning			

CO ASSESSMENT TOOLS-DIRECT

ASSIGNMENTS		**TUTORIALS**		**SERIES EXAMINATIONS**		**UNIVERSITY EXAM**	✔
LAB PRACTICES		**VIVA**		**INTERNAL LAB EXAM**		**REPORT/ DOCUMENT PREPARATION**	✔
PRESENTATION	✔	**EVALUATION BY GUIDE**		**INTERIM EVALUATION**		**FINAL EVALUATION**	

CO ASSESSMENT TOOLS -INDIRECT

ASSESSMENT OF COURSE OUTCOMES (BY COURSE EXIT (END) SURVEY)	✔

ASSESSMENT ITEMS /CLASS SESSIONS/LAB/FIELD/TUTORIAL HOURS FOR EACH COURSE OUTCOMES

CO	ASSESSMENT ITEMS	CLASS SESSIONS	LAB/FIELD/TUTORIAL HOURS
UCHUT347.1	Activity: Reflective Journaling	**8**	
UCHUT347.2	Report on Case Studies	**5**	
UCHUT347.3	Report on Case Studies	**3**	
UCHUT347.4	Report on Case Studies	**7**	
UCHUT347.5	Report on Case Studies	**8**	
		TOTAL HOURS OF INSTRUCTION	**31**

Prepared by **Approved by HOD**

Sreelakshmi Prasad.