INSTITUTE VISION

"To be a preferred institution in Engineering Education by achieving excellence in teaching and research and to remain as a source of pride for its commitment to holistic development of individual and society"

INSTITUTE MISSION

"To continuously strive for the overall development of students, educating them in a state of the art infrastructure, by retaining the best practices, people and inspire them to imbibe real time problem solving skills, leadership qualities, human values and societal commitments, so that they emerge as competent professionals"

DEPARTMENTAL VISION

“To be the centre of excellence in providing education in the field of Electronics and Communication Engineering to produce technically competent and socially responsible engineering graduates.”

DEPARTMENTAL MISSION

“Educating students to prepare them for professional competencies in the broader areas of the Electronics and Communication Engineering field by inculcating analytical skills, research abilities and encouraging culture of continuous learning for solving real time problems using modern tool”.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

PEO1:

Acquire core competence in Applied Science, Mathematics, and Electronics and Communication Engineering fundamentals to excel in professional carrier and higher study.

PEO2:

Design, Demonstrate and Analyze the Electronic Systems which are useful to society.

PEO3:

Maintain Professional and Ethical values, Employability skills, Multidisciplinary approach and an Ability to realize Engineering issues to broader social contest by engaging in lifelong learning.

PROGRAM SPECIFIC OUTCOMES(PSOS)

The graduates will be able to:

PSO1:

An ability to understand the concepts of Basic Electronics and Communication Engineering and to apply them to various areas like Signal Processing, VLSI, Embedded Systems, Communication Systems and Digital & Analog Devices

PSO2:

An ability to solve complex Electronics and Communication Engineering problems, using latest hardware and software tools, along with analytical skills to arrive at cost effective and appropriate solutions

PROGRAM OUTCOMES (POs):

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 sustainble 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 mangement 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.

STUDENT HELP DESK

Sr.No.	Name of the Faculty	Activities
1	Dr. S. B. Akkole	GATE / Preplacement Coaching
		ED Lab Incharge
		Students Mentor
		Dept. NAAC Criteria Sub Coordinator
		NBA Criteria Coordinator
		Participation in Funded Projects
2	Dr. R. R. Maggavi	GATE / Preplacement Coaching
		CN Lab Incharge
		Students Mentor
		Module Coordinator
		Research Center Coordinator
		Dept. NAAC Criteria Sub COordinator
		NBA Criteria Coordinator
		Innovations Club Coordinator
3	Prof. S. S. Malaj	GATE / Preplacement Coaching
		Adv.Comm. Lab Incharge
		Students Mentor
		Dept. NAAC Criteria Sub COordinator
		NBA Criteria Coordinator
		NIRF Coordinator
		Conference Coordinator
04	Prof. S. S. Kamate	GATE / Preplacement Coaching
		VLSI Lab Incharge
		Students Mentor
		Module Coordinator
		IEEE Coordinator
		Dept. NAAC Criteria Sub Coordinator
		NBA Criteria Coordinator
		Project Coordinator
05	Porf. D. M. Kumbhar	GATE / Preplacement Coaching
		AC Lab Incharge
		Students Mentor
		Dept. Association Coordinator
		Class Teacher
		IIIC Coordinator
		Dept. NAAC Criteria Sub Coordinator
		NBA Criteria Coordinator
		AICTE Activity Coordinator
		Dept. ED Cell Coordinator

Sr.No.	Name of the Faculty	Activities
06	Prof. S. S. Patil	GATE / Preplacement Coaching
		ARM & ES Lab Incharge
		Students Mentor
		Class Teacher
		NBA Criteria Coordinator
		AICTE Activity Coordinator
		Admission Coordinator
		Module Coordinator
07	Prof. D. B. Madihalli	GATE / Preplacement Coaching
		DSD Lab Incharge
		Students Mentor
		NBA Coordinator
		News & Publicity Coordinator
		NBA Criteria Coordinator
		Website Coordinator
		VTU LIC Coordinator
08	Prof. P. V. Patil	GATE / Preplacement Coaching
		HDL Lab Incharge
		Students Mentor
		NBA Criteria Coordinator
		T&P Cell Coordinator
		Alumni Coordinator
09	Prof. S. S. Ittannavar	GATE / Preplacement Coaching
		DSP Lab Incharge
		Students Mentor
		EMS/ IA Coordinator
		News Letter / Technical Magazine
		ISTE Coordinator
		AICTE Coordinator
10	Prof. B. P. Khot	GATE / Preplacement Coaching
		MC Lab Incharge
		Students Mentor
		Dept. Time Table Coordinator & Meeting Coordinator
		Class Teacher
		NBA Criteria Coordinator
		AICTE Activity Coordinator

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FACULTY POSITION

S.N.	Category	No. in position	Average experience
1	Teaching faculty.	10	16.15Y
2	Technical supporting staff.	03	16.25Y
3	Helper staff	02	21.08Y

MAJOR LABORATORIES

S. N.	Name of the laboratory	Area in Sq. Mtrs	Amount Invested in Lakhs	S. N.	Name of the laboratory	Area in Sq. Mtrs	Amount Invested in Lakhs
1	Digital Electronics Lab	71	1.54	5	VLSI Lab	71	35.51
2	Analog Electronics Lab	92	8.24	6	Project Lab	95	--
3	Advanced Commn & Commn + LIC Lab	92	20.50	7	Research/E-Yantra/DSP & C.N.Lab	71	16.49
4	HDL/MC / EMD Lab	71	19.57	8	Power Electronics Lab	--	4.86
Total Investment In The Department					**Rs. 95.31 Lacs**		

