E.G.S.PILLAYENGINEERINGCOLLEGE

(Autonomous)

Approved byAICTE,NewDelhi|Affiliated to AnnaUniversity, Chennai Accredited byNAAC with "A"Grade|AccreditedbyNBA(CSE, EEE, MECH)

NAGAPATTINAM–611002

B.E.Electronicsand CommunicationEngineering

FullTimeCurriculumand Syllabus

FinalYear– SeventhSemester

Course Code	CourseName	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1702EC701	Microwave Engineering	2	0	0	2	40	60	100
1702EC702	Optical Communication	3	0	0	3	40	60	100
1702EC703	Wireless Communication	3	0	0	3	40	60	100
1702EC704	Image Processing	3	0	0	3	40	60	100
1703MG002	Total Quality Management	3	0	0	3	40	60	100
	Professional (Open) Elective	3	0	0	3	40	60	100
LaboratoryCourse								
1702EC751	Microwave and Optical Communication Laboratory	0	0	2	1	50	50	100
1702EC752	Mini Project	0	0	0	1	100	-	100
1704EC753	In-plant Training/ Internship Presentation	0	0	0	1	100	-	100
1704GE751	Life Skills: Competitive Exams Preparation	2	0	0	2	100	-	100
	Total	**20**	**0**	**6**	**24**	**640**	**460**	**1100**

L–Lecture|T–Tutorial|P–Practical|C–Credit|CA –ContinuousAssessment| ES–EndSemester

1702EC701	MICROWAVE ENGINEERING	L	T	P	C
		3	0	0	3

Course Objectives:

1.To gain knowledge about RF Electronics.
2. To study about the various microwave component, signal generators and amplifiers.
3. To gain knowledge about integrated circuits and microwave meaurements.

UNIT I INTRODUCTION TO RF ELECTRONICS 9 Hours

The Electromagnetic Spectrum, units and Physical Constants, Microwave bands, RF behavior of Passive components: Tuned resonant circuits, Vectors, Inductors and Capacitors. Voltage and Current in capacitor circuits, Tuned RF/IF Transformers.

UNIT II MICROWAVE COMPONENTS 9 Hours

Introduction to Microwaves and their applications, Coaxial Line Components, Wave-guide Components, Directional Couplers, Hybrid Tee Junction, Magic Tee, Attenuators, Ferrite Devices, Isolators, Circulators, Cavity Resonators, Re-entrant Cavities, Wave-meters, Microwave Filters, Detectors, Mixers.

UNIT III MICROWAVE SIGNAL GENERATORS AND AMPLIFIERS 9 Hours

Vacuum Tube Triodes, Resonant Cavity Devices, Reflex Klystron, Two –Cavity Klystron, Multi – Cavity Klystron, Slow – Wave Devices, TWT, Crossed Field Devices, Magnetrons, Semiconductor Devices, Microwave BJTs, FETs, Tunnel Diodes, Gunn Diode, IMPATT, TRAPATT Diodes.

UNIT IV MICROWAVE INTEGRATED CIRCUITS 9 Hours

Materials, Substrate, Conductor, Dielectric and Resistive Materials, MMIC Growth, Fabrication Techniques, MOSFET Fabrication, NMOS Growth and CMOS Development, Thin Film Formation.

UNIT V MICROWAVE MEASUREMENTS 9 Hours

VSWR, Frequency, Guide Wavelength, Coupling and Directivity measurements

Total: 45 Hours

Further Reading:

1.Recent trend in Microwave application.

References:

1. Reinhold Ludwing, Pavel Bretchko, “RF Circuit design: Theory and applications”, Pearson Education Asia Publication, New Delhi 2001.
2.Foundations For Microwave Engineering, R. R. Collin, McGraw Hill
3.Microwave Communications – Components and Circuits, E. Hund, McGrawHill.
4.Microwave Devices and Circuits, S. Y. Liao, PHI.
5.Microwave Engineering, R. Chatarjee, East – West Press Pvt. Ltd.

