Dr. Ambedkar Institute of Technology
Department of Electronics & Telecommunication Engineering

The enclosed documents are verified and approved.

for HoD H. O. D
Dept. of Electronics & Telecommunication Engg.
Dr. Ambedkar Institute of Technology
Bengaluru-560 056

Dr. Ambedkar Institute of Technology, Bangalore

(An Autonomous Institute affiliated to VTU, Accredited by NAAC with 'A' grade)

Department of Telecommunication Engineering

(UG and PG Programs Accredited by NBA)

Date: 15-06-2018

Resolutions of Board of Studies Meeting – Under Graduation and Post Graduation Programs

Board of Studies meeting for finalizing the scheme and syllabus for Under Graduation Program 3rd to 8th Semester, Telecommunication Engineering and Post Graduation Program 1st to 4th semester M Tech in Digital communication and Networking, was held on 15.06.2018. Following members were present in the meeting:

(1) Dr. Yamuna Devi C. R.,	Chairman
(2) Dr. H. S. Sheshadri,	VTU Nominee
(3) Dr. S. Shanthala,	External Subject Expert
(4) Dr. K.R. Nataraj,	External Subject Expert
(5) Dr. Jayanthi K. Murthy,	External Subject Expert
(6) Prof. P. Nagaraju,	External Subject Expert
(7) Mr. Sharaschandra M.K,	Industry Representative
(8) Mr. T. Rajendra Prasad,	Industry Representative
(9) Mr. Umesh R. Rao,	Industry Representative
(10) Mrs. Laksimi Bhaskar,	Alumni with PG degree
(11) Dr. B. Sivakumar,	Internal faculty member
(12) Mrs. Sudha T,	Internal faculty member
(13) Mr. K. V. Mahesan,	Internal faculty member
(14) Mr. Aravinda H. L.,	Internal faculty member
(15)Mrs. P.C.Shruthi,	Internal faculty member
(16) Mrs. Usha Rani M. A.,	Internal faculty member
(17) Dr. Prashanth C.R.,	Internal faculty member
(18) Mrs. Chandrakala V.,	Internal faculty member

The Chiarman, Board of Studies (UG and PG Programs) welcomed all the members for BoS meeting and held discussion on scheme and syllabus of UG and PG programs for the academic year 2018-19 and following are the essence of the meeting.

UG Program:

Scheme & syllabus discussion for the Academic year 2018-19:

As per the preliminary BoS meeting held on 16.05.18 with the faculty members and student representatives, it was resolved to incorporate the changes and improvements in the scheme and syllabus.

There were changes to be made which needed immediate attention in subjects like Microcontrollers in 4th semester and Internet of Things in 7th semester.

1. It was resolved to reframe the syllabus by including basic concepts of Microprocessors in the 1st unit. Also, the contents related to MSP430 in 4th and 5th unit were replaced with contents of 8051 microcontroller.
2. MSP430 may be made offered as an individual elective subject.
3. It was resolved to reframe the complete syllabus of Internet of Things and the same was approved.

The format of the Scheme as per issued by the institute for the Academic year 2018-19 and the discussion of the scheme was made as per the format given.

1. A suggestion was given to include debate among the students of a class on a topic related to subject.
2. Measurements & Instrumentation(M&I) subject can be clubbed with Electronic Devices and Circuits. Hence, in place of M&I, the subject Transmission Lines & Waveguides(TLW) can be included in 3rd semester.
3. TLW will be removed from 4th semester and replaced with a combined subject Analog Communication & Linear Integrated Circuits (AC&LIC).
4. The subject Control Systems(CS) will be included in 4th semester.
5. The subject Information Theory and Coding(ITC) will be included in 5th semester and any other subject should be included in Program Elective (PE) list.
6. Digital Communication is made as a core subject in 5th semester.
7. Computer Communication Networks theory and Laboratory shall be included in 6th semester.
8. Microwave Engineering(MW) theory and laboratory shall be included in 7th semester and made as a core subject.
9. OOPS using C++ shall be included as Open Elective(OE) and any other subject to be included in PE list.

10. The subjects Wireless and Mobile Networks and Automotive Electronics can be introduced as Program Electives (PE) in 8th semester.
11. Department Vision, Mission, PO's and reframing of PEO's are discussed and analyzed.

The Chairman, BoS-UG and PG concluded the meeting after thanking all the members present.

Chairman, BoS- UG andPG

CHAIRMAN
Board of Studies
Department of Telecommunication Engg
Dr.Ambedkar Institute of Technology
BANGALORE-560 056

CWC to:
1. The Principal, Dr. AIT, for information.
2. The Dean (Aca), Dr. AIT, for information.

Credit break down/distribution for all semesters BE programme	
Semester	**Credits**
I & II	**20 + 20 = 40**
III	**24**
IV	**24**
V	**25**
VI	**24**
VII	**23**
VIII	**15**
Total	**175**

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SCHEME OF TEACHING AND EXAMINATION from Academic Year 2018-19

B.E TELECOMMUNICATION ENGINEERING

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

III SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	BC	18MA31	Transform calculus and boundary value problems	Mathematics	2	2	--	03	50	50	100	3
2	PC	18TE31	Electronic Devices & Circuits		4	0	--	03	50	50	100	4
3	PC	18TE32	Digital Systems Design		4	0	--	03	50	50	100	4
4	PC	18TE33	Network Theory		4	0	--	03	50	50	100	4
5	PC	18TE34	Linear Integrated Circuits		3	0	--	03	50	50	100	3
6	PC	18TE35	Field Theory		2	2	--	03	50	50	100	3
7	PC	18TEL36	Electronic Devices & Circuits Lab		--	--	3	03	50	50	100	1
8	PC	18TEL37	Digital Systems Design Lab		--	--	3	03	50	50	100	1
9	HS	18HS31/32	Constitution of India Professional Ethics and Human Rights/ / Env. Studies	Hu/Civ	1	--	--	02	50	50	100	1
10	MC	18HS33	Soft skills (MC)	Humanities	04		--	03	50	-	50	0
				TOTAL	**24**	**04**	**06**	**29**	**500**	**450**	**950**	**24**
Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs												
11	MC	18MAD31	Advance Mathematics - I	Mathematics	02	01	--	03	50		50	0

Note: HODs are informed to accommodate one more laboratory in addition to the above courses if needed, without altering the total number of credits (TOTAL: 24).

(a)**The mandatory non – credit courses** Advance Mathematics I and II prescribed at III and IV semesters respectively, to lateral entry Diploma holders admitted to III semester of BE programs shall compulsorily be registered during respective semesters to complete all the formalities of the course and appear for SEE examination.

(b) **The mandatory non – credit courses** Advance Mathematics I and II, prescribed to lateral entrant Diploma holders admitted to III semester of BE programs, are to be completed to secure eligibility to VII semester. However, they are not considered for vertical progression from II year to III year of the programme but considered as head of passing along with credit courses of the programme to eligibility to VII semester.

Note: BC: Science Course, PC: Professional Core. Hu: Humanities, MC: Mandatory Course.

