B.Sc. (Engg.) Third Year-2024
3rd Year 1st Semester

ICT-3101:   **Wave Propagation and Antenna**

Full Marks:100
Credit: 3.0
Contact Hours: 39
Exam. Duration: 4 Hours

Prerequisite: ICT:1103, MATH: 2101
Course Type: Theory
Course Summary: The Topic will be discussed in detail in class by the course teacher

Course Objectives: This course will introduce the students to the fundamental concepts underlying Electromagnetic theories and antenna, properties of EM wave, transmission and reflection of EM wave, transmission line theory and its characteristics, propagation theory of Radio waves, characteristics of antenna, types of antenna its application area etc. The emphasis is on studying and analyzing fundamental issues in antenna design and their impact on performance.

Course Learning Outcomes (CLO):

After completing this course a student would be able to

CLO1	**Learn** theory and properties of Electromagnetic waves.
CLO2	**Emphasize** understanding of Maxwell's equations in differential and integral forms in solving electromagnetic problems.
CLO3	**Understand** the concept of transmission and reflection of plane waves at boundaries.
CLO4	**Learn** the basics of transmission lines (TL), propagation of harmonic signals on TL, TL parameters and equations. Be able to apply the knowledge in basic analysis and design problems. Learn the basics of the Smith Chart as a tool for transmission line calculations, and be able to use it for basic parameter calculation and analysis of transmission lines.
CLO5	**Predict** propagation effects of electromagnetic waves in the surface, space, sky, troposphere, ionosphere including MUF and Fading.
CLO6	**Classify** the Guided Wave solutions -TE, TM, and TEM. Analyze and design rectangular waveguides and understand the propagation of electromagnetic waves.
CLO7	**Learn** antenna fundamentals types of antennas. Characterize the radiation of an antenna in terms of it radiation pattern, directivity, gain, bandwidth and radiation resistance.

Course Content		Time Frame	Alignment with		Suggested Activities	Teaching Strategy(s)
Outlines	Specific Topics		CLO	PLO		
Theory & Properties of Electromagnetic Waves	Potential in an electric field, potential in a changing magnetic field, displacement current.	Week 1	CLO-1	PLO-1 PLO-2	-Lecture Presentation with video -Interactive Discussion -Feedback	- Assignment - Oral Presentation
Equations of the Electromagnetic Fields, Radiation	Potential in an electric field, Potential in a charging magnetic field, Faraday's law, The first electromagnetic field equation, The second electromagnetic field equation, Maxwell's equation rewritten, The plane wave in space-I, The plane wave in space-II,	Week 1-2	CLO-2	PLO-2 PLO-3	-Lecture Presentation with video -Interactive Discussion -Feedback	- Assignment -Class test

	Energy of the radiated wave, Poynting's theorem					
Transmission and Reflection of Plane Waves at Boundaries	Conditions of field continuity at boundary surfaces, The analogous transmission line for plane wave propagation, Reflection from a plane conductor at normal incidence, Power flow in the reflected and transmitted waves, Current flow in the conductor, Depth of penetration, Skin effect, The perfect conductor concepts, Wave incident on a perfect conductor at an arbitrary angle, Wave incident at an arbitrary angle on a boundary between dielectrics, Index of reflection, Snell's law, Total reflection, Phase and group velocities, Elimination of reflections.	Week 3-4	CLO-3	PLO-2	-Lecture Presentation with video -Interactive Discussion -Feedback	- Assignment -Class test
Transmission Lines	Introduction, Propagation through lines, Determination of secondary line constants, Underground cables, Wave velocity, Distortion of low frequency lines, General line equations, High frequency lines, Reflection, Line impedance, Impedance matching in high frequency lines, Smith chart.	Week 5-6	CLO-4	PLO-2 PLO-3	-Lecture Presentation with video -Interactive Discussion -Feedback	- Assignment -Class test
Propagation of Radio Wave	Surface wave, space wave and sky wave, Tropospheric propagation, Ionospheric propagation, skip distance and MUF, fading.	Week 7-8	CLO-5	PLO-4	-Lecture Presentation with video -Interactive Discussion -Feedback	- Assignment -Class test
Wave Guides	Rectangular Wave guides, Circular and other Wave guides, Cavity resonators.	Week 9-10	CLO-6	PLO-5	-Lecture Presentation with video -Interactive Discussion -Feedback	- Assignment - Oral Presentation
Antenna Fundamentals	The radiation mechanism, Elementary doublet, Current and Voltage distribution, Resonant & Non-resonant antennas, Antenna gain, Bandwidth,	Week 11-12	CLO-7	PLO-2	-Lecture Presentation with video -Interactive Discussion	- Assignment -Class test

	beam width and polarization, Effects of ground on antennas, Antenna coupling.					
Different Types of Antennas	Directional high-frequency antennas, Microwave antennas, Wideband and special -purpose antennas, Cell-Site Antennas and Mobile Antennas.	Week 13	CLO-7	PLO-4	-Lecture Presentation -Interactive Discussion	- Assignment - Oral Presentation

Assessment Pattern (According FET Ordinance)

CIE: (Continuous Internal Evaluation-30Marks)

Bloom's Category Marks:30	Tutorial/In-course (10)	Assignment (05)	Quizz/Presentation (05)	Class Attendance 10
Remember			(05)	
Understand	(05)			
Apply				(10)
Analyze				
Evaluate	(05)			
Create		(05)		

SMEE: (Semester Mid and End Examination-30 Marks)

