

RAGHU ENGINEERING COLLEGE (Autonomous)

(Approved by AICTE, New Delhi & Permanently Affiliated to JNTUGV, Vizianagaram) NBA and NAAC 'A+' grade accredited Institute.

Dakamarri, Bheemili Mandal, Visakhapatnam – 531162, A.P.

Phone: 08922-248001 / 221122/9963981111, <u>www.raghuenggcollege.com</u>

INSTITUTE VISION

Envisioning to be a world class technical institution by synergizing quality education with ethical values.

INSTITUTE MISSION

- To encourage training and research in cutting-edge technologies.
- To develop and strengthen strategic links with the industry.
- To kindle the zeal among the students and promote their quest for academic excellence.
- To encourage extra-curricular activities along with good communication skills.

QUALITY POLICY

RAGHU Engineering College underscores ethical values along with innovative teaching through an interactive, activity-based pedagogy; establishes the best of infrastructural facilities, inculcates engineering temper among the students through the use of the latest Information and Communication Technologies, and strives for an efficient, responsive and transparent administration in all areas.

Department of Electronics and Communication Engineering

VISION

To grow into a premier engineering department with excellence in teaching, research, and innovation in the field of electronics and communication engineering at par with the global industrial standards catering to the needs of the stakeholders while keeping up with the advancing technology.

MISSION

- M1: To provide excellence in education, research and public services.
- M2: To provide a creative environment through structured teaching and learning process.
- M3: To impart employability-focused education while imbibing the spirit of entrepreneurship.
- M4: To inculcate self-learning attitude, management skills and professional ethics.

PROGRAMME EDUCTIONAL OBJECTIVES(PEOs)

- PEO 1: **Domain Knowledge:** To have the knowledge and technical skills required to remain productive.
- PEO 2: Communication Skills & Employability: To apply technical knowledge and skills as electronics and communication engineers to provide practical solutions in industrial and governmental organizations.
- PEO 3: Life Long Learning & Social Concern: To achieve success with awareness of entrepreneurship skills and have the ability for lifelong learning by pursuing professional development to meet the emerging and evolving demands for a successful career.

MAPPING OF MISSION STATEMENTS WITH PEOS

MS/ PEOs	PEO 1	PEO 2	PEO 3
MS 1	3	2	2
MS 2	3	3	2
MS 3	3	2	3
MS4	2	3	3

1-Slight, 2- Moderate, 3- Substantial

	PROGRAM OUTCOMES							
	Graduates of Electronics and Communication Engineering Will:							
PO 1 Engineering knowledge : Apply the knowledge of mathematics, science, eng fundamentals, and an engineering specialization to the solution of complex eng problems								
PO 2	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.							
PO 3	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.							
PO 4	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.							
PO 5	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.							
PO 6	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.							

PO 7	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.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities
	and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual, and as a member or
	leader in diverse teams, and in multidisciplinary settings.
PO 10	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.
PO 11	Project management and finance: Demonstrate knowledge and understanding of the
PO 11	Project management and finance : Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a
PO 11	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.
PO 11 PO 12	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. Life-long learning : Recognize the need for, and have the preparation and ability to
PO 11 PO 12	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. 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
PO 11 PO 12	 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. 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.
PO 11 PO 12	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. 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 (PSOs)
PO 11 PO 12 PSO 1: U	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. 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 (PSOs)
PO 11 PO 12 PSO 1: U up-skilling	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. 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 (PSOs) Inderstand and apply the fundamental concepts of Basic and Engineering Sciences for appropriate g in the fast-emerging fields of Signal Processing, Image Processing, Communication,
PO 11 PO 12 PSO 1: U up-skilling Networkin	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. 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 (PSOs) Inderstand and apply the fundamental concepts of Basic and Engineering Sciences for appropriate g in the fast-emerging fields of Signal Processing, Image Processing, Communication, ng, VLSI, Embedded Systems, Analog and Digital Technologies to meet the futuristic industrial
PO 11 PO 12 PSO 1: U up-skilling Networkin achieveme	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. 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 (PSOs) Inderstand and apply the fundamental concepts of Basic and Engineering Sciences for appropriate g in the fast-emerging fields of Signal Processing, Image Processing, Communication, and VLSI, Embedded Systems, Analog and Digital Technologies to meet the futuristic industrial ents.