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SCHEME OF TEACHING AND EXAMINATION from Academic Year 2018-19

B.E TELECOMMUNICATION ENGINEERING

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

IV SEMESTER

Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	BC	18MA41	Numerical Methods and Statistical Techniques	Mathematics	2	2	--	03	50	50	100	3
2	PC	18TE41	Microcontroller using Assembly and C language		4	0	--	03	50	50	100	4
3	PC	18TE42	Fundamentals of Telecommunications		3	0	--	03	50	50	100	3
4	PC	18TE43	Signals & Systems		4	0	--	03	50	50	100	4
5	PC	18TE44	Fundamentals of Hardware Description Language		3	0	--	03	50	50	100	3
6	PC	18TE45	Transmission Lines & Wave guides		4	0	--	03	50	50	100	4
7	PC	18TEL46	Microcontroller Lab		--		3	03	50	50	100	1
8	PC	18TEL47	Programming in HDL Lab		--		3	03	50	50	100	1
9	HS	18HS41/42	Constitution of India Professional Ethics and Human Rights/ Env. Studies	Hum/Civ	1	--	--	02	50	50	100	1
10	MC	18HS43	Employability skills (MC)	Humanities	04		--	03	50	-	50	0
				TOTAL	**25**	**02**	**06**	**29**	**500**	**450**	**950**	**24**
Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs												
11	MC	18MAD41	Advance Mathematics - II	Mathematics	02	01	--	03	50		50	0

Note: HODs are informed to accommodate one more laboratory in addition to the above courses if needed, without altering the total number of credits (TOTAL: 24).

(a) The mandatory non – credit courses Advance Mathematics I and II prescribed at III and IV semesters respectively, to lateral entrant Diploma holders admitted to III semester of BE programs shall compulsorily be registered during respective semesters to complete all the formalities of the course and appear for SEE examination.

(b) The mandatory non – credit courses Advance Mathematics I and II, prescribed to lateral entrant Diploma holders admitted to III semester of BE programs, are to be completed to secure eligibility to VII semester. However, they are not considered for vertical progression from II year to III year of the programme but considered as head of passing along with credit courses of the programme to eligibility to VII semester.

Note: BC: Science Course, PC: Professional Core. Hu: Humanities, MC: Mandatory Course.
ENV: Environmental Studies, CIP: Constitution of India Professional Ethics and Human Rights

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SCHEME OF TEACHING AND EXAMINATION from Academic Year 2018-19

B.E TELECOMMUNICATION ENGINEERING

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

V SEMESTER

Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	Hu	18HS51	M&E	Hu	3	--	--	03	50	50	100	3
2	PC	18TE51	Digital Signal Processing		2	2	--	03	50	50	100	3
3	PC	18TE52	Analog Communication		3	2	--	03	50	50	100	4
4	PC	18TE53	Antenna & Wave Propagation		3	--	--	03	50	50	100	3
5	PC	18TE54	ARM Processor and Embedded System Design		4	--	--	03	50	50	100	4
6	PE	18TE55X	Professional Elective-1		3	--	--	03	50	50	100	3
7	OE	18TEE01	Open Elective -A		3	--	--	03	50	50	100	3
8	PC	18TEL57	Signals systems and DSP Lab		--	--	2	03	50	50	100	1
9	PC	18TEL58	Analog Communication & LIC Lab		--	--	2	03	50	50	100	1
				TOTAL	21	4	4	27	450	450	900	25

Mini-project: To be carried out during the intervening vacations of V and VI semesters. The SEE examination will be conducted during VI semester. The credit prescribed for mini – project is added to VI semester credits. The mini-project is considered as a head of passing and is considered for the award of degree. Those, who do not take-up/complete the mini-project will be declared as failed and have to complete during subsequent SEE examination after satisfy the Mini-project requirements. Also, mini-project is considered for eligibility to VII semester.

Note: Hu: Humanities, PC: Professional Core, MC: Mandatory Course,

Course code	Professional Electives -1
18TE551	Control Systems
18TE552	OOPs using C++
18TE553	VLSI in Telecommunication Engineering
18TE554	Principles of RADAR Engineering

Course code	Open Elective - A
18TEE01	Embedded System Design
18TEE01	VLSI in Telecommunications

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SCHEME OF TEACHING AND EXAMINATION from Academic Year 2018-19

B.E TELECOMMUNICATION ENGINEERING

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

VI SEMESTER

Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory **Lecture**	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	Hu	18HS61	IPR	Hu	3	--	--	03	50	50	100	3
2	PC	18TE61	Computer Communication Network		4	--	--	03	50	50	100	4
3	PC	18TE62	Information Theory & Coding		3	--	--	03	50	50	100	3
4	PC	18TE63	Digital Communication		3	2	--	03	50	50	100	4
5	PE	18TE64X	Professional Elective -2		3	--	--	03	50	50	100	3
6	OE	18TEE02	Open Elective -B		3	--	--	03	50	50	100	3
7	PC	18TEL66	Digital Communication Lab		--	--	2	03	50	50	100	1
8	PC	18TEL67	Computer Communication Network Lab		--	--	2	03	50	50	100	1
9	MP	18TEMP68	Mini-project					03	50	50	100	2
10	INT	18TEI69	Internship	(To be carried out during the intervening vacations of VI and VII semesters)				--	--	--	--	--
			TOTAL		**19**	**2**	**4**	**27**	**450**	**450**	**900**	**24**

Note: PC: Professional core, PE: Professional Elective, OE: Open Elective, MP: Mini-Project, INT: Internship.

Internship: All the students admitted to III year of BE have to undergo mandatory internship of 4 weeks during the vacations of VI and VII semesters and /or VII and VIII semesters. A University examination will be conducted during VIII semester and prescribed credit are added to VIII semester. Internship is considered as a head of passing and is considered for the award of degree. Those, who do not take-up/complete the internship will be declared as failed and have to complete during subsequent University examination after satisfy the internship requirements.

Electives

Course code	Professional Electives -2
18TE641	Cryptography & Network Security
18TE642	Advanced Signal Processing
18TE643	Satellite Communication
18TE644	Data structures using C++

Open Elective -A

Students can select any one of the open electives (Please refer to consolidated list of Dr AIT for open electives) offered by any Department. Selection of an open elective is not allowed provided,

- The candidate has studied the same course during the previous semesters of the programme.
- The syllabus content of open elective is similar to that of Departmental core courses or professional electives.
- A similar course, under any category, is prescribed in the higher semesters of the programme.

Registration to electives shall be documented under the guidance of Programme Coordinator/ Mentor.