FACULTY DETAILS

TEACHING FACULTY

S.N.	Name and Designation	Qualification	Specialization	Professional Membership	Teaching Exp.	Contact No.
1	Dr. S. B. Akkole	Ph.D	Communication	LMISTE	27Y.07M	9480422508
2	Dr. R. R. Maggavi	Ph.D	E&C	LMISTE	17Y.09M	9480275583
3	Smt. S. S. Kamate	M.Tech	Digital Electronics	LMISTE	19Y.04M	9008696825
4	Smt. S. S. Malaj	M.E.	E & TC	LMISTE	24Y.11M	9731795803
5	Sri. D. M. Kumbhar	M.Tech	Electronics	LMISTE	18Y.02M	09373609880
6	Sri. Sachin .S. Patil	M.Tech	VLSI & Embedded	LMISTE	18Y.00M	9448102010
7	Sri .D. B. Madihalli	M.Tech	Industrial Electronics	LMISTE	14Y.11M	9902854324
8	Sri. P. V. Patil	M.Tech	VLSI & Embedded	LMISTE	9Y.08M	9731104059
9	Sri. S. S. Ittannavar	M.Tech	DSP	LMISTE	9Y.03M	9964299498
10	Smt. B. P. Khot	M.Tech	Microelectronics & Control Systems	LMISTE	6Y.03M	9964019501

TECHNICAL SUPPORTING STAFF

S.N.	Name	Qualification	Experience (in years)
1.	Sri. P. S. Desai	DEC	22Y-.00M
2.	Sri. V. V. Guruwodeyar	DEC	30Y-09 M
3.	Sri. A. K. Talawar	DEC, M.Sc (Ph.D)	12Y-03M
4	Sri. M. A. Attar	DEC	12Y-02M

SCHEME OF TEACHING AND EXAMINATION

VIII SEM ECE

Sl. No	Sub-Code		Teaching Dept.	Teaching hours /week		Examination			
				Theory	Pract. /Project	Duration	SIE Marks	CEE Marks	Total Marks
1	17EC81	Wireless Cellular and LTE 4G Broadband	EC	04	---	03	60	40	100
2	17EC82	Fiber Optics & Networks	EC	04	---	03	60	40	100
3	17EC83X	Professional Elective-5	EC	03	---	03	60	40	100
4	17EC84	Internship/Professional Practice	EC	Industrial Oriented		03	50	50	100
5	17ECP85	Project Work	EC	--	06	03	100	100	200
6	17ECS86	Seminar	EC	---	04	---	--	100	100
TOTAL				**11**	**10**	**15**	330	370	**700**

Professional Elective -5

17EC831	Micro Elctro Mechanical Systems
17EC832	Speech Processing
17EC833	Radar Engineering
17EC834	Machine Learing
17EC835	Network and Cyber Security

1. **Internship / Professional Practice:** To be carried between the (6th and 7th Semester) or (7th and 8th) Semester Vacation period.

ACADEMIC CALENDER

S J P N Trust's
Hirasugar Institute of Technology, Nidasoshi.
Inculcating Values, Promoting Prosperity
Approved by AICTE, Recognized by Govt. of Karnataka and Affiliated to VTU Belagavi.
Recognized Under Section 2(f) of UGC Act, 1956.
Accredited at 'A' Grade by NAAC, Programmes Accredited by NBA: CSE, ECE, EEE & ME.

IQAC
File I-11
2021-22 (Even)
Rev: 00

CALENDAR OF EVENTS FOR THE ACADEMIC YEAR 2021-22 OF VI & VIII SEMESTER (EVEN)

Date	Events
04-04-2022	Commencement of VI/VIII Semester Classes
07-04-2022	World Health Day
22-04-2022	World Earth Day
26-04-2022	World Intellectual Property Day
09-05-2022 to 11-05-2022	First Internal Assessment for VI Semester
09-05-2022 to 10-05-2022	First Internal Assessment for VIII Semester
12-05-2022	Feedback-I on Teaching-Learning
16-05-2022	Display of 1st I.A. Marks and submission of Feedback-I to office
30-05-2022 to 31-05-2022	Second Internal Assessment for VIII Semester
31-05-2022	Anti-Tobacco Day
02-06-2022	Feedback-II on Teaching-Learning of VIII Semester
05-06-2022	World Environment Day
06-06-2022	Display of 2nd I.A. Marks and submission of Feedback-II to office of VIII Semester
09-06-2022 to 11-06-2022	Second Internal Assessment for VI Semester
13-06-2022	Feedback-II on Teaching-Learning of VI Semester
14-06-2022	World Blood Donor Day
15-06-2022	Display of 2nd I.A. Marks and submission of Feedback-II to office of VI Semester
21-06-2022	International Yoga Day
27-06-2022 to 28-06-2022	Third Internal Assessment for VIII Semester
30-06-2022	Display of Final IA Marks of VIII Semester
30-06-2022	Last working day of VIII Semester
11-07-2022 to 13-07-2022	Third Internal Assessment for VI Semester
14-07-2022 to 15-07-2022	Lab Internal Assessment for VI Semester
16-07-2022	Display of Final IA Marks of VI Semester
16-07-2022	Last working day of VI Semester
21-07-2022	Project Exhibition
27-07-2022	Graduation Day
18-07-2022 to 29-07-2022	Practical Examination of VI Semester
01-08-2022 to 20-08-2022	Theory Examination of VI Semester
04-07-2022 to 20-07-2022	Theory Examination of VIII Semester
22-07-2022 to 30-07-2022	Internship Viva Voce/Project Viva for VIII Semester

April- 2022

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

02-Ugadi Festival,
14- Dr. B. R. Ambedkar Jayanthi
15-Good Friday

May-2022

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

03-Basav Jayanthi, Akshay Tritiya,
Khutub-E-Ramazan

June-2022

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

July-2022

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

Dr. B. V. Madiggond
Dean (Acad)