Bloom's Category	Test
Remember	05
Understand	05
Apply	10
Analyze	00
Evaluate	05
Create	05

Assessment and Evaluation
– Class Attendance & Participation (10%)
– Quiz/Presentation (10%)
– In-course/Tutorial (10%)
– Final Exam (70%)

Learning Resources
Text Books
1. *Networks, Lines and Fields, John D Ryder, Prentice-Hall of India Private Ltd.*
2. *Electronic Communications, Dennis Roddy and John Coolen, Prentice-Hall of India Private Ltd.*

References and other related books
3. *Hand Book of Electronics, Gupta and Kumar, PragatiPrakasan.*
4. *Radio Engineering, J K Mithal, Khanna Publishers.*
5. *Electrical Technology, B.L Theraja and A.K Theraja.*

ICT-3102: **Wave Propagation and Antenna Laboratory** Full Marks:100
Credit: 1.5
Contact Hours: 39
Exam. Duration: 6 Hours

Prerequisite: ICT-3101
Course Type: Practical/Laboratory work

Course Summary: The topic will be discussed in class by the course teacher

Course Objectives: This course will introduce the students to hands on knowledge on Electromagnetic theories and antenna, properties of EM wave, transmission and reflection of EM wave, transmission line theory, propagation theory of Radio waves, characteristics of antenna, types of antenna.

Course Learning Outcomes (CLO): After completing this course a student would be able to:

CLO1	**Realize** Electromagnetic theories and antenna
CLO2	**Understand** properties of EM wave
CLO3	**Comprehend** transmission line theory, propagation theory of Radio waves
CLO4	**Know** the characteristics of antenna

Course Content		Time Frame	Alignment with		Suggested Activities	Teaching Strategy(s)
Outline	**Specific Topics**		**CLO**	**PLO**		
Electromagnetic Wave	*Generation of Electromagnetic wave using Matlab. * Visualizing Maxwell's equations using Matlab.	Week-1-3 L-1-9	CLO1	PLO2 PLO3	-Lecture Interactive Discussion Presentation with video Experiment Implementation in the assigned Laboratory	Oral Presentation Assignment Laboratory trial output
Electromagnetic Theory	* To study and analysis propagation of wave in Rectangular Waveguide using Matlab. * Impedance Matching using Smith Chart using Matlab	Week-4-5 L-10-15	CLO-2 CLO-3	PLO3 PLO4	Lecture Interactive Discussion Presentation with video Experiment Implementation in the assigned Laboratory	Oral Presentation Assignment Laboratory trial output
Propagation of Radio Wave	* Calculate phase & group velocity using Matlab. * To study and analysis of Electromagnetic waves propagation characteristics using Matlab.	Week-6-7 L-16-21	CLO-2& CLO-3	PLO-3, PLO-4	-Lecture Interactive Discussion Presentation with video Experiment Implementation in the assigned Laboratory	Oral Presentation Assignment Laboratory trial output
Antenna	*Plot radiation pattern of dipole antenna using Matlab. *Plot the radiation pattern of Half wave dipole antenna using Matlab.	Week-8-10 L-22-30	CLO-4	PLO-3 PLO-4	-Lecture Interactive Discussion Presentation with video Experiment Implementation in the assigned Laboratory	Oral Presentation Assignment Laboratory trial output
Antenna	* Plot radiation pattern of monopole antenna using Matlab. *Plot of Radiation pattern of Uniform Linear Array using Matlab.	Week-11-13 L-31-39	CLO-4	PLO-3 PLO-4	-Lecture Interactive Discussion Presentation with video Experiment Implementation in the assigned Laboratory	Oral Presentation Assignment Laboratory trial output

Recess before Exam.		Week-14-15				
Semester End Exam.	Start	Week-16				

Assessment Pattern (According FET Ordinance)

CIE: (Continuous Internal Evaluation-20Marks)

Bloom's Category Marks:30	Lab. Performance (05)	Lab. Note Book (05)	Continuous Viva-Voce (10)	Lab. Attendance (10)
Remember			(10)	
Understand				
Apply		(05)		(10)
Analyze				
Evaluate	(05)			
Create				

SMEE: (Semester Mid and End Examination-30 Marks)

Bloom's Category	Test
Remember	10
Understand	00
Apply	15
Analyze	00
Evaluate	05
Create	00

Assessment and Evaluation
- Lab. performance during Lab. hours (05%)
- Lab. attendance (10%)
- Lab. Note book on experiment (05%)
- Viva-Voce on experiment (10%)
- Semester Final Exam (70%)

Learning Resources

Text Books
1. Networks, Lines and Fields, John D Ryder, Prentice-Hall of India Private Ltd.
2. Electronic Communications, Dennis Roddy and John Coolen, Prentice-Hall of India Private Ltd..

Reference Books and Other Materials
3. Hand Book of Electronics, Gupta and Kumar, PragatiPrakasan.
4. Radio Engineering, J K Mithal, Khanna Publishers.
5. *Lab. Guide and Lab. Manuals*

ICT-3103:	**Microwave Engineering**	Full Marks:100
		Credit: 3.0
		Contact Hours: 39
		Exam. Duration: 4 Hours

Prerequisite: ICT-2205, 3101
Course Type: Theory
Course Summary: Electronics and Communications Engineering (ECE) involves researching, designing, developing and testing of electronic equipment used in various systems. Electronics and Communications engineers also conceptualize and oversee the manufacturing of communications and broadcast systems.