1702EC702	OPTICAL COMMUNICATION	L	T	P	C
		3	0	0	3

Course Objectives:

1. To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures
2. To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors. Design optimization of SM fibers, RI profile and cut-off wave length.
3. To learn about various Optical Sources and Detectors.
4. To Explore the trends of optical fiber measurement systems.
5. To Enrich the idea of optical fiber networks algorithm such as SONET/SDH and optical CDMA

UNIT I INTRODUCTION TO OPTICAL FIBERS 9 Hours

Evolution of fiber optic system- Element of an Optical Fiber Transmission link Ray theory transmission- Total internal reflection-Acceptance angle –Numerical aperture – Skew rays – Electromagnetic mode theory of optical propagation –EM waves – modes in Planar guide – phase and group velocity – cylindrical fibers –SM fibers- Graded Index fiber structure.

UNIT II SIGNAL DEGRADATION OPTICAL FIBERS 9 Hours

Attenuation - Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides-Information Capacity determination -Group Delay-Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion- Pulse Broadening in GI fibers-Mode Coupling -Optical fiber connectors**,** Fiber alignment and Joint Losses – Fiber Splices – Fiber connectors – Expanded Beam Connectors – Fiber Couplers

UNIT III SOURCES AND DETECTORS 9 Hours

Optical sources: Light Emitting Diodes - LED structures - surface and edge emitters, mono and hetero structures - internal - quantum efficiency, lasers Diodes-Modes and Threshold condition -Rate equations -External Quantum efficiency -Resonant frequencies- injection laser diode structures.

Optical Detectors: PIN Photo detectors, Avalanche photo diodes, construction, characteristics and properties, Comparison of performance, Photo detector noise –Noise sources, Signal to Noise ratio , Detector response time.

UNIT IV FIBER OPTIC RECEIVER AND MEASUREMENTS 9 Hours

Fundamental receiver operation, Pre amplifiers, Error sources – Receiver Configuration– Probability of Error – Quantum limit. Fiber Attenuation measurements- Dispersion measurements – Fiber Refractive index profile measurements – Fiber cut- off Wave length Measurements – Fiber Numerical Aperture Measurements – Fiber diameter measurements.

UNIT V OPTICAL NETWORKS AND SYSTEM TRANSMISSION 9 Hours

Basic Networks – SONET / SDH – Broadcast – and –select WDM Networks –Wavelength Routed Networks – Non linear effects on Network performance –-Link Power budget -Rise time budget- Noise Effects on System Performance-Operational Principles of WDM Performance of WDM + EDFA system – Solitons – Optical CDMA – Ultra High Capacity Networks**.**

Total: 45 Hours

Further Reading:

1. Design Optimization of SM fibers-RI profile and cut-off wavelength.
2. Fiber amplifiers- Power Launching and coupling, Lencing schemes

References:

1. Gerd Keiser, "Optical Fiber Communication" Mc Graw -Hill International, 4th Edition., 2010.
2. John M. Senior , “Optical Fiber Communication”, Second Edition, Pearson Education, 2007.
3. Ramaswami, Sivarajan and Sasaki “Optical Networks”, Morgan Kaufmann, 2009
4. J.Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 3rd Edition, 2008.
5. J.Gower, "Optical Communication System", Prentice Hall of India, 2001.

1702EC703	WIRELESS COMMUNICATIONS	L	T	P	C
		3	0	0	3

Course Objectives:

1. To become skilled at fundamentals of mobile and wireless communication technologies and its applications.
2. To create the student to work on the transceivers for wireless channels.

UNIT I INTRODUCTION 4 Hours

Introduction to wireless Communication systems – Evolution of Mobile communication system – 2G, 3G, 4G, UMTS, LTE, WLL, WLAN, WPAN, Bluetooth, Ultra Wide Band

UNIT II MOBILE RADIO PROPAGATION 10 Hours

Large scale path loss –Path loss models: Free Space and TwoRay models -Link Budget design –Small scale fading-Parameters of mobile multipath channels –Time dispersion parameters-Coherence bandwidth –Doppler spread & Coherence time, Fading due to Multipath time delayspread–flat fading frequency selective fading –Fading due to Doppler spread –fast fading –slow fading.

