YESHWANTRAO CHAVAN COLLEGE OF ENGINEERING
(An Autonomous Institution affiliated to R T M Nagpur University Nagpur)
Accredited by NAAC (1st Cycle) with 'A' Grade (Score 3.25 on 4 Point Scale)

Wanadongri, Hingna Road, Nagpur-441110

Department of Electronics & Communications Engineering (Honors in AC)

B.E. Honors in Advanced Communication SoE & Syllabus 2021-22

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
Department of Electronics & Telecommunication Engineering
SoE and Syllabus
B.E Honors in Advanced Communication

| SoE No. |
| HON-101 |

B.E Honors in Advanced Communication
Information Brochure of Honor Program

1. Title of Program: Advanced Communication

2. Type of Program : Honor

3. Department offering the program: Electronics and Telecommunication
Engineering

4. Industry Collaboration: ETE services Pvt. Ltd., Nagpur
Sai Saurabh Apartment, Omkar Nagar,
Ring Road, Omkar Nagar Square, Nagpur,
Maharashtra 440034

5. Department/s eligible to opt for the program: **Only Department of Electronics and Telecommunication Engineering students are permitted to opt for this program.**

6. General information about courses in program:
   - This Program is intended for the vertical development of the students. All the courses in the Program cover various aspects of wireless communication, Networking and IoT for Communication. In nutshell, it provides detailed contents in the area of Communication Engineering. It includes advances in digital communication, wireless communication and wireless networks. It also encompasses the labs on Advanced Digital Communication and Communication Networks

7. Advance knowledge or research orientation of Program:

   - Most of the Courses in the Program are advanced and are not covered in their UG curriculum. The knowledge gained through this program will be useful for the students to explore further research and will help students to secure admission in Higher Studies.

8. Employability potential of program:
   - There is a vast scope of Employment in Telecom sector, Wireless Networking, Internet Service providing companies, Telecom Product manufacturing Companies etc.

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9. **Departmental Steering committee:** For proper publicity / conduct of program

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1.	Dr. M. S. Narlawar	HOD	Chairman	hod_et@ycce.edu	9763822298
2.	Dr. M. S. Dorle	Asst. Professor	In-charge	mdorle@gmail.com	9881711748
3.	Dr. P. W. Raut	Associate Professor	Member	pravinwraut@hotmail.com	9372153405
4.	Dr. D. B. Bhoyar	Asst. Professor	Member	dinesh.bhoyar23@gmail.com	9923448822

10. **Program Coordinator:**

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1	Dr. M. S. Dorle	Asst. Professor	In-charge	mdorle@gmail.com	9881711748

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Scheme of Examinations
B.E Honors in Advanced Communication

SN	Sem	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
					L	T	P	Hrs		MSEs*	TA**	ESE	
			B.E Honors in Advanced Communication										
1	5	ETH101	Modern Digital Communication Techniques	T	3	0	0	3	3	30	30	40	3
2	5	ETH102	Introduction to wireless and Cellular Communications	T	3	0	0	3	3	30	30	40	3
3	5	ETH103	Advanced Digital Communication Lab	P	0	0	1	2	1		60	40	3
4	6	ETH111	Adv communication networks	T	3	0	0	3	3	30	30	40	3
5	6	ETH112	Fiber optic Communication Technology	T	3	0	0	3	3	30	30	40	3
6	6	ETH113	Communication Network Lab	P	0	0	1	2	1		60	40	3
7	7	ETH121	Communication for IOT	T	3	0	0	3	3	30	30	40	3
8	7	ETH122	IoT Lab	P	0	0	1	2	1		60	40	3
			TOTAL		**15**	**0**	**6**	**21**	**18**				

MSEs* = Three MSEs of 15 Marks each will conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment

TA ** = for Theory : 20 marks on lecture quizzes, 8 marks on assignments, 2 marks on class performance

TA** = for Practical : MSPA will be 15 marks each

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V Semester
ETH101 : Modern Digital Communication Techniques

Course Objective	Course Outcome
Students should be able to	Students will be able to
1) Understand the key modules of digital communication systems with emphasis on digital modulation techniques. 2) Understand various baseband data transmission systems and M-ary signaling schemes. 3) Understand various aspects of block and convolutional channel codes. 4) Learn spread spectrum signals and various signals emerging digital communication technologies.	1. Compare different digital modulation techniques. 2. Describe and analyze various baseband data transmission systems and M-ary signaling schemes. 3. Describe various steps involved in block and convolutional channel codes. 4. Apply knowledge of spread spectrum signals and various signals emerging digital communication technologies.