PSO 2: Apply latest hardware and software tools to solve complex electronics and communication engineering problems along with analytical skills to derive appropriate solutions in the real time applications across varied business and administrative functions.

PEO/ POs	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
PEO 1	3	3	3	2	2						1	1	3	1
PEO 2	2	3	3	2			2	2		3			3	3
PEO 3						1	1	1	1	2	1	3	3	1

Mapping of PEOs with POs and PSOs

1-Slight, 2- Moderate, 3- Substantial

23ES112-ELECTROMAGNETICS WAVES AND TRANSMISSION LINES											
Programme &Branch	B. Tech & ECE	Sem	Category	L	, T		Credits				
Prerequisites	Basics of Vectors and Scalars, Physics of Electric Charges and Magnets with some concepts of Networks	4	Engineering Science	Engineering Science 2			2				
Course Objectives:											
 To carry out a study on various analytical methods of calculating electric field intensities and electric potentials To describe various analytical methods of calculating magnetic field intensities and magnetic potentials To study on time varying electrical and magnetic field intensities and consolidating important laws as Maxwell's equations To learn the fundamental concepts of the transmission lines in electromagnetic wave propagation To apply the knowledge of transmission lines to construct the smith chart and stub matching techniques. Preamble : The study of electromagnetic waves and transmission lines is a fundamental aspect of electrical and electronics engineering. Electromagnetic waves are the carriers of energy and information across different media, from the vacuum of space to the cables and waveguides used in telecommunications. Understanding the principles of how these waves propagate, interact with materials, and are guided along transmission lines is crucial 											
<u> </u>	broadcasting, and numerous other	techno	logies.								
Course Conte	nts:				1						
Unit-1	ELECTROSTATICS				Cont	act H	lours: 9				
Review of Co-o	ordinate Systems, Electrostatics: C	oulomb	's Law, Electric I	Field I	ntensi	ty, E	lectric Flux				
Density, Gauss	Law and Applications, Electric Pote	ntial, M	axwell's Two Equ	ations	for Ele	ctros	tatic Fields,				
Energy Density,	, Illustrative Problems. Convection a	and Con	duction Currents, I	Dielect	ric Co	nstan	t, Poisson's				
and Laplace's E	quations; Capacitance – Parallel Pl	ate, Coa	xial Capacitors, Il	lustrati	ive Pro	oblem	ns.				
Unit-2	MAGNETOSTATICS & MAXV	WELL'	S EQUATIONS		Cont	act H	lours: 9				
Magneto statics	: Biot - Savart's Law , Ampere's C	ircuital	Law and Applicat	ions, N	/agnet	ic Fl	ux Density,				
Maxwell's Equations for Magnetostatic Fields. Magnetic Scalar and Vector Potentials. Forces due to											
Magnetic Fields, Ampere's Force Law, Inductance (Solenoid, Torid) and Magnetic Energy Problem											
Maxwell's Equations (Time Varving Fields): Faraday's Law and Transformer EMF. Inconsistency of											
Ampere's Law	Displacement Current Density Ma	axwell's	Equations in Diff	erent	Final I	Form	s and Word				
Statements Co	nditions at a Boundary Surface. Di	electric	- Dielectric Diele	ctric-C	Conduc	tor	conductor -				
Interfaces Illust	trative Problems				- onau	,					
1110110005, 11105	ina (* 1100)0115.										