Dr. S. C. Kamate
Principal

Subject Title	**WIRELESS CELLULAR & LTE 4G BROADBAND**		
Subject Code	17EC81	**IA Marks**	20
Number of Lecture Hrs / Week	04	**Exam Marks**	80
Total Number of Lecture Hrs	50	**Exam Hours**	03

FACULTY DETAILS:		
Name: Dr.. S. B Akkole	**Designation:** Asst. Professor	**Experience:**27.06 yrs
No. of times course taught: 03	**Specialization:** Communication System	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	ECE	VI	DC, AWP,
02	ECE	VII	CCN

2.0 Course Objectives

This course will enable students to:

- Understand the basics of LTE standardization phases and specifications.
- Explain the system architecture of LTE and E-UTRAN, the layer of LTE, based on the use of
- OFDMA and SC-FDMA principles.
- Analyze the role of LTE radio interface protocols to set up, reconfigure and release the Radio Bearer, for transferring the EPS bearer.
- Analyze the main factors affecting LTE performance including mobile speed and transmission bandwidth.

3.0 Course Outcomes

At the end of the course, students will be able to:

CO	Description
C401. 1	Understand the system architecture and the functional standard specified in LTE 4G.
C402. 2	Analyze the role of LTE radio interface protocols and EPS Data convergence protocols to set up, reconfigure and release data and voice from users.
C402. 3	Understand channel structure of LTE, OFDMA radio resources and downlink control and physical channels.
C402. 4	Demonstrate the UTRAN and EPS handling processes from set up to release including mobility management for a variety of data call scenarios.
C402. 5	Test and Evaluate the Performance of resource management and packet data processing and transport algorithms.

4.0 Course Content

Module – 1
Key Enablers for LTE features: OFDM, Single carrier FDMA, Single carrier FDE, Channel Dependent Multiuser Resource Scheduling, Multi antenna Techniques, IP based Flat network Architecture, LTE Network Architecture.(Sec 1.4- 1.5 of Text).

Wireless Fundamentals: Cellular concept, Broadband wireless channel (BWC), fading in BWC, Modeling BWC – Empirical and Statistical models, Mitigation of Narrow band and Broadband Fading (Sec 2.2 – 2.7of Text).

Module – 2
Multicarrier Modulation: OFDM basics, OFDM in LTE, Timing and Frequency Synchronization, PAR, SC-FDE (Sec 3.2 – 3.6 of Text).

OFDMA and SC-FDMA: OFDM with FDMA, TDMA, CDMA, OFDMA, SC-FDMA, OFDMA and SC-FDMA in LTE (Sec 4.1 – 4.3, 4.5 of Text).

Multiple Antenna Transmission and Reception: Spatial Diversity overview, Receive Diversity, Transmit Diversity, Interference cancellation and signal enhancement, Spatial Multiplexing, Choice between Diversity, Interference suppression and Spatial Multiplexing (Sec 5.1 – 5.6 of Text).

Module – 3
Overview and Channel Structure of LTE: Introduction to LTE, Channel Structure of LTE, Downlink OFDMA Radio Resource, Uplink SC-FDMA Radio Resource (Sec 6.1 – 6.4 of Text).
Downlink Transport Channel Processing: Overview, Downlink shared channels, Downlink Control Channels, Broadcast channels, Multicast channels, Downlink physical channels, H-ARQ on Downlink (Sec 7.1 – 7.7 of Text).

Module – 4
Uplink Channel Transport Processing: Overview, Uplink shared channels, Uplink Control Information, Uplink Reference signals, Random Access Channels, H-ARQ on uplink (Sec 8.1 – 8.6 of Text).

Physical Layer Procedures: Hybrid – ARQ procedures, Channel Quality Indicator CQI feedback, Pre-coder for closed loop MIMO Operations, Uplink channel sounding, Buffer status Reporting in uplink, Scheduling and Resource Allocation, Cell Search, Random Access Procedures, Power Control in uplink (Sec 9.1- 9.6, 9.8, 9.9, 9.10 Text).

Module – 5
Radio Resource Management and Mobility Management:
PDCP Overview, MAC/RLC Overview, RRC Overview, Mobility Management, Inter-cell Interference Coordination. (Sec 10.1 – 10.5 of Text).

5.0 Relevance to future subjects

Sl. No	Semester	Subject	Topics
01	VIII	Project work	Wireless transmission of data, Mobile communication, GSM. GPS, GPRS and LTE

6.0 Relevance to Real World

Sl. No	Real World Mapping
01	Design of wireless sensor network and LTE based systems.
02	IOT based project development.
03	Design High data networks and design of 5G technology.

7.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Use of network simulation software like NS3 & NCTUns for simulation wireless networks.
02	NPTEL Videos	Applications of LTE.

8.0 Books Used and Recommended to Students

Text Books

1. Arunabha Ghosh, Jan Zhang, Jefferey Andrews, Riaz Mohammed, 'Fundamentals of LTE', Prentice Hall, Communications Engg. And Emerging Technologies.

Reference Books

1.LTE for UMTS Evolution to LTE-Advanced' Harri Holma and Antti Toskala, Second Edition – 2011, John Wiley & Sons, Ltd. Print ISBN: 9780470660003.

2020. 'EVOLVED PACKET SYSTEM (EPS) ; THE LTE AND SAE EVOLUTION OF 3G UMTS'
by Pierre Lescuyer and Thierry Lucidarme, 2008, John Wiley & Sons, Ltd. Print ISBN:978-0-470-05976-0.

3. 'LTE – The UMTS Long Term Evolution ; From Theory to Practice' by Stefania Sesia, Issam Toufik, and Matthew Baker, 2009 John Wiley & Sons Ltd, ISBN 978-0-470-69716-0.

