

Electronics & Telecommunication Engineering Department

Curriculum: BE (E&TC)

Electronics & Telecommunication Engineering Department

Program Educational Objective(s)	
After graduation and few years of graduation, the Electronics & Telecommunication Engineering graduates would	
PEO 1	Core Competency: Graduates will provide engineering solutions with strong base of science and mathematics, subject domain knowledge for challenging problems in Electronics and allied disciplines.
PEO 2	Career Building: Graduates will fulfill professional responsibilities effectively by synergizing theoretical and practical skills.
PEO 3	Technical Proficiency: Graduates will practice analytical, creative, innovative skills for higher education, research, industrial development.
PEO 4	Managerial Skills: Graduates will perform cohesively in group using moral, ethical practice, managerial, entrepreneurial skills for welfare of society with global outlook.

Electronics & Telecommunication Engineering Department

Programme Outcomes (PO's)

Programme Outcomes describe what students are expected to know or be able to do by the time of graduation from the programme. The POs for Under Graduate Course in Electronics and Telecommunication Engineering are able to

1. Apply knowledge of mathematics, science and technical fundamentals for solutions of domain problems
2. Identify, formulate, review the literature, analyze the complex engineering problems
3. Design and implement the systems' components and processes serving the needs of safety, environment and society
4. Perform experiment, analyze and interpret results
5. Use modern tools and technical skills necessary for electronic system development
6. Understand the impact of electronics in modern era
7. Explore the needs of society for sustainable development and human values
8. Understand professional, ethical and legal responsibilities
9. Work effectively in diverse and multidisciplinary tasks, to accomplish common goal
10. Communicate effectively
11. Engage in continuing educational / professional, entrepreneurship development
12. Apply electronics engineering and management principles / skills, as a member and leader in a team to solve social and industrial problems

Electronics & Telecommunication Engineering Department

Mapping of PEOs and POs

Program Educational Objective(s)		Mapped Programme Outcomes
PEO 1	Core Competency: Graduates will provide engineering solutions with strong base of science and mathematics, subject domain knowledge for challenging problems in Electronics and allied disciplines.	1,2,3,4,5,6
PEO 2	Career Building: Graduates will fulfill professional responsibilities effectively by synergizing theoretical and practical skills.	6,7,8,9,10,11,12
PEO 3	Technical Proficiency: Graduates will practice analytical, creative, innovative skills for higher education, research, industrial development.	1,2,3,4,5,6,9,11
PEO 4	Managerial Skills: Graduates will perform cohesively in group using moral, ethical practice, managerial, entrepreneurial skills for welfare of society with global outlook.	7,8,9,10,11,12

GOVERNMENT COLLEGE OF ENGINEERING, AURANGABAD

(An Autonomous Institute of Government of Maharashtra)

Department of Electronics & Telecommunication Engineering

Teaching and Evaluation Scheme

BE (Full-Time) in Electronics & Telecommunication Engineering

SEMESTER-I

THEORY COURSES														
Sr. No	Course Code	Subject	Programme Outcomes	Scheme of Teaching (Hrs /Week)			Total Credits	Scheme of Evaluation (Marks)						
				L	T	P		Theory				Term Work	Practical/ Viva-voce	Total
								Test I	Test II	TA	ESE			
1	ET4001	Computer Network	2,3,5,8,12	3	-	-	3	15	15	10	60	-	-	100
2	ET4002	Antenna & Waveguide	1,2,3,11	4	-	-	4	15	15	10	60	-	-	100
4	ET	Any ONE from Professional Elective Group		3	-	-	3	15	15	10	60	-	-	100
5	ET	Any ONE from Professional Elective Group		3	-	-	3	15	15	10	60	-	-	100
6	ET	Any ONE From Open Elective Group		3	-	-	3	15	15	10	60	-	-	100
LABORATORY COURSES														
7	ET4003	Lab-Computer Network	3,4,5,8,11,12	-	-	2	1	-	-	-	-	25	25	50
8	ET4004	Lab- Antenna & Waveguide	1,4,5	-	-	2	1	-	-	-	-	25	25	50
9	ET	Lab-Professional Elective		-	-	2	1	-	-	-	-	25	25	50
10	ET	Lab-Professional Elective		-	-	2	1	-	-	-	-	25	25	50
11	ET4005	Project I	2,3,5,6,7,9,10,11,12	-	-	4	2	-	-	-	-	50	-	50
MANDATORY COURSES (Only ONE Course during four year Program)														
Total				16	0	12	22	75	75	50	300	150	100	750