UNIT III CELLULAR COMMUNICATION 10 Hours

Introduction, Frequency reuse, Cell Assignment techniques, Hand off Strategies, Interference and System Capacity, Trunking and Grade of Service, Improving Coverage and capacity in cellular systems.Multiple Access techniques: FDMA, TDMA, CDMA, SDMA

UNIT IV MODULATION SCHEMES AND SPREAD SPECTRUM 12 Hours

Modulation techniques: M-QAM, M-PSK, GMSK, Spread Spectrum Systems: PN sequence-m-sequence -Direct Sequence Spread Spectrum-Frequency Hopping Spread Spectrum, Synchronization techniques for Spread Spectrum signals, Diversity and Combining Techniques: Time Diversity, Frequency diversity, Space Diversity

UNIT V MULTIPLE ANTENNA TECHNIQUES 9 Hours

MIMO systems – spatial multiplexing -System model – Pre-coding -Beam forming –Space Time Coding, Alamouti scheme -Channel state information-capacity in fading and non-fading channels- combining techniques-Selection combining, Equal gain combining, Maximum ratio Combining, RAKE receiver. Introduction to OFDM

Total: 45

Further Reading:

WANET, IoT, Zigbee Technology, WiMax, WLAN

References:

1. Rappaport. T.S., “Wireless Communications: Principles and Practices”, Second Edition,PHI, 2014
2. Andrea Goldsmith, “Wireless Communication”, Cambridge University Press, 2005
3. Andreas.F.Molisch, “Wireless Communications”, John Wiley, 2010
4. John G. Proakis, “Digital Communication”McGraw Hill, 4th Edition, 2008
5. Gordon L.Stuber, “Principles of Mobile Communication”, 3rd Edition, Springer International Ltd.,2011
6. William C Lee, “Wireless and Cellular Communications” 3rd Edition McGraw Hill, 2006

1702EC704	IMAGE PROCESSING	L	T	P	C
		3	0	0	3

Course Objectives:

1. To make the students to understand the digital image fundamentals.
2. To study the digital image using different transforms.
3. To acquire the basic knowledge in filters, image enhancement, image restoration and compression techniques.

UNIT I DIGITAL IMAGE FUNDAMENTALS 9 Hours

Elements of digital image processing systems, Elements of visual perception, Image sampling andquantization, Basic Relationships between pixels. Image Transforms:Discrete Fourier transform, Cosine,Hadamard, Haar, Walsh and Slant transform..

UNIT II IMAGE ANALYSIS 9 Hours

Histogram processing, Equalization and specification techniques,Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters, Image smoothing and sharpening using frequency domain filters.

UNIT III IMAGE SEGMENTATION 9 Hours

Point, line and edge detection-Detection of isolated points, Line detection, Edge models, Basic edgedetection, Edge linking and boundary detection. Thresholding-basic global thresholding, Otsu's method,Multiple, Variable and multivariable thresholding. Region-based segmentation-Region growing, Regionsplitting and merging.

UNIT IV IMAGE RESTORATION AND RECOGNITION 9 Hours

Image degradation/ restoration model, Noise models, Restoration-Spatial Filtering, Constrained Leastsquare filtering, Inverse filtering, Wiener Filtering, Object recognition-Patterns and patternclasses,Matching-Minimum Distance classifiers, Neural networks-Background, Training by Back Propagation.

UNIT V IMAGE COMPRESSION 9 Hours

Fundamentals, Basic compression methods-Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run – length coding, Lossless and Lossy predictive coding, Block transform coding, Waveletcoding.

Total: 45 Hours

Further Reading:

KL transform and their properties, Homomorphic filtering, Morphological image processing – Erosionand Dilation, Opening and closing, Segmentationusing morphological watersheds,Applications of neuralnetworks in image processing, Digital image watermarking.

References:

1. C.Rafeal Gonzalez and E.Richard Woods, Digital Image Processing, Third Edition, Pearson Education 2008.
2. Anil K.Jain, Fundamentals of Digital Image Processing, PHI, 2010.
3. S Jayaraman, S Esakkirajan T Veerakumar, Digital Image Processing , Mc Graw- Hill, 2010
4. K.William Pratt, Digital Image Processing, John Wiley, 1997.
5. M.A.Sid Ahmed, Image Processing Theory, Algorithm and Architectures, McGraw - Hill, 1995.