Unit 1 – Introduction to Digital Communication

Introduction, Information Capacity, Bits, Bit Rate, Baud rate, ASK, FSK, PSK QAM Bandwidth Efficiency Carrier Recovery, Clock Recovery, DPSK, Probability of Error & Bit Error Rate, Error Performance.   6 Hrs

Unit 2 - Baseband Data Transmission:

Introduction – Baseband Binary PAM Systems – Baseband Pulse Shaping, Optimum Transmitting and Receiving Filters – Duobinary Baseband PAM System – Use of Controlled ISI in Duobinary Signaling Schemes, Transmitting and Receiving Filters for Optimum Performance   6 Hrs

Unit 3 - M-ary Signaling Schemes

Analysis and Design of M-ary Signaling Schemes, Binary Versus M-ary Signaling Schemes - Shaping of the Transmitted Signal Spectrum – Effect of Pre coding on the Spectrum, Pulse Shaping by Digital Methods - Equalization - Transversal Equalizer, Automatic Equalizers   6 Hrs

Unit 4 - Block and Convolutional Channel Codes

Linear Block Codes - The Generator Matrix and Parity Check Matrix, Cyclic Codes, Bounds on Minimum Distance of Linear Block Codes, Non Binary Block Codes – Convolutional Codes – Transfer Function of a Convolutional Code, Optimum Decoding of Convolutional Code –Distance Properties of Binary Convolutional Codes 6 Hrs

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Unit 5 - Spread Spectrum Signals for Digital Communication

Model of Spread Spectrum Digital Communication System – Direct Sequence Spread Spectrum Signals – Error Rate Performance of the Decoder, Some Applications of DS Spread Spectrum Signals, Generation of PN Sequences – Frequency Hopped Spread Spectrum Signals – Performance of FH Spread Spectrum Signals in an AWGN Channel, CDMA System Based on FH Spread Spectrum

6 Hrs

Unit 6 - Signals Emerging Digital Communication Technologies

The North American Hierarchy, Digital Services, Broad band Digital Communication: SONET, Digital Switching Technologies, Broadband Services for Entertainment and Home office Applications, Video Compression, High Definition Television (HDTV)   6 Hrs

Text Books –

Advanced Electronic Communications Systems	6 Edition	Wayne Tomasi	Pearson Education
Digital and Analog Communication Systems	-	K Sam Shanmugam	John Wiley and sons (Asia) Pvt Ltd.

Reference Book –

Modern digital and analog communication systems	3rd Edition	B.P.Lathi	Oxford University press

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V Semester
ETH102 : Introduction to Wireless and Cellular Communication

Course Objective	Course Outcome
Students should be able to	Students will be able to
1. Study cellular concepts and techniques to improve capacity in cellular system and Study fundamentals equalization and diversity technique.	1.Discribe various generations of mobile communications and apply the concept of frequency reuse for design of cellular system.
2. Understand mobile radio environment and its different parameters.	2. Describe various types of equalization and diversity technique.
3. Learn various multiple access system..	3. Quantify causes and effects of path loss and signal fading on received signal characteristic and used various technique to improve signal quality and describe multiple access technique.
4. Understand the operating principles of various wireless systems & standards.	4. Analyze GSM & CDMA systems and Understand the fundamentals of wireless networking.
5. Learn the fundamentals of GSM & wireless networking.	