Course code	Open Elective -B
18TEE02	Principles of RADAR Engineering
18TEE02	Satellite Communication

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B.E TELECOMMUNICATION ENGINEERING

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

VII SEMESTER

Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory **Lecture**	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	MC	18HS71/72	CMEP / OSHA	IM/CV	2	--	--	03	50	50	100	2
2	PC	18TE71	Microwave Engineering		3	2	--	03	50	50	100	4
3	PC	18TE72	Wireless and Mobile networks		3	2	--	03	50	50	100	4
4	PE	18TE73X	Professional Elective -3		3	--	--	03	50	50	100	3
5	PE	18TE74X	Professional Elective -4		3	--	--	03	50	50	100	3
6	OE	18TEE03	Open Elective -C		3	--	--	03	50	50	100	3
7	PC	18TEL76	Microwave Lab		--	--	2	03	50	50	100	1
8	PC	18TEL77	WMN Lab		--	--	2	03	50	50	100	1
9	Project	18TEP77	Project Work Phase - 1		--	--	2	03	50	50	100	2
10	INT	18TEI78	Internship	(If not completed after VI semester examinations, it has to be carried out during the intervening vacations of VII and VIII semesters)				--	--	--	--	--
				TOTAL	**17**	**4**	**6**	**27**	**450**	**450**	**900**	**23**

Note: PC: Professional Core, PE: Professional Elective, OE: Open Elective, INT: Internship, MC: Mandatory Course

Internship: All the students admitted to III year of BE have to undergo mandatory internship of 4 weeks during the vacations of VI and VII semesters and /or VII and VIII semesters. A SEE examination will be conducted during VIII semester and prescribed credits shall be added to VIII semester. Internship is considered as a head of passing and is considered for the award of degree. Those, who do not take-up/complete the internship will be declared as failed and have to complete during subsequent SEE examination after satisfy the internship requirements.

Electives

Course code	Professional Electives - 3
18TE731	Optical Communication & Networking
18TE732	Mobile Communication
18TE733	Artificial Intelligence and Machine Learning

Course code	Professional Electives – 4
18TE741	Spread Spectrum Communication
18TE742	Digital Image Processing
18TE743	Internet Of Things

Open Elective -B

Students can select any one of the open electives (Please refer to consolidated list of Dr. AIT for open electives) offered by any Department.

Selection of an open elective is not allowed provided,

- The candidate has studied the same course during the previous semesters of the programme.
- The syllabus content of open elective is similar to that of Departmental core courses or professional electives.
- A similar course, under any category, is prescribed in the higher semesters of the programme.

Registration to electives shall be documented under the guidance of Programme Coordinator/ Mentor.

CMEP: Cost Management of Engg Projects, OSHA: Occupational Safety and Health Administration

Course code	Open Elective - C
18TEE03	Wireless Sensor Networks
18TEE03	Multi Media Communication

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SCHEME OF TEACHING AND EXAMINATION from Academic Year 2018-19

B.E TELECOMMUNICATION ENGINEERING

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

VIII SEMESTER

Sl. No	Course and Course code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	MC	18XX81	CMEP / OSHA	IM /CV	4	--	--	03	50	50	100	2
2	Project	18TEP84	Project Work Phase - 2		--	--	2	03	50	50	100	10
3	Seminar	18TES85	Technical Seminar		--	--	2	03	50	50	100	1
4	INT	18TEI86	Internship	(Completed during the intervening vacations of VI and VII semesters and /or VII and VIII semesters.)				03	50	50	100	2
			TOTAL		**4**	--	**4**	**12**	**200**	**200**	**400**	**15**

Note: PC: Professional Core, PE: Professional Elective, ,INT: Internship, MC: Mandatory Course

Internship: Those, who have not pursued /completed the internship will be declared as failed and have to complete during subsequent SEE examination after they satisfy the internship requirements.

CMEP: Cost Management of Engg Projects, OSHA: Occupational Safety and Health Administration

TYPICAL BREKDOWN FOR THE B.E DEGREE CURRICULUM

#	Course Category*	Percentage(%) of Total Credits		Average number of Credits(Typical)
		MIN	MAX	
1	Humanities, Social Sciences & Management (HSMC)	5	10	10
2	Basic Sciences (BSC)	10	20	28
3	Engineering Sciences (ESC)	15	20	20
4	Professional Courses (PCC) - Core	30	40	64
5	Professional Courses (PEC) -Elective	10	15	20
6	Other Open Elective Courses (OEC)	5	10	08
7	Project Work (PROJ/ Seminar/ Internship, etc.,)	10	15	25

Sub Title : MICROCONTROLLERS		
Sub Code: TE41	**No. of Credits:4= 4:0:0 (L:T:P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hrs	**CIE +Assignment + SEE = 45 + 5 + 50 =100**	**Total No. of Contact Hours : 52**

Course Objectives :

1. To understand the architecture of Microcontrollers and to summarise the instruction set.
2. To learn basic programming for Intel 8051 Microcontroller using Assembly and C language.
3. To study programming Intel 8051 Microcontroller using Assembly and C language for timers, serial communication and interrupts.
4. To learn basic programming for MSP430 Microcontroller using assembly and C language.
5. To study interfacing programs for MSP430 Microcontroller in assembly and C language.

Unit No.	Syllabus Content	No. of hrs.
1.	**Introduction:** A Historical background, the microprocessor based Personal Computer System. Architecture of 8086: Internal Microprocessor architecture, Real Mode Memory addressing. Introduction to 80386, 80486 & Pentium Processors. Microprocessors and microcontroller. Introduction, Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture, Computer software. (Text 1 & Reference 1)	**10**
2.	**The 8051 Architecture:** Introduction, Architecture of 8051, Pin diagram of 8051, Memory organization, External Memory interfacing, Stacks. **Instruction set:** Instruction timings, 8051 instructions: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction. Instruction syntax, **Addressing modes:** Immediate addressing, Register addressing, Direct addressing, Indirect addressing, relative addressing, Absolute addressing, Long addressing, Indexed addressing, Bit inherent addressing, bit direct addressing. (Text 2)	**10**
3.	**8051 programming in C:** Introduction to Embedded C**,** data types,Programming using Embedde C, logic operation, data conversion programs accessing code ROM space. Time delay calculations in 8051C. I/O programming. **Timers/counters:** Timers and Counters, 8051 timers/counters, programming 8051 timers in assembly and C . (Text 2)	**12**
4.	**8051 Serial Communication:** Data communication, Basics of Serial Data Communication, 8051 Serial Communication, connections to RS-232, Serial communication Programming in C. (Text 2) **Interrupts:** Basics of interrupts, 8051 interrupt structure (Text 2)	**12**
5.	**On-chip peripherals:** Watchdog Timer, Comparator, Real Time Clock (RTC), ADC, DAC, LCD, keyboard, stepper motor interfacing. (Text 2)	**08**

Note 1: Unit 3 and Unit 4 will have internal choice.

Note 2: Three assignments are evaluated for 5 marks: Assignment – 1 from units 1 and 2. Assignment - 2 from units 3 and 4 , Assignment – 3 from unit 5.

Course outcomes:

CO1: Learnt the concepts of Microprocessors and Microcontrollers.
CO2: Studied basic programming for Intel 8051 Microcontroller using assembly and C language.
CO3: Learnt programming Intel 8051 Microcontroller using assembly and C language for timers, serial communication and interrupts.
CO4: Able to execute basic programs for MSP430 Microcontroller using assembly and C language.
CO5: Studied and able to write interfacing programs for MSP430 Microcontroller in assembly and C language.

COs	**Mapping with Pos**
CO1	PO1,PO 2,PO7, PO10
CO2	PO1,PO 2,PO3, PO4, PO8
CO3	PO1,PO2, PO3, PO4, PO7
CO4	PO1,PO2, PO3, PO4, PO9
CO5	PO1,PO 2, PO3, PO5,PO6, PO9

TEXT BOOKS:

1. **The Intel Microprocessors, Architecture, Programming and Interfacing –** Barry B. Brey, 8e, Pearson Education / Phi, 2009.
2. **"The 8051 Microcontroller and Embedded Systems – using assembly and C",** Muhammad Ali Mazidi, Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, Pearson, 2006.

