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 Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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.
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.
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.
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.
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.
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.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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.
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.
12. **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.

1. Graduates will be able to apply subject domain knowledge to design and develop Electronics Circuits and Systems for Industrial Solutions
2. Graduates will be able to design and analyses various types of Communication Systems
3. Graduates will be able to apply concepts of Signal Processing and algorithm to develop diversified application

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

Sr No	Course Code	Subject	Programme Outcomes	Scheme of Teaching (Hrs /Week)			Total Credits	Scheme of Evaluation (Marks)						
								Theory				Term Work	Practical/ Viva-voce	Total
				L	T	P		TestI	TestII	TA	ESE			
	THEORY COURSES													
1	ET4001	Computer Network	1,2,3,5,6,8,9,11,12	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	AnyONEFromOpen ElectiveGroup		3	-	-	3	15	15	10	60	-	-	100
	LABORATORY COURSES													
7	ET4003	Lab-Computer Network	1,2,3,12	-	-	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
10	ET	Lab-Professional Elective		-	-	2	1	-	-	-	-	25	-	25
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**	**50**	**700**

SEMESTER-II

THEORY COURSES

Sr. No	Course Code	Subject	Programme Outcomes	Scheme of Teaching (Hrs /Week)			Total Credit s	Scheme of Evaluation (Marks)						
								Theory				Term Work	Practical / Viva- voce	Total
				L	T	P		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		2	-	-	2	10	-	10	30	-	-	50
	LABORATORY COURSES													
4	ET	Lab- Professional Elective		-	-	2	1	-	-	-	-	25	-	25
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				**11**	**0**	**14**	**18**	**55**	**45**	**40**	**210**	**75**	**100**	**525**
Grand Total				**27**	**0**	**26**	**40**	**130**	**120**	**90**	**510**	**225**	**150**	**1225**

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

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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

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ET4001: Computer Network	
Teaching Scheme **Lectures : 3Hrs/week** **Total credits : 03**	**Examination Scheme** **Test I : 15 Marks** **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 ranges 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 able to:

CO1	K2	Understand the functionality of layered network architecture
CO2	K2	Identify different networking components and their respective roles in a communication system
CO3	K3	Design an enterprise network employing the common LAN technologies and be able to evaluate the advantages and disadvantages
CO4	K3	Design, calculate and apply subnet masks and addresses and identify routing mechanisms to fulfil networking requirements
CO5	K4	Analyze the features and operations of various application layer protocols such as HTTP, DNS and SMTP
CO6	K3	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

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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: 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 and Program Specific Outcomes

	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	PSO 3
CO1	2	2	1	-	1	1	-	-	-	-	-	1	-	2	1
CO2	3	2	1		1	-	-	-	-	-	-	1	-	-	-
CO3	3	2	1		1	-	-	-	1	-	-	-	1	-	1
CO4	3	2	1		1	-	-	-	-	-	-	-	1	2	1
CO5	3	2	1		3	1	-	1	1	-	-	1	1	2	-
CO6	3	2	1		1	-	-	1	-	-	1	1	1	2	1

1 – Low 2 – Medium 3 – High

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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**

Prerequisites: Basic knowledge of Electromagnetics and Network Theory

Course description: The 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 of selection of required channel for communication.

Course objectives: The 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	Define different parameters of Transmission line and Waveguide.	**K1**
CO2	Explain principles of guided wave propagation.	**K2**
CO3	Formulate the equations of waveguide, antenna parameters and solve the numerical.	**K2**
CO4	Understand different types of antennas and transmission lines.	**K2**
CO5	Classify and compare different types of antennas.	**K2**
CO6	Design the antenna, transmission line, waveguide for specified requirement.	**K3**

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

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Unit-III	**Antenna basic terms**: Radiation mechanism, Radiating source, Short electric dipole, Current distribution, Induction and radiation field, Isotropic radiator, Half wave dipole, Field intensity, Radiation pattern, Power density, Power gain, Directivity, Efficiency, Effective length, Effective area, Reciprocity theorem, Antenna impedance, Front to back ratio, Antenna band width, Antenna beam efficiency, Antenna temperature, Equivalent noise temperature
Unit-IV	**Antenna types and arrays:** Concept of direction of arrival, 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, Monopole antenna, Bi-conical antenna, Helical antenna, Notch antenna, Log Periodic antenna, Patch antenna, Working principle of Smart 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

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

Mapping of course outcome with program outcomes and Program Specific Outcomes:

Program outcome / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1												1	2	
CO2	2													2	
CO3		2	1											2	
CO4	2	2												2	
CO5	2													2	
CO6	3	2									1		2	3	

1- Low 2-Medium 3- High

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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. Use the IP based diagnostic commands to support troubleshooting in IP networks
CO2	Configure and construct a local area network (LAN),WLAN Design cabling using Straight through, Cross over and Rollover cables
CO3	Design and implementation of a simple client/server model and running application using sockets and TCP/IP
CO4	Use of various network security algorithms & systems (e.g. firewall, cryptography)

List of Experiments

Perform 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 and Program Specific Outcomes

	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	PSO 3
CO1	2	2	1	-	-	-	-	-	-	-	-	1	-	2	1
CO2	3	2	1		-	-	-	-	-	-	-	1	-	-	-
CO3	3	2	1		-	-	-	-	-	-	-	-	1	-	1
CO4	3	2	1		-	-	-	-	-	-	-	-	1	2	1

1 – Low 2 – Medium 3 - High

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

1) Power point presentation of case studies
2) Question & answer / Numerical solution
3) Study of Industry communication and data networks and its presentation
4) Mini projects

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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**

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
CO4	Execute the radiation pattern of various antennas.

List of Experiments

Sr. No.	List of Experiments
1	Introduction of IE3D/FEKO/Ansys /RF Tool Box/Antenna Magus/Any other similar software.
2	Design waveguides for specified parameters using software
3	Explain the use of microwave components by hardware/software.
4	Plot radiation pattern of Yagi-Uda antenna, Biconical antenna .
5	Plot radiation pattern of Helical antenna, Log-periodic antenna and measure parameters based on it.
6	Plot the curves of output versus linear distance between the transmitter and receiver.
7	Obtain impedance matching with IE3D/FEKO/Ansys /RF Tool Box/Antenna Magus/Any other similar software.
8	Demonstrate the use of IE3D/FEKO/Ansys /RF Tool Box/Antenna Magus/Any other similar software for designing of Monopole antenna and Notch antenna.
9	Write a program to plot radiation pattern of Chebychev arrays, Rectagular arrays.
10	Write a program to plot radiation pattern of broadside array, end fire array and observe the effect by changing number of elements, distance between elements and excitation phase.

Mapping of Course outcome with Program Outcomes and Program Specific Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1			2									2	1	
CO2	1			2									2	1	
CO3	1			2	2									1	
CO4	1			2	2								2	1	

1 – Low 2 – Medium 3 - High

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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

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Council, Dated 12-5-

ET4005 : Project Part-I	
Teaching Scheme **Practical: 4 Hrs/Week** **Total Credits : 02**	**Examination Scheme** **Term Work : 50 Marks**

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	PO 12	PS O1	PS O2	PS O 3
CO1		3				3	3		2		2	3	2		
CO2			1		2					2		2	2		
CO3										3		2	2		

1 – Low 2 – Medium 3 -High

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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		3				3	3		2		2	3
CO2			2		3							3
CO3				3		3						3
CO4										3		3
CO5		3	2	3								3

1 – Low 2 – Medium 3 - High

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