This stream of engineering deals with analogue transmission, basic electronics, microprocessors, solid-state devices, digital and analogue communication, analogue integrated circuits, microwave engineering, satellite communication, antennae and wave progression. It also deals with the manufacturing of microwave engineering, microwave tubes and resonators.

Course Objectives: To provide knowledge on television system, satellite communication, radar system and microwave engineering.

Course Learning Outcomes (CLO): After completing this course a student would be able to

CLO1	**Acquire** general idea about the course
CLO2	**Understand** the television system.
CLO3	**Understand** the satellite system
CLO4	**Understand** the Radar system
CLO5	**Analysis** microwave communication networks

Course Content		Time Frame	Alignment with		Suggested Activities	Teaching Strategy(s)
Outline	**Specific Topics**		**CLO**	**PLO**		
Course Overview	**Comprehend** the mission and vision of the Department **To acquire** general idea about the course Fundamental **To grasp** the content and policies for the class	**Week-1 L-1-3**	CLO1	PLO1	Students will give brief introduction about themselves Course outline will be discussing in details	#Socialized recitation #Show presentation to motivate the students
Television System	**To discuss** Image Capturing, Image Continuity, Flicker, Interlaced Scanning, Composite Video Signal, Video Modulation, Sound Modulation, Channel bandwidth, TV Camera, TV Transmitter, Monochrome TV Receiver, Principle of Color TV.	**Week-2 L-4-6**	CLO2	PLO1	Students will discuss with a group. To apply the knowledge to understand the basic Television system.	#Interactive discussion #Lecture discussion with multimedia.
Satellite Communication	**To understand** General Structure, Merits & Demerits of Satellite Communication, Satellite Orbits, Linkages, Equipments on Satellite, Propagation of Signal, Ground Station, Digital Satellite Communication.	**Week-3 L-7-9**	CLO3	PLO5	Students will discuss with a group. To apply the knowledge to understand the Satellite communication.	#Interactive discussion #Lecture discussion with multimedia
Exam. Review	**To make an overview**	**Week-4 L-10-12**			Lectures, Questions and Answers	
Exam.		**Week-5 L-13-15**			Quiz and Tutorial Exam. Will be taken	
Radar	**To discuss** the Radar Performance Factors, Basic Pulsed Radar System, Antennas & Scanning, Display Methods, Pulsed Radar Systems, Moving Target Indication, CW Doppler Radar, and Frequency Modulated CW Radar, Phased Array Radars.	**Week-6-7 L-16-21**	CLO4	PLO2 PLO3	Students will discuss and apply complex engineering knowledge to understand the Radar system.	#White board discussion #Lecture discussion with multimedia

Exam Review	**To make an overview**	**Week-8 L-22-24**			Lectures, Questions and Answers	
Exam.		**Week-9 L-25-27**			Presentation and Tutorial Exam. Will be taken	
Microwave Engineering	**To discuss** Short history of microwave engineering, Microwave frequencies, Microwave systems, Microwave applications, Microwave circuit Elements and analysis, Micro strip and Strip line, Smith Chart.	**Week-10 L-28,29,30**	CLO5	PLO2 PLO3	Students will apply reasoning informed by contextual knowledge to understand microwave engineering.	#White board discussion #Lecture discussion with multimedia #Show video about MW engineering.
Microwave Components	**To analyze** Waveguide tees, E-plane tee, H-plane tee, Hybrid junctions, Cavity wave-meter, Hybrid ring, directional couplers, Isolators and circulators. **To discuss** about microwave resonators and tubes	**Week-11 L-31,32,33**	CLO5	PLO3 PLO6	Students will apply reasoning informed by contextual knowledge to understand microwave components.	#White board discussion #Lecture discussion with multimedia #Show video about MW components
Exam. Review	**To make an overview**	**Wee-12 L-34-36**			Lectures, Questions and Answers	
Exam.		**Week-13 L-37-39**			Assignment and Tutorial Exam will be taken	
Recess before Exam.		**Week14-15**				
Sem. End Exam.	**Start**	**Week-16**				

Assessment Pattern (According FET Ordinance)

CIE: (Continuous Internal Evaluation-30Marks)

Bloom's Category Marks:30	Tutorial/In-course (10)	Assignment (05)	Quiz/Presentation (05)	Class Attendance 10
Remember			(05)	
Understand	(05)			
Apply				(10)
Analyze				
Evaluate	(05)			
Create		(05)		

SMEE: (Semester Mid and End Examination-30 Marks)

Bloom's Category	Test
Remember	05
Understand	05
Apply	10
Analyze	00
Evaluate	05
Create	05

Assessment and Evaluation
 – Class Attendance & Participation (10%)
 – Quiz/Presentation (10%)
 – In-course/Tutorial (10%)
 – Final Exam (70%)

Learning Resources

Text Books

1. *Electronic Communication, Roddy and Coolen, Prentice Hall of India, 4th Ed.*
2. *Radio Engineering, G K Mithal, Khanna Publishers.*

Reference Books and Other Materials

3. *Integrated Electronics, Millman and Halkias, McGraw-Hill*
4. *Microwave Engineering- David M. Pozar*
5. *Microwave Devices and Circuits- Samuel Y Laio*

ICT-3104: **Microwave Engineering Laboratory**

Full Marks:100
Credit: 1.5
Contact Hours: 39
Exam. Duration: 6 Hours

Prerequisite: ICT-3103
Course Type: Practical/Laboratory work
Course Summary: This course gives students deep knowledge in electronic communication and microwave engineering at the practical level. This lab focuses on the fundamental concepts on TDM, Pulse modulations, digital modulation techniques, source coding techniques and Error-control coding techniques.