Additional Study material & e-Books

1. NPTEL notes and Videos
2. Free software's like NCTUns-4.0

9.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References

1) https://nptel.co.in
2) https://ieeexplore.ieee.org/document/8002586
3) http://eujournal.org/index.php/esj/article/view/1453
4) International Journal of Computer Science and Mobile Computing
5) IJCSNS International Journal of Computer Science and Network Security, VOL.16 No.11, November 2016

10.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	IEEE Xplorer	http://ieee.com
2	European Scientific Journal	http://eujournal.org
3	International Journal of Computer Science and Mobile Computing	https://www.ijcsmc.com/
4	IJCSNS International Journal of Computer Science and Network Security	http://ijcsns.org/

11.0 Examination Note

Internal Assessment: 40 Marks
Three IA will be conducted and average of best of two will be accounted.

Scheme of Evaluation for Internal Assessment (30 Marks)
(a) Internal Assessment test in the same pattern as the of the main examination. (30marks.)

SCHEME OF EXAMINATION:
Two questions to be set from the syllabus covered.
Student has to answer one part each from each question.
Question 1 1x15 = 15Marks
Question 2 1x15 = 15Marks
Total = 30 Marks
10 Marks for Assignment

INSTRUCTION FOR Wireless Cellular & 4G LTE broadband (17EC81) Examination
- Two full questions will be given which consists of a, b ,c, d sub sections.
- Student has to answer either a or b and c or d.

12.0 Course Delivery Plan

Course Delivery Plan:

UNIT	LECTURE NO.	CONTENT OF LECTURE	% OF PORTION
1	1	Key Enablers for LTE features: OFDM, Single carrier FDMA.	20
	2	Single carrier FDE.	
	3	Channel Dependent Multiuser Resource Scheduling.	
	4	Multi antenna Techniques, IP based Flat network Architecture.	
	5	LTE Network Architecture.	
	6	Wireless Fundamentals: Cellular concept, Broadband wireless channel (BWC).	
	7	Fading in BWC.	
	8	Modeling BWC – Empirical models.	
	9	Modeling BWC- Statistical models.	
	10	Mitigation of Narrow band and Broadband Fading.	

2	11	Multicarrier Modulation: OFDM basics.	40
	12	OFDM in LTE, Timing and Frequency Synchronization	
	13	PAR, SC-FDE	
	14	OFDMA and SC-FDMA: OFDM with FDMA.	
	15	TDMA, CDMA, OFDMA.	
	16	SC-FDMA, OFDMA and SC-FDMA in LTE	
	17	Multiple Antenna Transmission and Reception: Spatial Diversity overview.	
	18	Transmit Diversity, Interference cancellation and signal enhancement.	
	19	Receive Diversity, Spatial Multiplexing.	
	20	Choice between Diversity, Interference suppression and Spatial Multiplexing.	
3	21	Overview and Channel Structure of LTE: Introduction to LTE.	60
	22	Channel Structure of LTE.	
	23	Downlink OFDMA Radio Resource.	
	24	Uplink SC-FDMA Radio Resource.	
	25	Downlink Transport Channel Processing: Overview.	
	26	Downlink Control Channels.	
	27	Broadcast channels.	
	28	Downlink shared channels.	
	29	Multicast channels, Downlink physical channels.	
	30	H-ARQ on Downlink.	
4	31	Uplink Channel Transport Processing: Overview, Uplink shared channels.	80
	32	Uplink Control Information.	
	33	Uplink Reference signals.	
	34	Random Access Channels, H-ARQ on uplink.	
	35	Physical Layer Procedures: Hybrid – ARQ procedures.	
	36	Channel Quality Indicator CQI feedback.	
	37	Pre-coder for closed loop MIMO Operations, Uplink channel sounding.	
	38	Buffer status Reporting in uplink, Scheduling and Resource Allocation.	
	39	Cell Search, Random Access Procedures.	
	40	Power Control in uplink.	
5	41	Radio Resource Management and Mobility Management: PDCP Overview	100
	42	PDCP Overview	
	43	MAC/RLC Overview	
	44	RRC Overview	
	45	RRC Overview	
	46	Mobility Management	
	47	Mobility Management	
	48	Inter-cell Interference Coordination	
	49	Inter-cell Interference Coordination	
	50	Inter-cell Interference Coordination	

13.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl. No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: Expected University Questions on LTE Features & Wireless Fundamentals.	Students study the Topics and write the Answers. Get practice to solve expected university questions.	Module-01 of the syllabus	2	Individual Activity. Printed solution expected.	Text Book 1as per the syllabus and Websites of the Reference list
2	Assignment 2: Expected University Questions on Multicarrier Modulation & SC-FDMA	Students study the Topics and write the Answers. Get practice to solve expected university questions.	Module-02 of the syllabus	4	Individual Activity. Printed solution expected.	Text Book 1as per the syllabus and Websites of the Reference list
3	Assignment 3: Expected University Questions on Channel structure of LTE	Students study the Topics and write the Answers. Get practice to solve expected university questions.	Module-03 of the syllabus	6	Individual Activity. Printed solution expected.	Text Book 1as per the syllabus and Websites of the Reference list
4	Assignment 4: Expected University Questions on Uplink channel transport processing & Physical Layer Procedures.	Students study the Topics and write the Answers. Get practice to solve expected university questions.	Module-04 of the syllabus	8	Individual Activity. Printed solution expected.	Text Book 1as per the syllabus and Websites of the Reference list
5	Assignment 5: Expected University Questions on Radio Resource & Mobility Management.	Students study the Topics and write the Answers. Get practice to solve expected university questions.	Module-05 of the syllabus	12	Individual Activity. Printed solution expected.	Text Book 1as per the syllabus and Websites of the Reference list