REFERENCE BOOKS/WEBLINKS:

1. **"The 8051 Microcontroller Architecture, Programming and Applications",** 2e Kenneth J. Ayala, Thomson Learning 2005.
2. **Microcontrollers: Architecture, Programming, Interfacing and System Design",** Raj Kamal, " Pearson Education, 2005.
3. http://elearning.vtu.ac.in/elcmys/06ES42.html
4. "**The 8051 Microcontroller**", V.Udayashankar and MalikarjunaSwamy, TMH, 2009.

Sub Title :MULTIMEDIA COMMUNICATION		
Sub Code: TE82	**No of Credits : 3=3:0:0 (L-T-P)**	**No of lecture hours/week : 3**
Exam Duration : 3 hours	**CIE+SEE = 50 + 50 =100**	**Total No of Contact Hours : 39**

Course Objectives :

1. To study the different types of Media and their representation in different forms.
2. To understand the different compression techniques for Tex with examples.
3. To understand the different compression techniques for Image with examples.
4. To study the different compression techniques for Audio.
5. To study the different compression techniques for video.

UNIT No	Syllabus Content	No of Hours
1	**MULTIMEDIA COMMUNICATIONS:** Introduction, multimedia information representation, multimedia networks, multimedia applications, media types, communication modes, network types, multipoint conferencing, network QoS, Application QoS.	07
2	**TEXT AND IMAGE COMPRESSION**: Introduction, compression principles, text compression – Arithmetic coding, Lempel-ziv and Welsh coding, Image compression- GIFF, TIFF, Digitized documents and Pictures, JPEG.	07
3	**AUDIO COMPRESSION:** Introduction, audio compression, LPC, Code excited LPC, Perceptual coding, MPEG Audio coders, Dolby Audio coders. **VIDEO COMPRESSION** : Video compression principles, H.261, H.263, MPEG, MPEG-1, MPEG-2, and MPEG-4.	07
4	**THE INTERNET**: IP addresses, ARP, RARP, Routing Algorithms- Flooding, Distance vector Routing, Link State & Hierarchical Routing, ICMP, Broadcast Routing, Multicast Routing.	09
5	**BROADBAND ATM NETWORKS:** Cell format and Switching principles, Switching architectures, Protocol architectures. **TRANSPORT PROTOCOLS**: TCP, UDP, RTP and RTCP.	09

Note : Three assignments are evaluated for 5 marks: Assignment – 1 from units 1 and 2. Assignment - 2 from units 3 and 4 , Assignment – 3 from unit 5.

Course Outcomes : Students will be able to:

1. Understand types of Multimedia networks and applications.
2. Illustrate representation of the information of text, images, audio and video.
3. Implement the text and image, Audio and Video compression using different techniques and Standards.
4. Analyze the various Routing algorithms.
5. Understand different Architectures and Protocols.

COs	Mapping with POs
CO1	PO1,PO5
CO2	PO1,PO2,PO5
CO3	PO2, PO6,PO8
CO4	PO2,PO10
CO5	PO1,PO2,PO10

TEXT BOOK:

1. **Multimedia Communications: Applications, Networks, Protocols, and Standards** – Fred Halsall, Pearson Education, Asia, Second Indian reprint 2002.

REFERENCE BOOKS:

1. **Multimedia Information Networking** –, Nalin K. Sharda, PHI, 2003.
2. **Multimedia Fundamentals: Vol 1-Media Coding and Content**

Processing – RalfSteinmetz, KlaraNarstedt, Pearson Education, 2004.
3. **Multimedia Systems Design** – Prabhat K. Andleigh, KiranThakrar, PHI, 2004

Dr. AMBEDKAR INSTITUTE OF TECHNOLOGY, BANGALORE – 560056
(An Autonomous Institute affiliated to VTU)
DEPARTMENT OF TELECOMMUNICATION ENGINEERING

BOS MEETING PROCEEDINGS **Date:20/08/2020**

The Chairman Board of Studies (UG and PG programs) welcomed all the members for BOS committee and informed about the scheme and syllabus of UG and PG programs for the academic year 2020-21. Following members were present in the meeting:

(1) Dr. Yamuna Devi C R. ,Chairman

(2) Dr. Jayanthi K. Murthy, External Subject Expert

(3) Dr.Rathna G.N, External Subject Expert

(4) Dr.Ashwath, External Subject Expert

(5) Dr.Parameshachari B.D, External Subject Expert

(6) Er. Manisha Yadav ,Invited Member

(7) Dr.K.Viswanath,VTU Nominee

(8) Mr.Sharaschandra M.K,Industry Representative

(9) Mr.Sunil, Industry Representative

(10) Ms. Supriya Raghavendra Rao, Industry Representative

(11) Mr.Kirthi Prakash,alumni with PG degree

(12) Dr.B. Sivakumar,Internal Faculty Member

(13) Mr.Mahesan K.V. Internal Faculty Member

(14) Dr.Vidya H, Internal Faculty Member

(15) Mrs.Sudha T, Internal Faculty Member

(16) Dr.Aravinda H L, Internal Faculty Member

(17) Mrs.Usha Rani M.A, Internal Faculty Member

(18) Dr. Prashanth C. R., Internal Faculty Member

(19) Dr. Chandrakala V., Internal Faculty Member

Chairman BOS welcomed all the members for BOS meeting.

Detailed discussions were held regarding Scheme and syllabus of UG and PG courses for 2017 admitted students(UG), 2018 onwards admitted students(UG), 2018 onwards admitted students(PG), and 2020 admitted students(PG), and the following suggestions were given by members.

UG:-

1. To introduce online Internship program.
   - Chairman informed that some students have completed online internships.
2. To combine online courses under open electives head.
3. To introduce Virtual Labs to curriculum.
4. To include NPTEL and SWAYAM courses as credit and non-credit courses.
5. To include Virtual Labs, and also conduct and record hardware experiments and share among students.
   - Chairman informed that for previous semester, videos of experiments were shared with students and also uploaded in Institute website.
6. To conduct experiments in Virtual Lab and inform students to record and send to teachers.
7. To change the mode of conduction and question paper pattern for online SEE.
8. To record and share theory class videos, Material links, online videos in case of technical problems.
   - Chairman informed that few teachers are recording and sharing classes, materials and videos with students.
9. To use any open source software like Sci lab.
   - Chairman informed that suitable software is used in every lab for conduction of few demo experiments.
10. To introduce any online meeting tools like Webex, Google meet and Microsoft teams (licenced version).
11. To invite industry expert to teach theory and Laboratory.
    - Chairman informed that an industry expert from Simons was invited to teach a part of IV semester course (Fundamentals of Telecommunications) in previous semester.

PG:-

1. To verify the elective subjects in ELECTIVE –I, II,III, IV with equal distribution in communication and networking.
   - After discussion with senior faculty it was verified that electives have equal distribution in communication and networking.
2. Industrial Exposure is to be introduced for 1st year students.

BOS members gave their approval for scheme and syllabus mentioned above for UG and PG courses including the elective courses. Chairman informed that for few of the suggestions given by members, discussions are going on at the Institute level and changes will be incorporated as per the decisions taken by the higher authorities. Members of the BOS Committee gave their approval for scheme and syllabus of UG & PG courses.