Course Objectives: This course will introduce the students to hands on knowledge on image, Camera, principle of color TV and satellite communication, analysis and evaluation of microwave components and microwave resonators and tubes.

Course Learning Outcomes (CLO): After completing this course a student would be able to

CLO1	**Acquire** general idea about the course
CLO2	**Able** to understand Basics of conversions from analog signals into digital signals.
CLO3	**Able** to verify of microwave tube characteristics and gunn characteristics.
CLO4	**Able** to verify of microwave tube characteristics and gunn characteristics
CLO5	**Able** to analyze the frequency and wavelength of the different wave guides

Course Content		Time Frame	Alignment with		Suggested Activities	Teaching Strategy(s)
Outline	Specific Topics		CLO	PLO		
Course Overview	**To acquire** general idea about the ECMW Laboratory **To supply** the experimental list for this Laboratory. **To discuss** about the simulator tools	Week-1 L-1-3	CLO1	PLO1	Students will give brief introduction about themselves Course outline will be discussing in details	#Socialized recitation #Show the different instruments to the students which uses this Lab.

Frequency Spectrum	**To observe** frequency spectrum of AM and FM waves **To obtain** fidelity response of AM receiver.	**Week-2-3 L-4-9**	CLO2	PLO2 PLO3	Students will discuss with a group. To apply the knowledge to observe the frequency response and fidelity response.	#Interactive discussion #Student will apply the knowledge to analyze AM, FM signals.
Exam Review	**To make an overview**	**Week-4 L-10-12**			Demonstrate, Questions and Answers	
Exam.		**Week-5 L-13-15**			Quiz and Tutorial Exam. Will be taken	
Analog Modulation/D emodulation Techniques	**To generate** amplitude, frequency and phase modulation signal **To extract** modulating signal using Diode Detector.	**Week-6-7 L-16-21**	CLO2	PLO2 PLO3	Students will demonstrate /present and solve the problems.	#White board discussion #Demonstrate with multimedia
Exam Review	**To make an overview**	**Week-8 L-22-23**			Lectures, Questions and Answers	
Exam.		**Week-8 L-24**			Presentation and Tutorial Exam. Will be taken	
Digital Modulation/D emodulation Techniques	**To generate** and detect PCM **To generate** DPCM **To generate** Delta Modulation **To generate** and Detect PSK, DPSK, FSK	**W-9 L-25-27**	CLO2	PLO3	Students will simulate and observe the different modulated waves.	#Demonstrate with multimedia
Microwave Engineering	**To characterize** Reflex Klystron **To characterize** Gunn Diode **measurement** of scattering parameters of magic tee. **Measurement** of Scattering Parameters of Circulator. **Attenuation** measurement. **Measurement** of microwave Frequency.	**Week-10-11 L-28-33**	CLO3 CLO4 CLO5	PLO4 PLO5	Students will apply contextual knowledge to characterize the different microwave components	#Lecture discussion with multimedia #Show video about different MW components
Exam. Review	**To make an overview**	**Wee-12 L-34-36**			Lectures, Questions and Answers	
Exam.		**Week-13 L-37-39**			Presentation and Tutorial Exam. will be taken	
Recess before Exam.		**Week-14-15**				
Sem. End Exam.	**Start**	**Week-16**				

Assessment Pattern (According FET Ordinance)

CIE: (Continuous Internal Evaluation-20Marks)

Bloom's Category Marks:30	Lab. Performance (05)	Lab. Note Book (05)	Continuous Viva-Voce (10)	Lab. Attendance (10)
Remember			(10)	

Understand				
Apply		(05)		(10)
Analyze				
Evaluate	(05)			
Create				

SMEE: (Semester Mid and End Examination-30 Marks)

Bloom's Category	Test
Remember	10
Understand	00
Apply	15
Analyze	00
Evaluate	05
Create	00

Assessment and Evaluation

– Lab. performance during Lab. hours (05%)
– Lab. attendance (10%)
– Lab. Note book on experiment (05%)
– Viva-Voce on experiment (10%)
– Semester Final Exam (70%)

Learning Resources

Text Books

1. *Electronic Communication, Roddy and Coolen, Prentice Hall of India, 4th Ed.*
2. *Radio Engineering, G K Mithal, Khanna Publishers.*

Reference Books and Other Materials

3. *Microwave Engineering- David M. Pozar*
4. *Microwave Devices and Circuits- Samuel Y Laio*
5. *Lab. Guide and Lab. Manuals*

ICT-3105:	**Data Communication**	Full Marks: 100
		Credit: 3.0
		Contact Hours: 39
		Exam. Time: 4 Hours

Prerequisite: Computer Fundamentals

Course Type: Theory

Course Summary: This Course gives a general overview of data communications and networking. This course introduces students to evolution trend of Data communication. It also helps students in understanding the procedure of transmitting data over the network and how to resolve the conflicting issues arising in the course of transmission. This course provides with practical knowledge and hands-on experience in transmitting data over the network.

This stream of engineering deals with analogue transmission, basic electronics, microprocessors, solid-state devices, digital and analogue communication, analogue integrated circuits, microwave engineering, satellite communication, antennae and wave progression. It also deals with the manufacturing of microwave engineering, microwave tubes and resonators.

Course Objectives: This is an introductory course in Data Communications and networking. It familiarizes the students with the basics of data communications, OSI model and techniques, applications and control of modern data communications networks. Topics included are network models,

digital and analog transmission, multiplexing, circuit and packet switching. This course will mainly focus to develop engineering skills in troubleshooting and designing data networks.