14.0 Assignment Questions

Assignment No	Questions	Marks
I	1. Explain the advantages of OFDMA which led to its selection for LTE. 2. With neat block diagram explain evolved packet core architecture 3. Explain delay spread and coherence bandwidth with appropriate equations. 4. Explain with appropriate equations LTE channel models for path loss and for multipath. 5. Explain broadband wireless channel fading.	5marks each
II	1. Explain circular convolution and DFT, also explain the cyclic prefix. 2. Explain with block diagram OFDM-FDMA. 3. With block diagram explain OFDMA downlink transmitter. 4. Explain array gain & diversity gain in spatial diversity. 5. Explain DOA-based beam-steering.	5marks each
III	1. Explain with block diagram end-to end LTE network architecture. 2. Explain in detail radio interface protocols. 3. Explain in detail channel coding process. 4. Explain control format indicators. 5. Explain H-ARQ in the downlink.	5marks each
IV	1. Explain frequency hopping in detail. 2. Write a note on uplink control information. 3. Write a note on A-primer on CQI estimation. 4. Explain scheduling and resource allocation in physical layer. 5. Explain random access procedures in LTE.	5marks each
V	1. Write a note on PDCP. 2. Explain in detail PDU headers & formats. 3. Explain RRC states in LTE. 4. With block explain X2 mobility. 5. Explain RAN procedures for mobility.	5marks each

16.0 University Result

Examination	FCD	FC	SC	% Passing
2018-19				100
2019-20				100
2020-21				100

Prepared by	Checked by		
Prof. S.B.Akkole	Prof. D.M.Kumbar	HOD	Principal

Subject Title	**FIBER OPTICS & NETWORKS**		
Subject Code	17EC82	**IA Marks**	20
Number of Lecture Hrs / Week	04 L	**Exam Marks**	80
Total Number of Lecture Hrs	50	**Exam Hours**	03

FACULTY DETAILS:		
Name: Prof. Shreevijay Ittannavar	**Designation:** Asst. Professor	**Experience:**08 yrs
No. of times course taught:02	**Specialization:** E&C Engineering	

1.0 Prerequisite Subjects:

Sl. No	Branch	Semester	Subject
01	ECE	III	Analog Electronics
02	ECE	IV	Analog Communication

2.0 Course Objectives

1. To acquire the knowledge of optical link building blocks.
2. To analyze transmission parameters of optical fiber.
   a) Attenuation b) Dispersion
3. To understand the working of optical sources and detectors.
4. Analysis of couplers, connectors and other passive devices.
5. Design of analog and digital optical links and their applications.
6. To understand the working and types of optical Networks

CO	Description
CO410. 1:	Classification and working of optical fiber with different modes of signal propagation.
CO410. 2:	Describe the transmission characteristics and losses in optical fiber communication.
CO410. 3:	Describe the construction and working principle of optical connectors, multiplexers and amplifiers.
CO410. 4:	Describe the constructional features and the characteristics of optical sources and detectors.
CO410. 5:	Illustrate the networking aspects of optical fiber and describe various standards associated with it.

3.0 Course Content

Module -1

Optical fiber Communications: Historical development, The general system, Advantages of optical fiber communication, Optical fiber waveguides: Ray theory transmission, Modes in planar guide, Phase and group velocity, Cylindrical fiber: Modes, Step index fibers, Graded index fibers, Single mode fibers, Cutoff wavelength, Mode field diameter, effective refractive index. Fiber Materials, Photonic crystal fibers. (Text 2) L1, L2

Module -2

Transmission characteristics of optical fiber: Attenuation, Material absorption losses, Linear scattering losses, Nonlinear scattering losses, Fiber bend loss, Dispersion, Chromatic dispersion, Intermodal dispersion: Multimode step index fiber. Optical Fiber Connectors: Fiber alignment and joint loss, Fiber splices, Fiber connectors, Fiber couplers. (Text 2) L1, L2

Module -3

Optical sources: Energy Bands, Direct and Indirect Band gaps, Light Emitting diodes: LED Structures, Light Source Materials, Quantum Efficiency and LED Power, Modulation. Laser Diodes: Modes and Threshold conditions, Rate equation, External Quantum Efficiency, Resonant frequencies, Laser Diode structures and Radiation Patterns: Single mode lasers. Photo detectors: Physical principles of Photodiodes, Photo detector noise, Detector response time. **Optical Receiver:** Optical Receiver Operation: Error sources, Front End Amplifiers, Receiver sensitivity, Quantum Limit. (Text 1) L1, L2

Module -4

WDM Concepts and Components: Overview of WDM: Operational Principles of WDM, WDM standards, Mach-Zehnder Interferometer Multiplexers, Isolators and Circulators, Fiber grating filters, Dielectric Thin-Film Filters, Diffraction Gratings, Active Optical Components, Tunable light sources, Optical amplifiers: Basic application and Types, Semiconductor optical amplifiers, Erbium Doped Fiber Amplifiers, Raman Amplifiers, Wideband Optical Amplifiers. (Text 1) L1, L2

Module -5

Optical Networks: Optical network evolution and concepts: Optical networking terminology, Optical network node and switching elements, Wavelength division multiplexed networks, Public telecommunication network overview. Optical network transmission modes, layers and protocols: Synchronous networks, Asynchronous transfer mode, OSI reference model, Optical transport network, Internet protocol, Wavelength routing networks: Routing and wavelength assignment, Optical switching networks: Optical circuit switched networks, packet switched networks, Multiprotocol Label Switching, Optical burst switching networks, Optical network deployment: Long-haul networks, Metro soliton area networks, Access networks, Local area networks. (Text2) L1,

4.0 Relevance to future subjects

Sl No	Semester	Subject	Topics
01	VIII	Project work	Digital transmission of voice, video and data.
02	VIII	CCN, Optical Networks, HPCN	LAN/WAN, SONET / SDH, Optical Interfaces.