UNIT-1: Introduction to Wireless Communication Systems & Cellular Concept

Evolution of Mobile Radio communication, Cellular telephone system, frequency reuse, channel assignment and handoff strategies, interference and system capacity, trunking and grade of service, improving capacity in cellular system. **(06 Hours)**

UNIT-2: Mobile Radio Propagation

Large & Small Scale Path Loss & Fading: Introduction to Radio Wave Propagation, Reflection, Diffraction, Scattering Practical Link Budget Design Using Path Loss Models Small Scale Multipath Propagation, Parameters of Mobile Multipath Channels, Types of Small Scale Fading, Rayleigh & Rician Distribution. **(06 Hours)**

UNIT-3: Equalization & Diversity

Fundamentals of equalization, Equalizers in communication receiver, Survey of equalizer Technique, space polarization, frequency and time diversity techniques, space diversity, polarization diversity, frequency and time diversity. RAKE Receiver **(06 Hours)**

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UNIT 4: Multiple access techniques for wireless communication.

Introduction to Multiple Access, Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Spread Spectrum Multiple Access, Code Division Multiple Access (COMA), Hybrid Spread Spectrum Techniques, Space Division Multiple Access (SOMA), Packet Radio, Packet Radio Protocols, Carrier Sense Multiple Access (CSMA) Protocols.   **(06 Hours)**

UNIT-5: GSM

GSM - global system for mobile: services and features, GSM system architecture, GSM radio subsystem, GSM channel types, GSM frame structure, signal processing in GSM, introduction to CDMA digital cellular standard (IS-95)   **(06 Hours)**

UNIT-6: Wireless Networking

Introduction to wireless networks, Differences Between Wireless & Fixed Telephone Networks, Development of wireless networks, Traffic routing in wireless networks, Wireless data services, Common channel signaling, Signaling System No7. An Example of SS7, introduction to various generation of mobile communication.   **(06 Hours)**

Text books:				
1	Wireless communication Principles and practice	Second edition	by T S. Rappaport	(Prentice Hall PTR, upper saddle river, New Jersey.)
2	"Modern Wireless Communications" (Indian Edition)	2011	Haykin & Moher	Pearson (Indian Edition)
Reference books:				
1	Wireless digital communication	1995	by Kamilo Feher	PHI
2	Mobile Communications Design fundamentals	1993	by William C. Y. Lee	John Willey
3	Mobile Cellular Communication	2005	by W .C .Y. Lee	Mc Graw Hill
4	Mobile Radio Propagation channel	1996	by J.D. Pearson	John Willey

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V Semester
ETH103 : Lab: Advanced Digital Communication

Course Learning Objective Students should be able to	**Course Outcomes** Students will be able to
1) Learn Baseband representation, reception and probability of error 2) Understand the transmission errors in digital communication systems 3) Understand the concept of spread spectrum modulation, its types and applications. 4) Understand the practical applications of Multichannel and multicarrier communication systems	1) Distinguish various digital modulation techniques. 2) Analyze the probability of errors in digital communication systems. 3) Apply spread spectrum modulation for various applications of communication systems. 4) Distinguish Multichannel and multicarrier communication systems

Expt. No.	Name of Experiment
1	To write MATLAB Program for generation and detection ASK signal
2	To write MATLAB Program for generation and detection BPSK signal
3	To write MATLAB Program for generation and detection QPSK signal
4	To write MATLAB Program for generation and detection MSK signal
5	To write MATLAB Program for Matched filter receiver
6	To write MATLAB Program for generation and detection 16-PSK signal
7	To generate eye diagram with channel noise and without a band limiting filter
8	To perform practical on the data scrambler and descrambler.
9	Perform a Monte Carlo simulation of an M=8 QAM communication system.
10	To Perform DSSS using Simulink.