Course Learning Outcomes (CLO): Upon successful completion of this course, students will be able to -

CLO1	Describe the concepts of data communication, and the general principles of network design and compare the different network topologies.
CLO2	Analyze digital and analog representations of data and channels, mechanisms and techniques of encoding and different technologies regarding guided and unguided media, their constructions and applications in real life.
CLO3	Critique error detection, correction and flow control techniques; multiple access control techniques.

Course Content		Time Frame	Alignment with		Teaching-Learning Strategy	Assessment techniques
Outlines	**Specific Topics**		**CLO**	**PLO**		
Course Overview	Socialization and Introduction to the course.	Week - 1, Lecture – L-1	CLO-1	PLO-1	-Lecture Presentation with video -Interactive Discussion -Feedback	-Assignment - Oral Presentation
Introduction	Over view, Introduction to data communication, categories of network, Protocol and standards	Week – 3, Lecture - L-2, L-3, L-4	CLO-1	PLO-2	-Lecture Presentation with video -Interactive Discussion -Feedback	-Assignment -Class test - Oral Presentation
Transmission Layers	Layered communication architecture, The OSI Model, TCP/IP Model, Addressing	Week 4 Lecture - L-5, L-6, L-7	CLO-2	PLO-2 & PLO-3	-Lecture Presentation with video -Interactive Discussion -Feedback	-Assignment -Class test
Transmission Modes	Data and Signals, Periodic Analog Signals, Digital Signals, Transmission Impairment, Data rate limits and performance	Week 5, 6 Lecture - L-8, L-9, L-10, L-11, L-12, L-13	CLO-3	PLO-3 & PLO-4	-Lecture Presentation with video -Interactive Discussion -Feedback	-Assignment -Class test
Transmission Media	Guided Media, Unguided Media	Week 7 Lecture - L-14, L-15, L-16,	CLO-2	PLO-3 & PLO-4	-Lecture Presentation with video -Interactive Discussion -Feedback	-Assignment -Class test
Data Conversion	Digital to digital conversion, Analog to digital conversion, Transmission Mode	Week 8 Lecture - L-17, L-18, L-19	CLO-2	PLO-3 & PLO-4	-Lecture Presentation with video -Interactive	-Assignment - Oral Presentation

					Discussion -Feedback	
Data Conversion	Digital to Analog conversion Analog to Analog conversion	Week 9 Lecture - L-20, L-21, L-22	CLO-3	PLO-4 & PLO-5	-Lecture Presentation with video -Interactive Discussion	-Assignment -Class test
Multiplexing	Multiplexing Spread Spectrum	Week 10 L-23, L-24, L-25	CLO-1	PLO-4 & PLO-5	Lecture Presentation with video -Interactive Discussion -Feedback	-Assignment -Class test
Network Switching	Circuit-switched Network Datagram Networks Virtual-circuit Networks Switch	Week 11 L-26, L-27, L-28	CLO-1	PLO-4 & PLO-5	Lecture Presentation with video -Interactive Discussion -Feedback	-Assignment -Class test
Data Encoding	Types of error in data communication, Block Coding, Cyclic Codes, Checksum	Week 12 L-29, L-30, L-31	CLO-3	PLO-4 & PLO-5	Lecture Presentation with video -Interactive Discussion -Feedback	-Assignment -Class test
Modulation Techniques	Framing, Flow and Error Control, Noisy and noiseless channel, Multiple Access: CSMA/CD, CSMA/CD, Controlled Access, FDMA,CDMA, TDMA	Week 13 L-32, L-33, L-34	CLO-3	PLO-4 & PLO-5	Lecture Presentation with video -Interactive Discussion -Feedback	-Assignment -Class test
Recess before Exam.						
Semester End Exam.	Start					

Assessment Pattern (According FET Ordinance)

CIE: (Continuous Internal Evaluation-20Marks)

Bloom's Category Marks:30	Lab. Performance (05)	Lab. Note Book (05)	Continuous Viva-Voce (10)	Lab. Attendance (10)
Remember			(10)	
Understand				
Apply		(05)		(10)
Analyze				
Evaluate	(05)			
Create				

SMEE: (Semester Mid and End Examination-30 Marks)

Bloom's Category	Test
Remember	10
Understand	00

Apply	15
Analyze	00
Evaluate	05
Create	00

Assessment and Evaluation
– Lab. performance during Lab. hours (05%)
– Lab. attendance (10%)
– Lab. Note book on experiment (05%)
– Viva-Voce on experiment (10%)
– Semester Final Exam (70%)

Learning Resources:
Books Recommended
1. Foruzan, B. A. (2013). Data communication and Networking. Science Engineering& Math Publications.
2. Blanchard, E. (2000). Introduction to Networking and Data Communications.
3. Tanenbaum, A. S., &Wetherall, D. J. (2011). Computer networks. Pearson.
4. Video Tutorials on Data communication for beginners.

ICT-3106:   **Data Communication Laboratory**   Full Marks: 100
Credit: 1.5
Contact Hours: 39
Exam. Time: 6 Hours

Prerequisite: ICT-3105
Course Type: Practical
Course Summary: This Course gives a general overview of data communications laboratory. This course introduces students to evolution trend of Data communication. It also helps students in understanding the procedure of transmitting data over the network and how to resolve the conflicting issues arising in the course of transmission. This course provides with practical knowledge and hands-on experience in transmitting data over the network.