5.0 Relevance to Real World

SL. No	Real World Mapping
01	Design of optical links for different applications.
02	WDM/DWDM Networks for high speed data.
03	Underwater submarine links for trans Atlantic transmission.

6.0 Gap Analysis and Mitigation

Sl. No	Delivery Type	Details
01	Tutorial	Topic: Simulation software's like PTDS,OPTYSIS and OPTISYM
02	NPTEL	Assembly Application

7.0 Books Used and Recommended to Students

Text Books
1 Gerd Keiser , Optical Fiber Communication, 5th Edition, McGraw Hill Education(India) Private Limited, 2015. ISBN:1-25-900687-5. 2. John M Senior, Optical Fiber Communications, Principles and Practice, 3rd Edition, Pearson Education, 2010, ISBN:978-81-317-3266-3."Optical Fiber Communication" Gred Keiser, 4th Ed. MGH 2015.
Reference Books
1.Joseph C Palais, Fiber Optic Communication , Pearson Education, 2005, ISBN:0130085103
Additional Study material & e-Books
3. NPTEL notes and Videos 4. VTU on line notes. 5. Free softwares like PTDS,OPTYSIS and OPTISYM.

8.0 Relevant Websites (Reputed Universities and Others) for Notes/Animation/Videos Recommended

Website and Internet Contents References
6) https://nptel.co.in 7) http://m.noteboy.in/vtuflies/machine%20drawing.pdf

9.0 Magazines/Journals Used and Recommended to Students

Sl.No	Magazines/Journals	website
1	IEEE Xplorer	http://ieee.com
2	International Journal of Science and Technology	http://www.sciencedirect.com/science/journal/00207683
3	Journal of Communication Engineering	http://ieee.com

10.0 Examination Note

Internal Assessment: 40 Marks
Three IA will be conducted and average of best of two will be accounted.

Scheme of Evaluation for Internal Assessment (30 Marks)
(b) Internal Assessment test in the same pattern as the of the main examination. (50marks.)

SCHEME OF EXAMINATION:
Two questions to be set from the syllabus covered.
Student has to answer one part each from each question.
Question 1 1x15 = 15Marks
Question 2 1x15 = 15Marks
Total = 30 Marks
10 Marks FOR ASSIGNMENT

INSTRUCTION FOR Optical Fiber Communication (17EC82) Examination
- Two full questions will be given which consists of a, b, c, d sub sections.
- Student has to answer either a or b and c or d.

11.0 Course Delivery Plan

Course Delivery Plan:

UNIT	LECTURE NO.	CONTENT OF LECTURE	% OF PORTION
1	1	General system, advantages, disadvantages, and applications of optical fiber communication	20
	2	Optical fiber waveguides, Ray theory, TIR	
	3	Mode filed diameter	
	4	Modes in planar guide, Phase and group velocity,	
	5	Cylindrical fibers	
	6	Step index fibers, Graded index fibers	
	7	Cutoff wavelength,	
	8	Optical Fibers: fiber materials,	
	9	Photonic crystal	
	10	Fiber optic cables specialty fibers	
2	11	Transmission Characteristics of Optical Fiber	40
	12	Attenuation	
	13	Material and Scattering losses,	
	14	Linear and Non linear scattering losses	
	15	Fiber Bending losses	
	16	Dispersion	
	17	Optical Fiber Connectors	
	18	Fiber Alignment and Joint losses	
	19	Fiber Splices	
	20	Fiber Couplers	

3	21	Energy bands-Direct and Indirect band gaps	60
	22	LED-Structures, Light source materials	
	23	Quantun Efficiency and power	
	24	Modulation of light sources	
	25	Laser Diodes-Modes and Threshold conditions	
	26	Photo Detectors-Noise,Response Time	
	27	Optical Receivers-error sources	
	28	Front end Amplifiers	
	29	Receiver Sensitivity	
	30	Quantum Limit.	
4	31	Principals of WDM	80
	32	WDM Standards	
	33	Mach-Zehnder Interferometer Multiplexer	
	34	Isolators and Circulators	
5	35	Fiber Grating Filters	15.38
	36	Active Optical Components	
	37	Tunable Light sources	
	38	Optical Amplifiers	
	39	Semiconductor Optical Amplifiers	
	40	Erbium Doped Fiber Amplifiers, Wideband Amplifiers	
6	41	Optical Networking Terminology	100
	42	Nodes and Switching elements	
5 7	43	Pubic Telephone networks	100 11.50
	44	Layers and Protocols	
	45	Asynchronous Transfer Mode.	
	46	Optical Transport Network	
	47	Optical Burst Switching network	
	48	Long Haul Networks	
	49	Access Networks	11.50
		Local Area Networks.	

12.0 Assignments, Pop Quiz, Mini Project, Seminars

Sl.No.	Title	Outcome expected	Allied study	Week No.	Individual / Group activity	Reference: book/website /Paper
1	Assignment 1: University Questions on OFC basics.	Students study the Topics and write the Answers. Get practice to solve university questions.	Unit 1, of the syllabus	2	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
2	Assignment 2: University Questions on transmission characteristics ans connectors	Students study the Topics and write the Answers. Get practice to solve university questions.	Unit 2 of the syllabus	4	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list

3	Assignment 3: University Questions on optical sources and detectors	Students study the Topics and write the Answers. Get practice to solve university questions.	Unit3 of the syllabus	6	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
4	Assignment 4: University Questions on WDM concepts and optical networks	Students study the Topics and write the Answers. Get practice to solve university questions.	Unit 74,5 of the syllabus	8	Individual Activity. Printed solution expected.	Book 1, 2 of the reference list. Website of the Reference list
5	Mini Project Rivets based for the students groups	Students study the Rivets applications from Real World Example view.	Syllabus with Real World Mapping	12	Group Activity. Student Group need to perform Project and do a brief Report	All Books / paper Resources / Study Material. All Internet /