SEMESTER-II

THEORY COURSES														
Sr. No	Course Code	Subject	Programme Outcomes	Scheme of Teaching (Hrs /Week)			Total Credits	Scheme of Evaluation (Marks)						
				L	T	P		Theory				Term Work	Practical / Viva-voce	Total
								Test I	Test II	TA	ESE			
1	ET	Any ONE from Professional Elective Group		3	-	-	3	15	15	10	60	-	-	100
2	ET	Any ONE From Open Elective Group		3	-	-	3	15	15	10	60	-	-	100
3	ET	Any ONE From Open Elective Group		3	-	-	3	15	15	10	60	-	-	100
4	HS	Any One from Humanity Group		3	-	-	3							
LABORATORY COURSES														
4	ET	Lab- Professional Elective		-	-	2	1	-	-	-	-	25	25	50
5	ET4006	Project-II	2,3,4,5,6,7,9,10,11,12	-	-	12	6	-	-	-	-	50	100	150
MANDATORY COURSES (Only ONE Course during four year Program)														
Total				09	0	14	19	45	45	30	180	75	125	500
Grand Total				25	0	26	41	120	120	80	480	225	225	1250

L-Lectures, T-Tutorials, P-Practical, TA-Teacher Assessment, ESE-End-Semester Examination

Mandatory Courses: Group Discussion/ Seminar/ Implant Training/ NSS/ NCC/ Yoga/ Talent Hour

ET4001: Computer Network

Teaching Scheme	Examination Scheme
Lectures : 3Hrs/week	Test I : 15 Marks
Total credits : 03	Test II : 15 Marks
	Teachers Assessments : 10 Marks
	End Semester Exam : 60 Marks

Prerequisites: Basic knowledge of digital communication systems and computers as a data terminal.

Course description: This course introduces the elements and architecture of computer and data communication networks, demonstrates the fundamental principles of computer networking, and provides experience in the practical use of current networking technology. Topics range from data communications architecture and protocols and network topologies, internetworking, routing and switching strategies and emerging high speed networks. You will also learn what careers may be available to you within this field.

Course Objectives:

- To understand the various error controlling techniques in data communication networks
- To learn the functions of different protocols
- To understand TCP/IP & Application layer protocols and its uses in modern communication
- To identify different components of data communication network & IoT

Course Outcomes: After completing the course, the students will be able to:

CO1	Identify the issues and challenges in the architecture of a computer network and recognize security issues in a network.
CO2	Understand the ISO/OSI seven layers in a network.
CO3	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
CO4	Choose the required protocol and the communication modes for the given system. analyze topological and routing strategies for an IP based networking, IoT

Detailed Syllabus:

Unit	Content
Unit 1	Data Communication, Networks, Protocols and Standards, Topology, Categories of Networks, OSI & TCP/IP Protocol suites Guided media, Unguided media
Unit 2	Data Link Layer Design Issues : Framing, Error control, Flow control, practical data link protocols, Medium Access Technique : Ethernet, CSMA /CD protocol High speed LAN's like FDDI, Ethernet

Unit 3	Network Layer & Design Issues: Routing & congestion control algorithms, IP addressing OSPF & BGP, CIDR & IPV6 Transport Layer: Transport Protocols, Addressing, Establishing & releasing a connection Transport protocol for Internet TCP & UDP
Unit 4	Application Layer Protocols. A web server implementation, Study of client-server implementation. Introduction to Network security, firewall, network intrusion detection system
Unit 5	Networking simulation and modeling techniques. Case studies. Internet of Things Architecture Introduction, Reference Model Case Study

Text and Reference Books

1. Behrouz A. Forouzan, Data Communications and Networking, 2nd Edition, Tata McGraw-Hill, New Delhi, 2003
2. Andrew S. Tanenbaum, Computer Networks, 4th Edition, Prentice-Hall of India, New Delhi, 2000.
3. William Stallings, Data and Computer Communication, 6th Edition, Prentice Hall of India, New Delhi, 1999.
4. Douglas E Comer, Computer Networks and Internet, Pearson Education Asia, 2000.
5. Larry L. Peterson and Bruce S. Davie, Computer Networks: A Systems Approach, 3rd edition (2003), Morgan Kaufmann Publishers.