The Chairman BOS(UG and PG) concluded the meeting after thanking all the members present.

Chairman-BoS

H.O.D.
Dept. of Telecommunication Engg.
Dr. Ambedkar Institute of Technology,
Bangalore-560 056

Sub Title : MOBILE COMMUNICATION		
Sub Code: TE72	**No of Credits : 4=4:0:0 (L-T-P)**	**No of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE+SEE = 50 + 50 =100**	**Total No of Contact Hours : 52**

Course Objectives:

After completing the course, the students should:

1. Analyse the environment in which the wireless industry operates.
2. Understand the different propagation mechanisms of wireless signals.
3. Understand different modulation schemes used in wireless communications.
4. Understand the concepts of different multiple access techniques used for wireless Communication.
5. Become familiar with 3G technologies.

Unit No	**Syllabus**	**No of hours**
1	**Introduction to wireless communication system:** Evolution of mobile radio communication, mobile radio system around the world, examples of wireless communication system. **The cellular concept:** Frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, trunking and grade of service, improving coverage and capacity in cellular systems.	10
2	**Mobile radio propagation(large scale path loss):**Free space propagation model, relating power to electric field, three basic propagation mechanisms, reflection, Two-ray model, diffraction, outdoor and indoor propagation models	10
3	**Mobile radio propagation(Small scale fading and multipath):**Small scale multipath propagation, impulse response model, small scale multipath measurement, parameters of mobile multipath channels, types of small scale fading. **Digital modulation:** Overview , line coding, pulse shaping techniques, linear modulation techniques.	11
4	**Speech coding:** Characteristic, quantization, ADPCM, frequency domain coding of speech, vocoders, linear predictive coders. **Multiple access techniques for wireless communication:** FDMA , TDMA, Spread spectrum multiple access, space division multiple access	11
5	3G Digital cellular technology:2.5G TDMA,GPRS ,EDGE Technologies,Need for 3G cellular network,IMT-2000 global standard,UMTS technology,W-CDMA air interface,TD-SCDMA technology,CDMA 2000 cellular technology.	10

Note 1 :- Unit number 3 & 4 will have internal choice

Note 2: Three assignments are evaluated for 5 marks: Assignment – 1 from units 1 and 2. Assignment - 2 from units 3 and 4 , Assignment – 3 from unit 5.

Course Outcomes:

1. Demonstrate cellular radio concepts in the design of wireless communication systems
2. Analyse different propagation mechanisms.
3. Study small scale propagation models and modulation scheme of wireless communication systems .
4. Understand different multiple access schemes and speech coding
5. Learn about 3G wireless technology

Cos	Mapping with POs
CO1	PO1,PO2,PO5,PO6
CO2	PO1,PO2,PO5,PO8
CO3	PO1,PO4,PO5,PO6
CO4	PO1,PO2,PO6,PO8
CO5	PO2,PO5,PO6,PO9

TEXT BOOKS:

1. **Wireless communications –Theodore.S.Rappaport**.PHI,second edition.
2. **Wireless communications**-T.L.Singal, McGraw Hill

REFERENCE BOOKS/WEBLINKS:

1. **Mobile Cellular Telecommunication** – Lee W.C.Y, MGH, 2002.

2. **Wireless communication** – D P Agrawal: 2nd Edition Thomson learning 2007.

3. **Fundamentals of Wireless Communication** – David Tse, Pramod Viswanath, Cambridge

Dr. Ambedkar Institute of Technology
(An Autonomous Institute affiliated to VTU)
Department of Electronics & Telecommunication Engineering

Date: 20.05.2021

Preliminary BOS Meeting -2

To discuss about formulating scheme and syllabus for forthcoming Academic year 2021-22 , an online preliminary BOS meeting for UG was conducted in the presence of all the faculty members on 20.05.2021 at 11.30 am.

Following faculty members were present for the meeting:

Sl. No.	Name
1.	Dr. Yamuna Devi C. R.
2.	Dr. B. Sivakumar
3.	Dr. Prashanth C. R.
4.	Dr. Vidya H.
5.	Dr. Sudha T.
6.	Mahesan K. V.
7.	Dr. Chandrakala V.
8.	Dr. Shruthi P. C.
9.	Dr. Aravinda H.L.
10.	Usha Rani M. A.
11.	Praveen K. B.
12.	Kavitha Narayan B. M.
13.	Sowmya M.

Chairman-BOS & HOD welcomed the faculty members and briefed about the proposed syllabus and requested faculty members to give their suggestions for improvisation, especially regarding final year syllabus which is to be newly implemented in the forthcoming academic year.

Following suggestions/opinions were expressed by the faculty members during the meeting, regarding the proposed scheme and syllabus :

(1) The subject "Microwave Engineering" in 7th semester can be renamed as "Microwaves & RADAR" to emphasize that RADAR which is essential application in telecommunication is dealt in the course.

(2) Syllabus of the subject "Optical Communication & Networking" to be revised.
(3) In the syllabus of professional elective "Mobile Communication" in 7th semester, along with other generations of mobile technology , 5G also to be mentioned.
(4) In the syllabus of professional elective "Artificial Intelligence and Machine Learning" along with Neural Networks concepts, genetic algorithm has to be included.
(5) Regarding professional elective "Spread Spectrum Communication", more specific topics about PN sequence to be included, and also order of units can be modified.
(6) In professional elective "Digital Image Processing" the topic image fragmentation can be included along with Image segmentation. Python implementation can be mentioned in any of the units.
(7) For professional elective "Internet of Things", the book **"Internet of Things (A Hands-on-Approach)"** by Vijay Madisetti and Arshdeep Bahga to be included as Text Book 2.
(8) Inclusion of subject "Internet of Things for Mobile Applications" as Open Elective by the department was suggested.

Faculty members were informed to put advanced relevant topics and included latest edition of books.

HOD & Chairman-BOS thanked all the faculty members for participating and giving their inputs and concluded the meeting.

Aravinda. H.L
Syllabus/BoS Coordinator

HOD & Chairman-BOS

Dept. of Telecommunication Engg.
Dr. Ambedkar Institute of Technology
Bengaluru-560 056

Sub Title : Microwave Engineering		
Sub Code: 18TE71	**No of Credits : 4=4:0:0 (L-T-P)**	**No of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE + SEE = 50 + 50 =100**	**Total No of Contact Hours : 52**

Course Objectives :

1. To study the principle of working of microwave generators and applications.
2. To study the working of passive microwave devices and its applications.
3. To understand the working principle of various solid state microwave devices
4. To study the impact of microstrip lines.
5. To understand various principles of radars as an important microwave application.