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VI Semester
ETH111 : Advanced Communication Networks

Course Objective	Course Outcome
The student should be able to	**The student will be able to**
1) Understand different networks and network topologies	1) Analyse different networks and network topologies
2) Know protocols used in high speed networks	2) Compare different protocols used in high speed networks
3) Study Network design issues 4) Study optical sensors and Networks	3) Solve Network design issues
	4) Compare optical sensors and Networks

UNIT-1: Network services, Network Elements, Basic Network Mechanism, High Performance Networks, Traffic Characterization and quality of service, Applications, Layered Architecture. **06 Hrs**

UNIT-2: OSI and IP Models, Frame Relay, Internet Protocol, TCP and UDP, Performance of TCP/IP networks, Internet Success and Limitation **06 Hrs**

UNIT-3 : Wireless Networks: Introduction, The wireless Channel, Link Level Design, Channel Access, Network Design **06 Hrs**

UNIT-4: Control of Networks: Objectives and Methods of Control, Circuit-switched Networks, Datagram Networks, Mathematical Background of Control Networks. **06 Hrs**

UNIT-5: Introduction to Adhoc Wireless Networks, Issues, Routing approaches, Table-Driven of Routing Protocols, On-Demand Routing Protocols, Hierarchical routing Protocols. Ad hoc network security- Requirements, Issues and Challenges **06 Hrs**

UNIT-6: SONET, Optical Links, WDM Systems, Optical Cross-Connects, Optical LANs, Optical Paths and Networks **06 Hrs**

Text books:

1 Computer Networking J.F.Kurose & K.W. Ross Pearson   (2005)

2 High-Performance Communication Networks 2e Jean Warland Pravin Varaiya   Elsevier

Reference books:

1 Adhoc Wireless Networks C.Siva Ram Murthy & B.S.Manoj Pearson Education, (2005)

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VI Semester

ETH112 : Fiber optic Communication Technology

Course Objective	Course Outcome
Students should be able to	Students will be able to
1. Learn the principles of step index and graded index optical fiber.	1. Design and analyze an Optical fibers with fabrication process.
2. Understand Transceiver systems in optical communication.	2. Explore different types of sources and receivers in fiber optics.
3. Learn various optic topologies, Amplifiers and switches.	3. Explore different topologies in optic fiber, types of Amplifiers and switches.
4. Understand WDM, SONET and Ethernet in optic fiber technology	4. Explore WDM, SONET and Ethernet in optic fiber technology

UNIT I : INTRODUCTION TO OPTICAL FIBERS

Principle of optical communication- Fiber Types, Ray theory transmission, Electromagnetic mode theory for optical propagation, Leaky modes, structures of various fibers. Numerical aperture. Skew Rays .   **06Hrs**

UNIT II :FIBER MATERIAL AND FABRICATION SIGNAL DEGRADATION IN OPTICAL FIBERS

Fiber materials, Fiber drawing apparatus, Outside Vapor, Phase Oxidation, Vapor Phase Axial Deposition, Double Crucible Method, Modified Chemical Vapor Deposition, Plasma Activated Chemical Vapor Deposition, Fiber Buffering, Optical Fiber Cable structure.

06Hrs

UNIT III : FIBER OPTICAL SOURCES

LED structures – Light source materials – Quantum efficiency and LED power, Modulation of a LED, Laser Diodes – Rate equations – External Quantum efficiency –– Single Mode lasers –, Fabry Perot cavity Quantum laser, distributed feedback **,** 3db optical and 3db electrical bandwidth   **06Hrs**

UNIT IV : FIBER OPTICAL RECEIVERS

PIN and APD diodes, Detector requirements, Avalanche Multiplication Noise, Comparison of Photo detectors , Fundamental Receiver Operation , pre-amplifiers - Receiver Configuration   **06Hrs**
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UNIT V: ADVANCED SYSTEMS AND TECHNIQUES
Local Area Network-Optical Fiber Bus, Ring Topology, Star Architecture
Optical Amplifier-Basic Application, Optical Amplifier types
Photonic switches- Mechanical Switches, Integrated Optical Switches.   **06Hrs**

UNIT VI:

Optical Networks: System design consideration, Point – to –Point link design, WDM, Elements of optical networks, SONET/SDH. Optical Interfaces, SONET/SDH Rings and Networks, High speed light wave Links, Optical ETHERNET-Solution.   **06Hrs**

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Text books:

1	Optical Fiber Communication	2008	Gerd Keiser,	McGraw-Hill International,
2	Optical Communication, Principles and Practice.		J.Senior	Prentice Hall of India

Reference books:

1	Optical Communication System		J. Gower	Prentice Hall of India
2	Fiber-Optic Communication System	Third Edition	GovindAgrawal	John Willy & Sons
3	Optical communication systems		J. Gower,	PHI
4.	Optical Fiber System		Kao	Tata Mc Graw Hill

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VI Semester

ETH113 : Communication Networks Lab

1. Configuration and logging to a CISCO Router and introduction to the basic user Interfaces. Also Introduction to the basic router configuration and basic commands.