13.0 Assignment Questions

Assignment No	Questions	Marks
1	1. State and explain advantages and disadvantages of fiber optic communication systems. 2. State and explain in brief the principle of light propagation. 3. Consider a fiber in air with n1=1.51, n2=1.50, Calculate Critical angle, acceptance angle and NA for source to fiber medium n_0=1. 4. Write a note on fiber optic cables.	5marks
2	0 Explain absorption mechanism and its effects on fiber optics. 1 Derive expression of pulse broadening in graded index fibers. 2 Give expression of pulse broadening in graded index fibers. 3 State the significance of mode coupling in fiber optic system	5marks
3	1. Explain the Fabry-Perot resonator and DFB laser diode. 2. Give the expression for 1) External quantum efficiency 2) Frequency spacing 3)Wavelength spacing 3. Using rate equations prove that laser is threshold device	5marks
4	1. Derive an expression for carrier to noise ratio(CNR) of an analog optica system, under limiting conditions of different noise sources involved 2.. With neat block diagram explain multichannel amplitude modulation 3..Explain the rise –time budget analysis with its basic elements that contribute to system rise time.	5marks
5	Briefly explain i)SONET?SDH ring ii)SONET/SDH format iii) Frame format of SONET/SDH	5 Marks

14.0 University Result

Examination	FCD	FC	SC	% Passing
July 2018	26	23	22	93.42
July 2019	30	15	05	100
Aug 2021	17	17	00	100

Prepared by	Checked by		
Prof. S. S. Ittannavar	Dr. R. R. Maggavi	HOD	Principal

Subject Title	**NETWORK AND CYBER SECURITY**		
Subject Code	17EC835	**IA Marks**	40
Number of Lecture Hrs / Week	04	**Exam Marks**	60
Total Number of Lecture Hrs	40	**Exam Hours**	03

Faculty Details:		
Name: Prof. B. P. Khot	**Designation:** Asst. Professor	**Experience:** 6.04Yrs
No. of times course taught: 4	**Specialization:** Microelectronics and Control Systems	

1.0 Prerequisite Subjects:

Sr. No.	Branch	Semester	Subject
01	Electronics & Communication Engineering	VI	Operating Systems, Microprocessors
02	Electronics & Communication Engineering	VII	Embedded Systems, RTOS

2.0 Course Objectives

1. Know about security concerns in Email and Internet Protocol.
2. Understand cyber security concepts.
3. List the problems that can arise in cyber security.
4. Discuss the various cyber security frame work.

3.0 Course Outcomes

Having successfully completed this course, the student will be able to

Sr. No.	Course Outcome	Pos
C411E.1	Explain network security protocols.	PO1-PO4, PO6- -PO12
C411E.2	Understand the basic concepts of cyber security.	PO1-PO4, PO6- -PO12
C411E.3	Discuss the cyber security problems.	PO1-PO4, PO6 -PO12
C411E.4	Explain Enterprise Security Framework.	PO1-PO4, PO6 -PO12
C411E.5	Apply concept of cyber security framework in computer system administration.	PO1-PO4, PO6 -PO12
Total Hours of instruction		**40**

4.0 Course Content

Module-1	RBT Level
Transport Level Security: Web Security Considerations, Secure Sockets Layer, Transport Layer Security, HTTPS, Secure Shell (SSH) [Text 1: Chapter 15] **8 Hours**	L1, L2
Module-2	
E-mail Security: Pretty Good Privacy, S/MIME, Domain keys identified mail [Text 1: Chapter 17] **8 Hours**	L1, L2
Module-3	
IP Security: IP Security Overview, IP Security Policy, Encapsulation Security Payload (ESP), Combining security Associations Internet Key Exchange. Cryptographic Suites [Text 1: Chapter 18] **8 Hours**	L1, L2
Module-4	
Cyber network security concepts: Security Architecture, antipattern: signature based malware detection versus polymorphic threads, document driven certification and accreditation, policy driven security certifications. Refactored solution: reputational, behavioural and entropy based malware detection. **The problems:** cyber antipatterns concept, forces in cyber antipatterns, cyber anti pattern templates, cyber security antipattern catalog. [Text-2: Chapter1 & 2] **8 Hours**	L1, L2, L3
Module-5	
Cyber network security concepts contd. : **Enterprise security using Zachman framework** Zachman framework for enterprise architecture, primitive models versus composite models, architectural problem solving patterns, enterprise workshop, matrix mining, mini patterns for problem solving meetings. Case study: cyber security hands on – managing administrations and root accounts, installing hardware, reimaging OS, installing system protection/ antimalware, configuring firewalls. [Text-2: Chapter 3 & 4] **8 Hours**	L1, L2, L3

5.0 Relevance to future subjects

Sr. No.	Semester	Subject	Topics
01	VIII	Project work	Security based Projects
02	M. Tech (SE) 2nd SEM	Information and Network Security	Secured Communication system design

6.0 Relevance to Real World

Sr. No.	Real World Mapping
01	Secured internet banking and business
02	Secured communication required for military, Navy and Air force sectors.

7.0 Gap Analysis and Mitigation

Sr. No.	Delivery Type	Details
01	Tutorial	Topic: Encryption & Decryption Algorithms concepts & numerical
02	NPTEL	Encryption & Decryption Algorithms, SET, Malicious Software

8.0 Books Used and Recommended to Students

Text Books
1. **"Cryptography and Network Security Principles and Practice"**, William Stallings, Pearson Education Inc., 6th Edition, 2014, ISBN: 978-93-325- 1877-3.
2. **"Cyber Security – Managing Systems, Conducting Testing, and Investigating Intrusions"**, Thomas J. Mowbray, Wiley.
Reference Books
1. **Cryptography and Network Security**, Behrouz A. Forouzan, TMH, 2007.
2. **Cryptography and Network Security**, Atul Kahate, TMH, 2003.