List of Reference Sources for Classes and Assignments: Request for Comments, Network Standards, available from

<http://www.rfceditor.org/rfcsearch.html>;

IEEE Communications Magazine (technical journal)

IEEE Journal on Selected Areas in Communications (technical journal)

IEEE Network (technical journal)

IEEE Spectrum (technical journal)

IEEE Transactions on Communications (technical journal)

Resources available on e-learning site <http://www.e-gecaect.com>

Computer Networks and ISDN Systems (technical journal)

Cisco Systems Technical Journal

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					2			3				1
CO2		3										2
CO3												1
CO4			2		3							

1 – High 2 – Medium 3 – Low

Teacher's Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following

- 1) Simulation
- 2) Application development

- 3) Power point presentation of case studies
- 4) Question & answer / Numerical solution
- 5) Study of Industry processes and its presentation
- 6) Mini projects

Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	Test-I	Test-II	Teachers Assessment/ Assignment	End Semester Examination
K1	Remember	05	05	00	10
K2	Understand	10	10	05	20
K3	Apply	00	00	05	25
K4	Analyze	00	00	00	05
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks 100		15	15	10	60

Assessment table

Assessment Tool	K1	K2	K2	K3
	CO1	CO1,CO2	CO3	CO4
Class Test – I (15 Marks)	05	10	00	00
Class Test – II (15 Marks)	00	00	10	05
Teachers Assessment (10 Marks)	00	00	05	05
ESE Assessment (60 Marks)	10	20	15	15

Designed by

Dr. A. R. Karwankar

ET4003: Lab Computer Network	
Teaching Scheme Practical: 2 Hrs/Week Total Credits: 01	Examination Scheme Term Work : 25 Marks Practical Examination & Viva Voce: : 25 Marks

Laboratory Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1	Identify and describe the functions of common networking devices.
CO2	Configure and construct a local area network (LAN),WLAN
CO3	Design and implementation of a simple client/server model and running application using sockets and TCP/IP
CO4	Study of various network security algorithms & systems (e.g. firewall, cryptography)

List of Experiments

Preform any six experiments.

Sr. No.	List of Experiments
1	Identification of various networks components - connections, BNC, RJ-45, I/O box - Cables, Co-axial, twisted pair, UTP - NIC (network interface card) - Switches
2	Demonstrate wiring diagrams of network cabling considering a computer lab of 20 systems
3	Use of protocols in establishing LAN
4	Installation of networks (Peer to Peer Networking client server interconnection)
5	Use/installation of proxy server
6	Designing a network system for an organization using TCP/IP Network using a. Class A address b. Class B address c. Class C address d. Telnet e. FTP f. Ping
7	Installation of server operating system
8	Create a Virtual Private Network (VPN) over WAN Evaluate application response time in the presence and absence of a firewall.
9	Perform various network security algorithms
10	Use of Network Simulation and modelling tool

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			3	3								3
CO2			1								2	3
CO3			1								2	3
CO4			1	2	2			2			1	2

1 – High 2 – Medium 3 - Low

Assessment Table

Assessment Tool	S1	S3	S4	S2
	CO1	CO2	CO3	CO4
Term Work (25 Marks)	05	05	10	05

Assessment Pattern

Assessment Pattern Level No.	Skill Level	Term Work
S1	Imitation	05
S2	Manipulation	05
S3	Precision	05
S4	Articulation	10
S5	Naturalization	00
Total		25

Designed by
Dr. A.R. Karwankar

ET4002: Antenna and Waveguides

Teaching Scheme Lectures : 4Hrs/week Total Credits : 04	Examination Scheme Test I : 15 Marks Test II : 15 Marks Teachers Assessments : 10 Marks End Semester Exam : 60 Marks
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Prerequisites: Basic knowledge of Electromagnetics and Network Theory

Course description: This course gives exposure to various channels used in Electronic Communication. It is designed to give the basic concepts of transmission lines, waveguides and antenna. It is the basis required to understand the wired and wireless communication systems. During the course, students will explore interesting concepts to select required channel for communication.

Course objectives: This course has the following objectives:

- To introduce channels for wired and wireless communications
- To give basic ideas of transmission lines
- To impart the knowledge of waveguides and propagation through it
- To give exposure to antenna basics

Course Outcomes: After completing the course, the students will able to:

CO1	Understand the fundamentals of communication channels	K2
CO2	Explain variety of principles of propagation of waves	K2
CO3	Design the channel components for specified requirement	K3
CO4	Classify and compare different types of antennas with their basic parameters	K2

Detailed Syllabus:

Unit	Content
Unit-I	Transmission line: Fundamental quantities, primary and secondary constants of line, skin effect, transmission line equation, infinite line, propagation constant, wavelength, velocity of propagation and group velocity, open and short circuited lines, reflected and incident waves, standing waves in open and short lines, Input impedance of open and short Circuited Lines Secondary Line Constants in terms of Z_{co} and Z_{sc}
Unit-II	Line with any termination: General Equation, input impedance, reflection, reflection coefficient, loss, SWR, reflection loss due to mismatching, power delivered to load, lines for high frequencies, SWR, Relation between VSWR and reflection coefficient, Impedance circle diagram, Smith chart, properties of Smith chart, application of

	Smith charts, impedance matching devices: Quarter wave transformer, Balun , Stub matching, single and double stub matching
Unit-III	Antenna theory : Radiation mechanism, Radiating source, Short electric dipole, Current distribution, Induction and radiation field , Half wave dipole, Field intensity, Radiation pattern, Power gain, Efficiency, Effective length, Effective area, Reciprocity theorem, Antenna impedance, Antenna beam efficiency, Antenna temperature, Equivalent noise temperature
Unit-IV	Antenna types and arrays: Broadside array, End fire array, Collinear arrays, Arrays of point sources, Linear arrays with ‘n’ Isotropic point sources, Multiplication of patterns, Tapering of arrays, Chebychev arrays, Continuous arrays, Rectangular array, Yagi-Uda antenna, Biconical antenna, Helical antenna, Notch antenna, Log Periodic antenna
Unit-V	Waveguide: Microwave band designations, Advantages and applications of Microwaves, Propagation of microwave in rectangular waveguides, TE and TM modes, Waveguide Cutoff Frequency, Guide wavelength, Group & Phase Velocity, , flexible waveguide.

Text and Reference Books

6. M.E. Van Valkenburg, Network Analysis, PHI Publications
7. M.E. Van Valkenburg, Introduction to Modern Network Synthesis, Wiley Publications
8. C.L. Wadhawa, Network Analysis and Synthesis, New Age International Publications
9. D. Roy Chaudhary, Networks and Systems, New Age International Publications
10. C.A. Balanis , Antenna Theory: Analysis & Design, John Wiley & Sons
11. K.D. Prasad, Antenna and Wave Propagation, SatyaPrakashan, New Delhi
12. Samuel Y Liao, Microwave Devices and Circuits, PHI 3rd edition.
13. David M Pozar, Microwave Engineering, Wiley Publication 3rd Edition
14. George F. Kennedy, Electronic Communication System, Tata McGraw Hill.

Mapping of course outcome with program outcomes:

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

1-High 2-Medium 3-Low

Teachers' Assessment: Teachers Assessments of 10 marks is based on one of the/or combination of few of the following

1. Simulation
2. Power point presentation of case studies
3. Question and Answer/Numerical solution
4. Survey of actual channels used in practice

Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	Test 1	Test 2	Teachers' Assessment/ Assignment (10)	End Semester Examination
K1	Remember	5	5	00	10
K2	Understand	10	10	00	40
K3	Apply	00	00	10	10
K4	Analyze	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks (100)		15	15	10	60

Assessment Table

Assessment Tool	K2	K2	K3	K2
	CO1	CO2	CO3	CO4
Class Test 1 (15 marks)	7	8	-	-
Class Test 2 (15 marks)	-	-	5	10
Teachers' Assessment (10 marks)	-	-	10	-
ESE Assessment (60 marks)	20	20	10	10

**Designed by
Dr. V. R. Ratnaparkhe**

ET 4004 : Lab Antenna and Waveguides

Teaching Scheme Practical: 2Hrs/Week Total Credits : 01	Examination Scheme Term Work : 25 Marks Practical Examination & Viva Voce: : 25 Marks
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Laboratory Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1	Manipulate antennas to obtain outputs with respect to changes in linear and angular positions
CO2	Obtain impedance matching precisely
CO3	Demonstrate use of software tool for modeling antenna and waveguide designs and antenna arrays

List of Experiments

Sr. No.	List of Experiments
1	Smith chart based experiment
2	Design waveguides for specified parameters using software
3	Study of microwave test bench
4	Plot radiation pattern of different antennas
5	Plot the curves of output versus linear distance between the transmitter and receiver
6	Measure the parameters of antenna beam width, current at various points
7	Obtain impedance matching using stubs
8	Demonstrate the use of IE3D/FEKO/Ansys /RF Tool Box/Antenna Magus/Any other similar software for antenna modeling
9	Write a program to plot radiation pattern of various antenna arrays
10	Write a program to plot radiation pattern of antenna array and observe the effect by changing number of elements, distance between elements and excitation phase