UNIT No	Syllabus Content	No. of Hours Teaching
1	**Microwave Communication:** Introduction to microwave communication; frequency bands; Microwave sources- Klystrons, Travelling Wave Tubes, Magnetron Oscillator; Applications; Relevant problems.	12
2	**S-Matrix Representation of Microwave Passive Devices :** Introduction ;S-Matrix representation of multiport networks- Microwave Tee Junctions, Directional couplers; Waveguide bends, Corners, Twists , Phase-shifters, Microwave Attenuators , Isolators and Circulators; Relevant problems.	10
3	**Solid State Microwave Devices :** Introduction; Transfer Electron Devices: GUNN diode – GaAs Diode, Avalanche Transit Time Devices : IMPATT Diode, BARITT Diode. Other diodes : PIN diode , Crystal diode ; Relevant problems.	08
4	**Microwave Strip Lines :** Introduction to Microstrip Lines; Parallel strip lines; Coplanar strip-lines; Shielded strip-lines; Relevant problems.	10

5.	**Introduction to Radar**: Origins of Radar, Basic Radar, Simple form of Radar equation, Radar block diagram, Radar frequencies, Doppler and MTI Radar, Digital MTI Processing, Delay line cancellers, Moving Target detector (MTD); Relevant problems	12

Note: (1) Five assignments are evaluated for 5 marks: Assignment – 1 from units 1 , Assignment 2 from Unit 2, Assignment - 3 from units 3, Assignment 4 from Unit 4 and Assignment – 5 from unit 5.

(2) Unit 3 is identified for Blended learning

Course Outcomes :

1. To analyze microwave generators with numericals.
2. To analyze and represent S -matrix of various passive microwave devices.
3. To analyze the working principle of microwave solid state devices
4. To analyze the design of strip lines
5. To analyze various radars with numericals.

COs	Mapping with Pos
CO1	PO1,PO2,PO5,PO6
CO2	PO1,PO2,PO5,PO8
CO3	PO1,PO4,PO5,PO6
CO4	PO1,PO2,PO6, PO8
CO5	PO2,PO5,PO6,PO9

TEXT BOOKS:

1. Microwave Engineering-Annapurna Das, Sisir K Das, 2nd Ed., TMH Publication, 2010.
2. Microwave Devices and circuits- Liao, 3rd Ed., Pearson Education, 2009.
3. Introduction to Radar systems-Merrill L Skolnik, 3rd Ed., TMH, 2001.

REFERENCE BOOK:

1. Microwave & RADAR Engineering– M. Kulkarni, 2nd Ed., Umesh Publications, 2001.
2. Microwave Engineering–David M Pozar, 3rd Ed., John Wiley India Pvt. Ltd., 2008.
3. http://webee.technion.ac.il/people/schachter/Teaching/Microwaves%202011 -2012-locked.pdf

Sub Title: WIRELESS AND MOBILE NETWORKS		
Sub Code: 18TE72	**No. of Credits: 4=4:0:0(L:T:P)**	**No of lecture hours per week: 4**
Exam Duration : 3 hours	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 52**

Course Objectives :

1. To study fundamentals of Wireless communication networks, their issues and standards.
2. To study WBAN technology, its architecture, design issues, protocols and applications
3. To study WPAN technology, its architecture, design issues, protocols, components and applications.
4. To study WLAN components, design requirements, WMAN architecture, protocols and applications.
5. To study WWANs, cellular networks, Satellite Network, Applications, ad-hoc networks, Sensor network.

UNIT No.	Syllabus Content	No. of Hours Teaching
1	Review of fundamentals of wireless communication and Networks: Wireless communication channel specifications, Wireless communication systems, Wireless networks, Switching technology, Communication problems, Wireless network issues and standards.	10
2	Wireless body area networks: Properties, Network architectures, Components, Design issues, Network Protocols, WBAN technologies and WBAN applications.	10
3	Wireless personal area networks: Network Architectures, WPAN Components, Requirements of WPAN devices, WPAN Technologies and protocols, WPAN applications, Bluetooth and Zigbee.	8
4	Wireless LANs: Network components, design requirements, Architectures, IEEE-802.11x, WLAN protocols, 802.11p and applications. WMANs, IEEE-802.16: Architectures, Components, WiMax mobility support, Protocols, Broadband networks and applications.	12
5	WWANs, cellular networks, Satellite Network, Applications. Wireless ad-hoc networks: Mobile ad-hoc networks, Sensor network, Mesh networks, VANETs, Research issues in Wireless networks.	12

Note: (1) Five assignments are evaluated for 5 marks: Assignment – 1 from units 1 , Assignment 2 from Unit 2, Assignment - 3 from units 3, Assignment 4 from Unit 4 and Assignment – 5 from unit 5.

(2) Unit 3 is identified for Blended learning

Course Outcomes :

CO1: Have complete knowledge fundamentals of wireless communication and Networks and their applications.

CO2: Identify the different wireless networks like WBAN, WMAN, WLAN, WMAN, WMAN and understand their architecture and their components.

CO3: Understand and interpret the protocols and standards in different Wireless communication and networks.

CO4: Analyze the various design issues in WMAN, WLAN, WMAN, WMAN.

CO5: Determine the applications of Wireless communication networks, Adhoc networks and Sensor Networks.

Cos	Mapping with POs
CO1	PO2, PO5
CO2	PO2, PO4,PO5
CO3	PO5
CO4	PO2,PO8
CO5	PO5

TEXT BOOK:

1. S S Manvi, and M. S. Kakkasageri, "Wireless and Mobile network concepts and Protocols", Wiley India Pvt Ltd, 2010.

REFERENCE BOOKS:

1. P Kaveh, Krishnamurthy, "Principles of Wireless network: A unified approach", PHI, 2006.
2. Iti Saha Mitra, "Wireless communication and network: 3G and Beyond", McGraw Hill, 2009.
3. Ivan Stojmenovic, "Handbook of Wireless networks and Mobile Computing", Wiley, 2009.
4. P Nicopolitidis, M. S. Obaidat, et al, "Wireless Networks", Wiley, 2009.
5. Yi-Bing Lin, Imrich Chlamtac, "Wireless and Mobile Network Architectures", Wiley, 2009.
6. Mullet, "Introduction to Wireless Telecommunication Systems and Networks", Cengage, 2009.

Professional Elective -3

Sub Title : Optical Communication & Networks		
Sub Code: 18TE731	**No of Credits : 3=3:0:0 (L-T-P)**	**No of lecture hours/week : 3**
Exam Duration : 3 hours	**CIE + SEE = 50 + 50 =100**	**Total No of Contact Hours : 39**

Course Objectives:

1. To understand the environment of optical communication and networks.
2. To study the components ,both active and passive required in the optical domain.
3. To study the design concepts of optical networks.
4. To study the requirements of WDM networks.
5. To understand the functions required for maintenance and control of optical networks.