This stream of engineering deals with analogue transmission, basic electronics, microprocessors, solid-state devices, digital and analogue communication, analogue integrated circuits, microwave engineering, satellite communication, antennae and wave progression. It also deals with the manufacturing of microwave engineering, microwave tubes and resonators.

Course Objectives: This is an introductory course in data communications and networking. It familiarizes the students with the basics of data communications, OSI model and techniques, applications and control of modern data communications networks. Topics included are network models, digital and analog transmission, multiplexing, circuit and packet switching. This course will mainly focus to develop engineering skills in troubleshooting and designing data networks.

Course Learning Outcomes (CLO): Upon successful completion of this course, students will be able to

CLO1	Bit stuffing, de-stuffing, channel encoding
CLO2	Error detection, correction and flow control techniques; multiple access control techniques.
CLO3	Analyze digital and analog representations of data and channels, mechanisms and techniques of encoding and different technologies regarding guided and unguided media, their constructions and applications in real life.
CLO4	Describe the concepts of data communication, and the general principles of network design and compare the different network topologies.

CLO5	Analog to digital conversion and pulse code transmission

Course Content		Time Frame	Alignment with		Teaching-Learning Strategy	Assessment techniques
Outlines	**Specific Topics**		**CLO**	**PLO**		
Course Overview And Exp #1: Character Stuffing and De-stuffing	**To acquire** general idea about the data communication laboratory **To supply** the experimental list for this laboratory. **Implementing** character stuffing and de-stuffing	**Week-1 L-1-3**	CLO1	PLO1	Students will give brief introduction about themselves Course outline will be discussing in details	#Socialized recitation #Show the different instruments to the students which uses this Lab.
Exp #2: Bit Stuffing and De-stuffing	**Implementation** bit stuffing and de-stuffing	**Week 2-3, Lecture - L-4-9**	CLO-1	PLO-2 PLO-3	-Lecture Presentation with video -Interactive Discussion -Feedback	-Assignment -Class test - Oral Presentation
Exp # 3: Channel Encoding	I**mplementation** cyclic redundancy check and parity checker.	**Week 4 Lecture - L-10-13**	CLO-2 CLO-3	PLO-2 PLO-3	-Lecture Presentation with video -Interactive Discussion -Feedback	-Assignment -Class test
Exp # 4: Error detection and correction	**Implementation** of error detection and correction mechanism using Hamming code	**Week 5-6 Lecture - L-14-25**	CLO-2 CLO-3	PLO-3 PLO-4	-Lecture Presentation with video -Interactive Discussion -Feedback	-Assignment -Class test
Exp # 5: Encoding and decoding scheme	**Implementation** of encoding and decoding scheme using NRZ-I	**Week 7-8 L-26-31**	CLO-2 CLO-3	PLO-3 PLO-4	-Lecture Presentation with video -Interactive Discussion -Feedback	-Assignment -Class test
Exp # 6: IPv4 Implementation	**IPv4 implementation** of decimal to binary and vice versa	**Week 9-10 Lecture - L-32-37**	CLO-3	PLO-3 PLO-4	-Lecture Presentation with video -Interactive Discussion -Feedback	-Assignment - Oral Presentation
Exp# 7: Encoding and decoding using Manchester	**Implementation** of encoding and decoding scheme using Manchester	**Week 11-12 Lecture - L-38-43**	CLO-2 CLO-3	PLO-3 PLO-4	-Lecture Presentation with video -Interactive Discussion	-Assignment -Class test
Exp# 8: Encoding and decoding using Manchester	**Implementation** of encoding and decoding scheme using AMI and Pseudo ternary	**Week 13 L-44-46**	CLO-2 CLO-3	PLO-3 PLO-4	Lecture Presentation with video -Interactive Discussion	-Assignment -Class test

					-Feedback	
Exp# 9: Network Topologies	**Study** of network topologies using packet tracer software	**Week 14 L-47-49**	CLO-3 CLO-4	PLO-2 PLO-3 PLO-4	Lecture Presentation with video -Interactive Discussion -Feedback	-Assignment -Class test
Exp# 10: LAN transmission, standard, cross-wired and straight cable	**Study** of LAN transmission media's, topologies, interconnection devices & LAN standards and practically implement the cross-wired cable and straight through cable using clamping tool.	**Week 15 L-50-52**	CLO-3 CLO-4	PLO-4 PLO-5	Lecture Presentation with video -Interactive Discussion -Feedback	-Assignment -Class test
Exp# 11: Analog to digital conversion and pulse code modulation	**Implementation** of analog to digital conversion and pulse coded transmission	**Week 16 L-53-55**	CLO-5	PLO-4 PLO-5	Lecture Presentation with video -Interactive Discussion -Feedback	-Assignment -Class test
Recess before Exam.						
Semester End Exam.	Start					

Assessment Pattern (According FET Ordinance)

CIE: (Continuous Internal Evaluation-20Marks)

Bloom's Category Marks:30	Lab. Performance (05)	Lab. Note Book (05)	Continuous Viva-Voce (10)	Lab. Attendance (10)
Remember			(10)	
Understand				
Apply		(05)		(10)
Analyze				
Evaluate	(05)			
Create				

SMEE: (Semester Mid and End Examination-30 Marks)

Bloom's Category	Test
Remember	10
Understand	00
Apply	15
Analyze	00
Evaluate	05
Create	00

Assessment and Evaluation

– Lab. performance during Lab. hours (05%)

– Lab. attendance (10%)
– Lab. Note book on experiment (05%)
– Viva-Voce on experiment (10%)
– Semester Final Exam (70%)

Learning Resources:

Books Recommended

1. *Foruzan, B. A. (2013). Data communication and Networking. Science Engineering& Math Publications.*
2. *Blanchard, E. (2000). Introduction to Networking and Data Communications.*

References and other related books

3. *Tanenbaum, A. S., &Wetherall, D. J. (2011). Computer networks. Pearson.*
4. *Video Tutorials on Data communication for beginners.*

ICT-3107:	**Computer Networking**	Full Marks: 100 Credit: 3.0 Contact Hours: 39

Prerequisite:	Basic ICT at Higher Secondary Level
Course Type:	Theory
Course Summary:	This course is an introduction to a broad range of topics in Computer Networking. It is meant to introduce the basic concepts of a range of topics, with the full details left to upper-level Computer Network classes. The course covers Network introduction and Network Models, Data and Signals, Digital and Analog Transmission, Multiplexing, Error Detection, Data Link Control, Media Access Control and Ethernet, Data Link and Network Layer Protocols, Unicast and Multicast Routing, Wireless Networks, Network Management and Firewalls.
Course Objectives:	The main emphasis of this course is on the organization and management of local area networks (LANs). The course objectives include learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems. Students are introduced to computer communication network design and its operations, and discuss the following topics: Open Systems Interconnection (OSI) communication model; error detection and recovery; local area networks; bridges, routers and gateways; network naming and addressing; and local and remote procedures. On completion of the course, students should be able, in part to design, implement and maintain a typical computer network (LAN).

Course Learning Outcomes (CLO): After completing this course a student would be able to

CLO1	To acquire general idea about the course
CLO2	To Discuss about Computer Network, OSI Model and Physical Layer
CLO3	Analyze the properties of Data Link Layer and Medium Access Layer
CLO4	Understand about Network Layer and Transport Layer
CLO5	Explain and design process of Application Layer

Content of the Course

Course Content		Time Frame	Alignment with		Suggested Activities	Teaching Strategy(s)
Outline	Specific Topics		CLO	PLO		
Course Overview	To comprehend the mission and vision of the Department. To acquire general idea about the course Fundamental and Computer Networking. To grasp the content and policies for the class.	**Week-1** **L-1-3**	CLO1	PLO1	Students will give brief introduction about themselves Course outline will be discussing in details	#Socialized recitation #Show presentation to motivate the students
Introduction and The Physical Layer	**To discuss** about Types of Computer Networks, Network Topologies, Circuit and Packet Switching and Protocol Hierarchies. **To analyze**OSI Model, The TCP/IP Model and Uses of Computer Networks**. To understand** Transmission Media, Communication Channel and Wireless Transmission**). To explain** Telephone System, Narrowband ISDN Cellular Radio and Communication Satellite.	**Week-2,3** **L-4-9**	CLO2	PLO1 PLO2 PLO3	Students will discuss with a group. To apply the knowledge to solve the different real-time problems.	#Interactive discussion #Lecture discussion with OSI Model and Physical Layer.
Exam Review	To make an overview	**Week-4** **L-10-12**			Lectures, Questions and Answers	
Exam.		**Week-5** **L-13-15**			Quiz and Tutorial Exam. Will be taken	
The Physical Layer and Data Link Layer	**To explain** Telephone System, Narrowband ISDN Cellular Radio and Communication Satellite, **To discuss data link layer**: Design Issues, Error Detection and Correction, Data Communication Interface, Elementary Data Link Protocols, Example Data Link Protocols.	**Week-6,7** **L-16-21**	CLO2 CLO3	PLO2 PLO3	Students will identify, analyze and formulate complex real-time error detection and correction development problems.	#White board discussion #Lecture discussion with Physical and Data Link Layer

	To explain medium access layer: The channel allocation problem, Multiple access protocols, IICE standard for LANs and MANs, Bridges, High speed LANs.					
Exam. Review	To make an overview	Week-8 L-22-24			Lectures, Questions and Answers	
Exam.		Week-9 L-25-27			Presentation and Tutorial Exam. Will be taken	
The Network, Transport and Application Layer	To discuss the network layer: Design issues, Routing algorithms, Congestion control algorithms, Internetworking, The network layer in the internet. To discuss the transport layer: The transport service, Element of transport protocols, TCP and UDP, Performance issues. To discuss the application layer: Network security, DNS, SNMP, E-Mail, Usenet News, WWW, Multimedia.	Week-10-11 L-28-33	CLO4 CLO5	PLO3	Students will apply reasoning informed by contextual knowledge to understand Network, Transport and Application Layer	#White board discussion #Lecture discussion with network and Transport Layer #Show video about Application Layer to motivate students
Exam. Review	To make an overview	Wee-12 L-34-36			Lectures, Questions and Answers	
Exam.		Week-13 L-37-39			Assignment and Tutorial Exam will be taken	
Recess before Exam.		Week-14-15				
Sem. End Exam.	Start	Week-16				

Assessment Pattern (According FET Ordinance)

CIE: (Continuous Internal Evaluation-30Marks)

Bloom's Category Marks:30	Tutorial/In-course (10)	Assignment (05)	Quiz/Presentation (05)	Class Attendance 10
Remember			(05)	
Understand	(05)			
Apply				(10)

Analyze				
Evaluate	(05)			
Create		(05)		

SMEE: (Semester Mid and End Examination-30 Marks)

Bloom's Category	Test
Remember	05
Understand	05
Apply	10
Analyze	00
Evaluate	05
Create	05

Assessment and Evaluation
– Class Attendance & Participation (10%)
– Quiz/Presentation (10%)
– In-course/Tutorial (10%)
– Final Exam (70%)

Learning Resources
Text Books
1. Computer Networks, Andrew. S. Tanenbum.
2. Data Communications and Networking, Behrouz. A Forouzan.