Mapping of Course outcome with Program Outcomes

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

1 – High 2 – Medium 3 - Low

Assessment Table

Assessment Tool	S1	S2	S2	S2
	CO1	CO2	CO3	CO4
Term Work (25 Marks)	5	5	5	10
Practical Examination & Viva Voce (25 Marks)	5	5	5	10

Assessment Pattern

Assessment Pattern Level No.	Skill Level	Term Work	Practical Examination & viva voce
S1	Imitation	05	05
S2	Manipulation	20	20
S3	Precision	00	00
S4	Articulation	00	00
55	Naturalization	00	00
Total		25	25

**Designed by
Dr. V. R. Ratnaparkhe**

ET4005 : Project Part-I

Teaching Scheme Practical: 4 Hrs/Week Total Credits : 02	Examination Scheme Term Work : 50 Marks
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Course Description: The project work will be carried out by a batch of at the most 4 students (Preferably 3 students) working on topic related to the Electronics, Telecommunications and allied fields. It is also allowed to have a multi-disciplinary work by forming a project group of students from different programmes. The batch will select the topic, by consulting the guide. They have to design and fabricate the system, which will be submitted at the end of second term of current academic year.

Students shall carry field survey and review of literature on selected topic. They shall finalize the methodology and plan implementation stages of project.

Term Work Assessment: The batch has to prepare typed report of not less than 25 pages, in prescribed format, which shall include:

- Summary of field survey
- Literature review
- Technical details
- Design
- Related data

Every candidate has to give a talk on the selected topic in presence of staff members and students.

The Head of the department will appoint two internal examiners to assess the term work; guide shall be one of the examiners.

Course Outcomes

CO1	Identify, formulate and review the literature and frame problem statement
CO2	Plan methodologies and implementation stages
CO3	Write technical report and deliver presentation

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		1				1	1		2		2	1
CO2			3		2					2		2
CO3										1		2

1 – High 2 – Medium 3 - Low

Assessment Table

Assessment Tool	K4	K2	A3
	CO1	CO2	CO3
Term Work (50 Marks)	20	20	10

Assessment Pattern

Assessment Pattern Level No.	Cognitive/ Skill /Affective domain Level	Term Work
K2	Understand	20
K4	Analyze	20
A3	Valuing	10
Total		50

**Designed by
All faculty members**

ET4006 : Project Part-II	
Teaching Scheme Practical: 12 Hrs/Week Total Credits : 06	Examination Scheme Term Work : 50 Marks Practical Examination & Viva Voce: 100 Marks

Course Description:

Project Part-II, is in continuation of Project Part-I undertaken by the candidates in first term. The group of students shall complete the work assigned to them in the first term with faculty guidance.

Group of students shall implement hardware and / or software for planned project. They shall carry module wise testing / debugging, analysis. They shall integrate and validate the specifications under faculty guidance. It is mandatory for students to report weekly progress to guide.

Term Work Assessment

The term work shall consist of a typed report of about 70 pages or more, on the work carried out by the batch of students in respect of the project assigned, during first term and second term. It should be in the prescribed format.

Practical Examination

It shall consist of demonstration of designed, fabricated project and viva voce based on it. The said examination will be conducted by a panel of two examiners; one of them will be a guide and another will be an external examiner. The external examiner will be either from the allied industry or a senior faculty member from other institute.

Course Outcomes

CO1	Identify, formulate and review the literature and frame problem statement
CO2	Implement hardware and/or software techniques for identified problems
CO3	Test and analyze the modules of planned project
CO4	Write technical report and deliver presentation
CO5	Apply engineering and management principles to achieve project goal

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		1				1	1		2		2	1
CO2			2		1							1
CO3				1		1						1
CO4										1		1
CO5		1	2	1								1

1 – High 2 – Medium 3 - Low

Assessment Table

Assessment Tool	K4	K4 & S3	K4 & S3	A3	A4
	CO1	CO2	CO3	CO4	CO5
Term Work (50 Marks)	10	10	15	10	05
Practical Examination & Viva Voce (100 Marks)	20	20	30	20	10

Assessment Pattern

Assessment Pattern Level No.	Cognitive/ Skill /Affective domain Level	Term Work	Practical Examination & viva voce
K4	Analyze	10	20
K4 & S3	Analyze & Precision	25	50
A3	Valuing	10	20
A4	Organizing	05	10
Total		50	100

**Designed by:
All faculty members**