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Unit No	Syllabus	No. of Teaching hours
1	**OVERVIEW OF OPTICAL FIBER COMMUNICATION:** Introduction, Historical development, general system, advantages, disadvantages, and applications of optical fiber communication, Ray theory, step index fibers, graded index fibers, single mode fiber, cutoff wave length, mode field diameter.	08
2	**TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS:** Introduction, Attenuation, material absorption characteristics in silica glass fibers ,linear scattering losses, non-linear scattering losses, fiber bend loss, dispersion, chromatic dispersion, Inter modal dispersion, overall fiber dispersion.	08
3	**OPTICAL SOURCES AND DETECTORS:** Introduction, LED's (4.2; 4.2.1;4.2.4), LASER diodes (4.3,4.3.4), Photo detectors (6.1-6.1.1,6.1.2), Photo detector noise (6.2-6.2.1,6.2.2) **ANALOG AND DIGITAL LINKS:** Analog Systems: – Introduction, Overview of analog links, CNR, RIN (9.2.3), Digital links – Introduction, point–to–point links, System considerations, link power budgets (8.1.2), rise-time budget (8.1.3)	08

4	**INTRODUCTION TO OPTICAL NETWORKS**: Telecommunication network architecture (1.1), Optical networks (1.3), Multiplexing techniques (1.3.1), Second-generation optical networks (1.3.2), The Optical Layer (1.4), Transperancy and All-optical networks (1.5), optical packet switching (1.6), Network Evolution (1.8 – 1.8.1 to 1.8.4), Non-linear effects (2.5) - SPM (2.5.5), CPM (2.5.7) , Four Wave Mixing (2.5.8)	08
5	**CONTROL AND MANAGEMENT :** Network management functions (8.1, - 8.1.1 to 8.1.3), Optical layer services and interfacing (8.2), Layers within the optical layer (8.3), Multivendor interoperability (8.4), Performance and fault management (8.5, - 8.5.1 to 8.5.4), Optical safety (8.7, - 8.7.1)	07

Note: Three assignments are evaluated for 5 marks: Assignment – 1 from units 1 and 2. Assignment - 2 from units 3 and 4 , Assignment – 3 from unit 5.

Unit 3: Blended learning

Course Outcomes:

1. To analyse the need for optical communication and networking.
2. To analyse the working principle of various components of optical networks.
3. To analyse the impact of design considerationsof optical networks.
4. To analyse the components required for WDM networks.
5. To analyse the maintenance and control functions required for optical networks.

Cos	Mapping with PO s
CO1	PO1,PO2, PO5, PO10
CO2	PO1, PO2, PO5, PO10
CO3	PO1, PO2, PO5, PO10
CO4	PO1, PO2, PO10
CO5	PO1, PO2, PO5, PO10

TEXT BOOKS:

1. **Optical Fiber Communications**– – John M. Senior, Pearson Education. 3rd Edition, 2010.
2. **Optical Fiber Communication** – Gerd Keiser, 4th Ed., MGH, 2008.
3 **Optical networks: A practical perspective Third Edition** – Rajiv Ramaswamy, Kumar N Sivarajan, Galen H. Sasaki ,Morgan Kauffman 1998 & 2010.
4. **Optical Communication Networks–** Biswajit Mukherjee TMG 1998.

REFERENCE BOOK:

1. **Fiber Optic communication** – Joseph C Palais: 4th Edition, Pearson Education
2. Optical networks – Ulysees Black, Pearson education 2007.

Sub Title : MOBILE COMMUNICATION		
Sub Code: 18TE732	**No. of Credits : 3=3:0:0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hours	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 39**

Course Objectives:

After completing the course, the students should:

1. Analyse the environment in which the wireless industry operates.
2. Understand the different propagation mechanisms of wireless signals.
3. Understand different modulation schemes used in wireless communications.
4. Understand speech coding and GSM concepts for wireless communication.
5. Become familiar with 3G technologies.

Unit No.	Syllabus	No. of Teaching hours
1	**Introduction to wireless communication system & Networks:** Histroy & Evolution of mobile radio communication, Different generation of WirelessCellular Networks 1G,2G, 3G ,4G & 5G. Examples of Wireless Communication System.**Cellular Concept:** Frequency reuse. Channel Assignment Stratergies, Interference and System Capacity, Trunking and Grade of Service, Improving Capacity in Cellular Systems.	08
2	**Mobile radio propagation(large scale path loss):**Free space propagation model, relating power to electric field, three basic propagation mechanisms, reflection, Two-ray model, diffraction, outdoor and indoor propagation models	07
3	**Mobile radio propagation(Small scale fading and multipath):**Small scale multipath propagation, impulse response model, small scale multipath measurement, parameters of mobile multipath channels, types of small scale fading. **Digital modulation:** Overview , line coding, pulse shaping techniques, linear modulation techniques.	08
4	**Speech coding:** Characteristic, quantization, ADPCM, frequency domain coding of speech, vocoders, linear predictive coders.	08

	Global System for Mobile(GSM):GSM services and features, system architecture, Radio subsystem, channel types. Example of GSM call, frame structure for GSM, signal processing in GSM.	
5	**3G Digital cellular technology**:2.5G TDMA,GPRS ,EDGE Technologies,Need for 3G cellular network,IMT-2000 global standard,UMTS technology,W-CDMA air interface,TD-SCDMA technology,CDMA 2000 ceular technology. (**Text 2**)	08

Note : Three assignments are evaluated for 5 marks: Assignment – 1 from units 1 and 2. Assignment - 2 from units 3 and 4 , Assignment – 3 from unit 5.

Course Outcomes:

1. Demonstrate cellular radio concepts in the design of wireless communication systems
2. Analyse different propagation mechanisms.
3. Study small scale propagation models and modulation scheme of wireless communication systems .
4. Understand speech coding and GSM concepts for wireless communication.
5. Learn about 3G wireless technology

Cos	Mapping with Pos
CO1	PO1,PO2,PO5,PO6
CO2	PO1,PO2,PO5,PO8
CO3	PO1,PO4,PO5,PO6
CO4	PO1,PO2,PO6,PO8
CO5	PO2,PO5,PO6,PO9

TEXT BOOKS:

1. **Wireless communications –Theodore. S. Rappaport**, PHI, second edition,2010.
2. **Wireless Communications – T.L. Singal**, Mcgraw Hill,2015.

REFERENCE BOOKS/WEBLINKS:

1.	**Mobile Cellular Telecommunication** – Lee W.C.Y, MGH, 2002.
2.	**Wireless communication** – D P Agrawal: 2nd Edition Thomson learning, 2007.
3.	**Fundamentals of Wireless Communication** – David Tse, Pramod Viswanath, Cambridge.
4.	**Fundamentals of 5G Mobile networks** – Jonathan Rodriguez, WILEY, 2015.
5.	https://youtu.be/hQvHNVRv_ms (5G cellular networks: 6 new technologies)

Sub Title : ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Sub Code: 18TE733	No. of Credits : 3=3:0:0 (L-T-P)	No. of lecture hours/week : 3
Exam Duration : 3 hours	CIE + SEE = 50 + 50 =100	Total No. of Contact Hours : 39

Course Objectives: The objectives are to

- Understand concepts and techniques that are core to Machine Learning.
- Apply learning techniques and decision trees.
- Acquire knowledge of neural networks, Bayesian techniques and instant based learning..
- Implement and work with state of the art tools in Machine Learning.

Unit No.	Syllabus	No. of Teaching hours
1	**Learning:** Designing Learning systems, Perspectives and Issues, Concept Learning, Version Spaces and Candidate Elimination Algorithm, Inductive bias.	8
2	**Decision Tree and ANN**: Decision Tree Representation, Hypothesis Space Search, Inductive bias in decision tree, issues in Decision tree. Neural Network Representation, Perceptrons, Multilayer Networks and Back Propagation Algorithms.	8
3	**Bayesian and Computational Learning**: Bayes Theorem, Bayes Theorem Concept Learning, Maximum Likelihood, Minimum Description Length Principle, Bayes Optimal Classifier, Gibbs Algorithm, Naïve Bayes Classifier.	8
4	**Instant Based Learning and Learning set of rules**: K- Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning. Sequential Covering Algorithms, Learning Rule Sets, Learning First Order Rules, Learning Sets of First Order Rules, genetic algorithms.	8
5	**Analytical Learning and Reinforced Learning**: Perfect Domain Theories, Explanation Based Learning, Inductive-Analytical Approaches, FOCL Algorithm, Reinforcement Learning.	7

Course Outcomes: After the completion of the course, the student will be able to

1. Explain different supervised and unsupervised machine learning algorithms.
2. Explore and apply the fundamentals of machine learning techniques.
3. Implement and apply different supervised and unsupervised machine learning algorithms.
4. Analyze the strength and weakness of different machine learning models to solve real world problems.
5. Carry out projects based on Machine Learning.