1702EC751	MICROWAVE AND OPTICAL COMMUNICATION LAB	L	T	P	C
		0	0	4	2

Course Objectives:

1. To have a detailed practical study on microwave equipmentsand microstrip components.
2. To study the optical devices and to use in appropriate application.

LIST OF EXPERIMENTS:

MICROWAVE EXPERIMENTS:

1. Reflex Klystron – Mode characteristics
2. Gunn Diode – Characteristics
3. VSWR, Frequency and Wave Length Measurement
4. Directional Coupler – Directivity and Coupling Coefficient – S – parameter Measurement
5. Circulator – S - parameter measurement
6. Attenuation and Power measurement
7. S - matrix Characterization of E-Plane T, H-Plane T and Magic T.
8. Radiation Pattern of Antennas.
9. Antenna Gain Measurement

OPTICAL EXPERIMENTS:

1. DC characteristics of LED and PIN Photo Diode.
2. Mode Characteristics of Fibers.
3. Measurement of Connector and Bending Losses.
4. Fiber Optic Analog and Digital Link
5. Numerical Aperture Determination for Fibers
6. Attenuation Measurement in Fibers.

Contend Beyond:

- Study of Manchester coding.

Total: 45 Hours

PROFESSIONAL ELECTIVES – V

1703MG002	**TOTALQUALITYMANAGEMENT**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Objectives:

1. To learn concepts, dimension quality and philosophies ofTQM.
2. To study the TQM principles and itsstrategies.
3. To impart knowledge on TQM tools for continuous improvement.

UNIT I INTRODUCTION **9 Hours**

Definition of Quality - Dimensions of Quality - Quality Planning - Quality costs - Analysis Techniques for Quality Costs - Basic concepts of Total Quality Management - Historical Review - Quality Statements - Strategic Planning, Deming Philosophy - Crosby philosophy - Continuous Process Improvement - JuranTrilogy, PDSA Cycle, 5S, Kaizen - Obstacles to TQM Implementation

UNIT II TQM PRINCIPLES **9 Hours**

Principles of TQM, Leadership - Concepts - Role of Senior Management - Quality Council, Customer satisfaction - Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement - Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits - Supplier Partnership - Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures - Basic Concepts, Strategy, Performance Measure

UNIT III STATISTICAL PROCESS CONTROL (SPC) **9 Hours**

The seven tools of quality - Statistical Fundamentals - Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables X bar and R chart and attributes P, NP, C, and u charts, Industrial Examples, Process capability, Concept of six sigma - New seven Management tools

UNIT IV TQM TOOLS **9 Hours**

Benchmarking - Reasons to Benchmark - Benchmarking Process, Quality Function Deployment(QFD)- House of Quality, QFD Process, and Benefits - Taguchi Quality Loss Function - Total Productive Maintenance (TPM) - Concept, Improvement Needs, and FMEA - Stages of FMEA- Casestudies

UNIT V QUALITY SYSTEMS **9 Hours**

Concept, Requirements of ISO 9000 and Other Quality Systems - ISO 9000:2000 Quality System - Elements, Implementation of Quality System, Documentation, Quality Auditing, ISO 9000:2005 and 9001:2015, ISO 14000.

Total: 45 Hours

Further Reading:

1. Case Study: TQM Quality and Environmental Concepts in real World Applications
2. Environment Management system

References:

1. Rathakrishnan, Gas Dynamics, 5th edition, PHI Learing Private Limited,2013.
2. N. Gupta and B. Valarmathi, Total Quality Management, Tata McGraw-Hill Publishing Company Pvt. Ltd., New Delhi,2009.
3. S. Kumar, Total Quality Management, Laxmi Publications Ltd. New Delhi,2006
4. P.N. Muherjee, Total Quality Management, Prentice Hall of India, New Delhi,2006.
5. DaleH.Besterfiled, Total Quality Management, Pearson Education Inc., New Delhi,2003.
6. James R. Evans and William M. Lidsay, The Management and Control of Quality, South- Western2002.