Unit	3	EM Wave Characteristics	Contact Hours: 9								
Wave	Equation	s for Conducting and Perfect Dielectric Media, Uniform Plane W	aves – Definition, All								
Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossy dielectrics, lossless											
dielec	dielectrics, free space, wave propagation in good conductors, skin depth, Polarization & Types, Poynting										
Vecto	Vector and Poynting Theorem, Illustrative Problems. Reflection and Refraction of Plane Waves – Normal										
and O	blique Inc	idences, for both Perfect Conductor and Perfect Dielectrics, Brewste	r Angle, Critical Angle								
and T	and Total Internal Reflection, Surface Impedance.										
Unit-4	Unit-4Transmission Lines – IContact Hours: 9										
Types	, Paramet	ers, T & π Equivalent Circuits, Transmission Line Equations,	Primary & Secondary								
Const	ants, Expr	essions for Characteristic Impedance, Propagation Constant, Phase	and Group Velocities,								
Infinit	te Line, Lo	ossless lines, distortion less lines, Illustrative Problems.									
Unit-	5	Transmission Lines – II	Contact Hours: 9								
Input	Impedanc	e Relations, SC and OC Lines, Reflection Coefficient, VSWR. Lo	w loss radio frequency								
lines a	and UHF	Transmission lines, Impedance Transformations, $\lambda/8,\lambda/4$ and λ /2	Lines, Smith Chart –								
Const	ruction and	d Applications, Quarter wave transformer, Single Stub Matching, Il	lustrative Problems.								
			Total Hours: 45								
Text	Books:										
1	Principle	s of Electromagnetics – Matthew N.O. Sadiku and S.V. Kulkarni, C	Oxford University								
	Press, Si	xth (Asian) Edition,2015.									
2	Electrom	agnetic Waves and radiating systems – Edward C. Jordan and Keitl	n G. Balmain, Prentice								
	Hall of I	ndia, Second Edition, 2010.									
3	Engineer	ing Electromagnetics – William H. Hayt Jr. and John A. Buck, Mc	Graw Hill, Eighth								
	Edition.	2014.									
Refei	rence Boo	oks:									
1	Electrom	agnetic Field Theory and Transmission Lines – G. S. N. Raju, Pear	son Education, 2006.								
2	Electromagnetic Field Theory and Transmission Lines – G Sasi Bhushana Rao, Wiley India, 2013.										
3	3 Networks, Lines and Fields – John D. Ryder, Pearson Education, Second Edition,2015										
Web	Reference	ces :									
1	https://or	nlinecourses.nptel.ac.in/noc21_ee83/preview_									
2	https://w	ww.youtube.com/watch?v=f97Ej1f72vw									
3	https://w	ww.classcentral.com/course/swayam-electromagnetic-theory-5223									

COURS	SE OUTCOMES:	BT Mapped					
Upon co	Upon completion of the course, students shall have ability to						
	Understand and apply Coulomb's law, Gauss's law equations for	L3					
CO 1	calculating electric field intensities and electric potentials in vacuum and						
	materials due to various charge distributions.						
	Understand and apply Biot-Savart's law, Ampere's circuital law for	L3					
CO 2	calculating magnetic field intensities and potentials (scalar & vector) in						
	vacuum and materials due to steady electric currents						
	Apply and analyze Faraday's law in generation of Electro Motive Force	L4					
CO 3	and modified Ampere's law to get finalized forms of Maxwell's						
	equations.						
CO 4	Know the fundamental concepts of the transmission lines in	L2					
CO 4	electromagnetic wave propagation						
CO 5	Construct and design the Smith Chart and stub matching techniques with	L4					
005	the knowledge of transmission lines						

Mapping of Cos with POs and PSOs

COs/	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PSO-	PSO-
POs	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	-	1	-	-	1	-	-	-	-	-	3	-
CO 2	3	2	-	1	-	-	1	-	-	-	-	-	3	-
CO 3	2	2	1	2	-	-	1	-	-	-	-	-	2	-
CO 4	1	1	1	2	-	-	1	-	-	-	-	-	2	-
CO 5	1	1	2	2	-	-	1	-	-	-	-	-	2	-
1 - Sli	1 – Slight, 2 – Moderate, 3 – Substantial													

ASSESSMENT PATERN – THEORY											
TEST	Remembering (K1)%	Creating (K6)%	Total%								
MID-1	10	30	40	20			100				
MID-2	10	40	30	20			100				
SEE	20	20	30	30			100				
	*+ 3% may be varied										