9.0 Relevant Websites (Reputed Universities and Others) for Notes /Animation / Videos Recommended

Website and Internet Contents References
1. https://nptel.ac.in/courses/106105031/
2. https://www.infosecurity-magazine.com/
3. https://www.securitymagazine.com/keywords/1944-network-security
4. https://www.coursera.org/learn/information-security-data

10.0 Magazines/Journals Used and Recommended to Students

Sr. No.	Magazines/Journals	Website
1	Cyber Security; Issue and Challenges in E-Commerce	https://www.worldwidejournals.com/paripex/recent_issues_pdf/2016/January/January_2016_1453357435__63.pdf
2	International cyber security challenges	https://bib.irb.hr/datoteka/878827.Duic_Cvrtila_Ivanjko_International_cyber_security_challenges_.pdf
3	International cyber security challenges	https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7973625

11.0 Examination Note

Internal Assessment: 40 Marks

Three IA will be conducted for 30 marks and average of three will be accounted.

SCHEME OF EXAMINATION:

Two questions to be set from the syllabus covered.
Student has to answer one part each from each question.
Question 1 1x15 = 30Marks
Question 2 1x15 = 30Marks
Total = 30 Marks 10 Marks for Assignment

INSTRUCTION FOR SIGNALS AND SYSTEMS (17EC835) EXAMINATION:

- Four full questions will be given which consists of a, b, c, d sub sections.
- Students have to answer either Q :1 or 2 and Q 3 or 4 completely.

12.0 Course Delivery Plan

MODULE	LECTURE NO.	CONTENT OF LECTURE	% OF PORTION
1	1	**Transport Level Security:** Introduction	20
	2	Web Security Considerations	
	3	Secure Sockets Layer	
	4	Secure Sockets Layer	
	5	Transport Layer Security	
	6	Transport Layer Security	
	7	Https	
	8	Secure Shell (SSH)	
2	9	**E-Mail Security:** Introduction	40
	10	Pretty Good Privacy Notation	
	11	Pretty Good Privacy Operational Description	
	12	**S/MIME:** RFC 5322, Multipurpose Internet Mail Extensions	
	13	**S/MIME:** Functionality, Messages, Certificate Processing	
	14	**S/Mime:** Enhanced Security Services	
	15	Domain Keys Identified Mail: Internet Mail Architecture, E-Mail Threats	
	16	DKIM: Strategy, Functional Flow	

3	17	IP Security: Introduction	60
	18	IP Security Overview	
	19	IP Security Policy	
	20	Encapsulation Security Payload (ESP)	
	21	Encapsulation Security Payload (ESP)	
	22	Combining Security Associations	
	23	Internet Key Exchange	
	24	Cryptographic Suites	
4	25	**Cyber network security concepts:** Security Architecture, ,	80
	26	Antipattern: Signature based malware detection versus polymorphic threads	
	27	Antipattern: Document driven certification and accreditation	
	28	Antipattern: Policy driven security certifications.	
	29	Refactored solution: reputational, behavioral and entropy based malware detection.	
	30	**The problems:** cyber antipatterns concept	
	31	Forces in cyber antipatterns	
	32	Cyber anti pattern templates and cyber security antipattern catalog.	
5	33	Enterprise security using Zachman framework	100
	34	Zachman framework for enterprise architecture,	
	35	Primitive models versus composite models,	
	36	Problem solving patterns, enterprise workshop,	
	37	Architectural matrix mining, mini patterns for problem solving meetings.	
	38	Case study: cyber security hands on – managing administrations and root accounts	
	39	Installing hardware, reimaging OS,	
	40	Installing system protection/ antimalware, configuring firewalls	

13.0 IMPORTANT QUESTIONS

MODULE 1

1. Web Security Threats Web Traffic Security Approaches
2. Explain Secure Socket Layer (SSL) Architecture
3. Explain SSL Record Protocol
4. Explain Handshake Protocol
5. Explain Change Cipher Spec Protocol Alert Protocol
6. Explain HTTPS Connection Initiation
7. Explain HTTPS Connection Closure

8. Explain Secure Shell (SSH)
9. Explain SSH Transport Layer Protocol
10. Explain SSH User Authentication Protocol and Connection Protocol

MODULE 2

1. Web Security Threats Web Traffic Security Approaches
2. Explain Secure Socket Layer (SSL) Architecture
3. Explain SSL Record Protocol
4. Explain Handshake Protocol
5. Explain Change Cipher Spec Protocol Alert Protocol
6. Explain HTTPS Connection Initiation
7. Explain HTTPS Connection Closure
8. Explain Secure Shell (SSH)
9. Explain SSH Transport Layer Protocol
10. Explain SSH User Authentication Protocol and Connection Protocol

MODULE 3

1. Explain Applications of IPsec
2. Explain Benefits of IPsec
3. Explain Transport and Tunnel Modes
4. Explain IP Security Policy
5. Explain Security Associations and Security Association
6. Explain Encapsulating Security Payload
7. Explain ESP Format Encryption and Authentication Algorithms
8. Explain Combining Security Associations Authentication Plus Confidentiality
9. Explain Basic Combinations of Security Associations
10. Explain Internet Key Exchange Key Determination Protocol Header and Payload Formats

13.0 University Result

Examination	FCD	FC	SC	% Passing
June/July 2019	**14**	**4**	**1**	**100**
June/July 2020	**8**	**4**	**-**	**100**
June/July 2021	**25**	**10**	**-**	**100**

Prepared by	Checked by		
Prof. B. P. Khot	Prof. S. S. Kumate	HOD	Principal