2. Configuration of IP addressing for a given scenario for a given set of topologies.

3. Configure a DHCP Server to serve contiguous IP addresses to a pool of four IP devices with a default gateway and a default DNS address. Integrate the DHCP server with a BOOTP demon to automatically serve Windows and Linux OS Binaries based on client MAC address.

4. Configure, implement and debug the following: Use open source tools for debugging and diagnostics. a. ARP/RARP protocols

5. RIP routing protocols

6. BGP routing

7. OSPF routing protocols

8. Static routes (check using netstat)

9. Configure DNS: Make a caching DNS client, and a DNS Proxy; implement reverse DNS and forward DNS, using TCP dump/Wireshark characterise traffic when the DNS server is up and when it is down.

10. Configure a mail server for IMAP/POP protocols

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VII Semester
ETH121 : Communication for IoT

Course Objective	Course Outcome
Students should be able to	Students will be able to
1. Learn various components of Internet of things. 2. Understand the various communication layer protocols. 3. Learn IoT circuits and IOT communication based circuits.	1. Explore various communication devices and sensors. 2. Explore M2M to IoT main design principles and capabilities 3. Analyze communication designs ,IoT architectures and communication protocols 4. Create IoT solutions for communication Devices

Unit I:

Introduction to IoT: Sensing, Actuation, Networking basics, Communication Protocols, Sensor Networks, IoT Definition, Characteristics. IoT Functional Blocks, Physical and logical design of IoT, Communication models & APIs.

6 Hrs

Unit II:

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, Differing Characteristics. definitions, M2M Value Chains, IoT Value Chains, M2M vs IoT An Architectural Overview–Building architecture, Main design principles and capabilities.

6 Hrs

Unit III:

IoT Reference Architecture- Outline of IoT architecture and standards Various architectural views of IoT (Functional, Information, Operational and Deployment). Constraints affecting design in IoT, Technical design Constraints.

6 Hrs

Unit IV:

PHY/MAC Layer Protocol (3GPP MTC, IEEE 802.15), WirelessHART, ZWave, Bluetooth Low Energy,
Zigbee Smart Energy
Network Layer Protocol –(IPv6, 6LoWPAN, ICMP, RPL, CORPL, CARP)
Transport Layer Protocol (TCP, UDP, DCCP, SCTP)
Session Layer Protocol –(HTTP, CoAP, AMQP, MQTT)

6 Hrs

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Unit V:

Service Layer -oneM2M, ETSI M2M, OMA, BBF –
Security in IoT Protocols – MAC802.15.4, 6LoWPAN, RPL, Application Layer

6 Hrs

Unit VI:

Developing IoT solutions: Introduction to Python, Introduction to different IoT tools, Introduction to Arduino and Raspberry Pi

6 Hrs

Text books:				
1	Building the Internet of Things with IPv6 and MIPv6 The EvolvingWorld of M2M Communications	2016	Daniel Minoli	Willy Publications
2	From Machine-to-Machine to the Internet ofThings: Introduction to a New Age of Intelligence	2015	Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand,Stamatis Karnouskos, David Boyle	Academic Press
Reference books:				
1	Internet of Things (A Hands-on-Approach)	1st Edition, 2014	Vijay Madisetti and Arshdeep Bahga	VPT

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VII Semester
ETH122 : IoT Lab

Expt. No.	Name of Experiment
01	Add ten natural numbers in python
02	Experiment on functions in python
03	Experiment on string manipulation in python
04	Interfacing LED with Raspberry pi.
05	Interfacing DHT11 sensor with Raspberry pi.
06	File handling using Python.
07	Reading data from server.
08	Smart Gardening System
09	Home automation System
10	Mini-project

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