Reference Books and Other Materials
3. Understanding Data Communications, William A Shay, An International Thompson Publishing Company.
4. Introduction to Data Communications- A practical approach, Larry Hughes, Narosa Publishing House,

ICT-3108:   **Computer Networking Laboratory**   Full Marks: 100
Credit: 1.5
Contact Hours: 39

Prerequisite: Basic Networking knowledge at Higher Secondary Level
Course Type: Laboratory
Course Summary This course is an introduction to a broad range of topics in Practical Computer Networking. It is meant to introduce the basic concepts of a range of topics, with the full details left to upper-level Computer Network classes. The course covers basic network topologies and network models, pair to pair network, Dynamic Host Configuration Protocol, DNS Server, Active directory, Cabling and packet sniffing, Basic Network Operation and Troubleshooting, IP Addressing Subnetting.

Course Objectives: The main emphasis of this course is on the organization and management of local area networks (LANs). The course objectives include learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems. Students are introduced to computer communication network design and its operations, and discuss the following topics: local area networks; bridges, routers and gateways; network naming and addressing; and local and remote procedures. On completion of the course, students

should be able, in part to design, implement and maintain a typical computer network (LAN).

Course Learning Outcomes (CLO): After completing this course a student would be able to

CLO1	To acquire general idea about the LAN, Cabling and Different network devices
CLO2	To Discuss about Topologies, Printer and output device sharing
CLO3	Analyze the properties ofDHCP, DNS and Directory Services
CLO4	Understand about Basic Network Operation and Troubleshooting
CLO5	Explain and testing basic Linux command

Course Content		Time Frame	Alignment with		Suggested Activities	Teaching Strategy(s)
Outline	**Specific Topics**		**CLO**	**PLO**		
Basic Idea About Network Devices	To acquire general idea about cabling, cross and straight through cabling, CAT 6 and CAT 7 cable identification. To understand basic networking such as LAN, MAN and WAN. To find out the characteristics of different network devices such as Hub, Switch, Router, Microtik Router other network devices.	**Week-1 L-1-3**	CLO1	PLO1	Students will give brief introduction about themselves Course outline will be discussing in details	#Socialized recitation #Show presentation to motivate the students
Different Topologies and Sharing	**To discuss** about Types of Networks Topologies and analysis their performance based on PDR, E2E and other parameters. **To share** printer and scanner and MODEM through multiple PCs**. To understand** Hybrid Topologies and implement them in real time**.**	**Week-2,3 L-4-9**	CLO2	PLO3	Students will discuss with a group. To apply the knowledge to solve the different real-time problems.	#Interactive discussion #Lecture on Topologies
Exam Review	**To make an overview**	**Week-4 L-10-12**			Lectures, Questions and Answers	
Exam.		**Week-5 L-13-15**			Quiz and Tutorial Exam. Will be taken	

Network Protocols	**To explain** DHCP and implement how DHCP work and understand it logically. **To discuss** about domain name Server, how DNS work, explain Subnetting and super netting. **To explain** basic directory services, active directory and passive directory services. To configure basic router and Microtik Router**.**	**Week-6,7** **L-16-21**	CLO3	PLO2 PLO3	Students will identify, analyze and formulate complex real-time DHCP and DNS problems.	#White board discussion #Lecture discussion with DHCP and DNS
Exam Review	**To make an overview**	**Week-8** **L-22-24**			Lectures, Questions and Answers	
Exam.		**Week-9** **L-25-27**			Presentation and Tutorial Exam. Will be taken	
Troubles hooting	**To discuss** how to set up windows using disk or bootable pen-drive, Setting NIC driver for basic networking. **To discuss** about several network related errors such as NIC adapter missing, IP address missing and other driver related problem findings and their solutions. **To discuss** about network security related issues and try to solve these problems practically. **To run** several Linux commands to test the security of the network.	**Week-10,11** **L-28-33**	CLO4 CLO5	PLO3	Students will apply reasoning informed by contextual knowledge to understand network related problems and their solutions	#White board discussion #Lecture discussion with network related problems and their solutions
Exam. Review	**To make an overview**	**Wee-12** **L-34-36**			Lectures, Questions and Answers	
Exam.		**Week-13** **L-37-39**			Assignment and Tutorial Exam will be taken	
Recess before Exam.		**Week-14,15**				
Sem. End Exam.	**Start**	**Week-16**				

Assessment Pattern (According FET Ordinance)

CIE: (Continuous Internal Evaluation-30Marks)

Bloom's Category Marks:30	Tutorial/In-course (10)	Assignment (05)	Quiz/Presentation (05)	Class Attendance 10
Remember			(05)	

Understand	(05)			
Apply				(10)
Analyze				
Evaluate	(05)			
Create		(05)		

SMEE: (Semester Mid and End Examination-30 Marks)

Bloom's Category	Test
Remember	05
Understand	05
Apply	10
Analyze	00
Evaluate	05
Create	05

Assessment and Evaluation

    – Class Attendance & Participation (10%)
    – Quiz/Presentation (10%)
    – In-course/Tutorial (10%)
    – Final Exam (70%)

Learning Resources

Text Books

1. Computer Networks, Andrew. S. Tanenbum.
2. Data Communications and Networking, Behrouz. A Forouzan.
3. Lab. Manual