Cos	Mapping with Pos

CO1	PO1, PO2, PO3, PO4, PO5, PO12
CO2	PO1, PO2, PO3, PO4, PO5, PO12
CO3	PO1, PO2, PO3, PO4, PO5, PO12
CO4	PO1, PO2, PO3, PO4, PO5, PO12
CO5	PO1, PO2, PO3, PO4, PO5, PO12

TEXT BOOKS:

1. Introduction to Machine Learning- Ethem Alpaydin, 2nd Ed., PHI Learning Pvt. Ltd., 2013.

REFERENCE BOOKS/WEBLINKS:

1. The Elements of Statistical Learning-T. Hastie, R. Tibshirani, J. H. Friedman, Springer; 1st edition, 2001.
2. Machine Learning, Amit Kumar Das, SaikatDutt, Subramanian Chandramouli, Pearson Education India, April 2018.

Professional Elective -4

Sub Title: SPREAD SPECTRUM COMMUNICATION		
Sub Code: 18TE741	**No. of Credits : 3=3:0:0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hours	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours: 39**

Course Objectives: The objectives are to

- Understand the concept of Spread Spectrum and study various types of Spread spectrum sequences and their generation.
- Explain the principles of Code Division Multiple Access (CDMA) and use of Spread spectrum concept in CDMA
- Learn various Code tracing loops for optimum tracking of wideband signals viz spread spectrum signals
- Understand the procedure for synchronization of receiver for receiving the Spread spectrum signal.
- Study the performance of spread spectrum systems in Jamming environment, systems with Forward Error Correction and Multiuser detection in CDMA cellular radio.

Unit No.	Syllabus	No. of Teaching hours
1	**Introduction to Spread Spectrum Systems:** Fundamental Concepts of Spread Spectrum Systems, Pseudo Noise Sequences – generation, properties, Direct Sequence Spread Spectrum, Frequency Hop Spread Spectrum, Hybrid Direct Sequence Frequency Hop Spread Spectrum, Code Division Multiple Access. Binary Shift Register Sequences for Spread Spectrum Systems: Introduction, Definitions, Mathematical Background and Sequence Generator Fundamentals, Maximal Length Sequences, Gold Codes.	8
2	**Cellular Code Division Multiple Access (CDMA) Principles:** Introduction, Wide Band Mobile Channel, The Cellular CDMA System, Single User Receiver in a Multi User Channel, CDMA System Capacity, Multi-User Detection in CDMA Cellular Radio: Optimal Multi-User Detection, Linear Suboptimal Detectors, Interference Combat Detection Schemes, Interference Cancellation Techniques.	
3	**Code Tracking Loops:** Introduction, Optimum Tracking of Wideband Signals, Base Band Delay-Lock Tracking Loop, Tau-Dither Non- Coherent Tracking Loop, Double Dither Non-Coherent Tracking Loop.	7
4	**Initial Synchronization of the Receiver Spreading Code:** Introduction,	8

	Problem Definition and the Optimum Synchronizer, Serial Search Synchronization Techniques, Synchronization using a Matched Filter and correlation filter, Synchronization by Estimated the Received Spreading Code.	
5	**Performance of Spread Spectrum Systems in Jamming Environments:** Spread Spectrum Communication System Model, Performance of Spread Spectrum Systems without Coding. Performance of Spread Spectrum Systems with Forward Error Correction: Elementary Block Coding Concepts, Optimum Decoding Rule, Calculation of Error Probability, Elementary Convolution Coding Concepts, Viterbi Algorithm, Decoding and Bit-Error Rate.	8

Course Outcomes: After the completion of the course, the student will be able to

- Explain generation of PN sequence and their significance in spread spectrum systems.
- Explain various types of Spread spectrum systems and their applications.
- Apply concepts of spread spectrum communication to solve communication problems.
- Analyze the performance of Spread spectrum systems in Jamming environment and systems with Forward Error Correction.
- Implement the spread spectrum techniques to carry out projects.

COs	Mapping with POs
CO1	PO1, PO2, PO3, PO4, PO12
CO2	PO1, PO2, PO3, PO4, PO12
CO3	PO1, PO2, PO3, PO4, PO12
CO4	PO1, PO2, PO3, PO4, PO12
CO5	PO1, PO2, PO3, PO4, PO12

TEXT BOOKS:

1. Rodger E Ziemer, Roger L. Peterson and David E Borth, “Introduction to Spread Spectrum Communication”- Pearson Education, 1st Edition, 1995.
2. Mosa Ali Abu-Rgheff, “Introduction to CDMA Wireless Communications.” Elsevier Publications, 2008.

REFERENCE BOOKS:

1. George R. Cooper, Clare D. Mc Gillem, “Modern Communication and Spread Spectrum”, McGraw Hill, 1986.
2. Andrew j. Viterbi, “CDMA: Principles of spread spectrum communication”, Pearson Education, 1st Edition, 1995.
3. Kamilo Feher, “Wireless Digital Communications”, PHI, 2009.
4. Andrew Richardson, “WCDMA Design Handbook”, Cambridge University Press, 2005.
5. Steve Lee, “Spread Spectrum CDMA”, McGraw Hill, 2002.

Sub Title : Digital Image Processing		
SubCode: 18TE742	**No. of Credits : 3=3:0:0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3	**CIE + SEE = 50 + 50 =100**	**No. of working hours: 39**

Course Objectives : The objectives are to

1. Understand the basic principles and methods of digital image processing.
2. Be able to formulate solutions to general image processing problems.
3. To learn various image enhancement techniques.
4. To study segmentation techniques used in different applications.
5. To acquire knowledge of concepts of color image processing.

UNIT No	Syllabus Content	No. of Teaching Hours
1	**DIGITAL IMAGE FUNDAMENTALS** Background, fundamental steps in Digital Image Processing, Components of an Image processing system, elements of Visual Perception, Image sensing and acquisition, Image Sampling and Quantization, Some basic relationships between pixels, Linear and Nonlinear operations,	9
2	**IMAGE ENHANCEMENT IN SPATIAL DOMAIN** Background, Some Basic Gray Level Transformations, Histogram Processing, Enhancement using Arithmetic/ Logic Operations, Use of Python for implementation of image processing algorithms.	8
3	**IMAGE ENHANCEMENT IN FREQUENCY DOMAIN** Introduction to Fourier Transform and the Frequency domain fo image, Smoothing Frequency Domain Filters, Sharpening Frequ domain filters, homomorphic filtering.	7
4	**IMAGE SEGMENTATION:** Detection of discontinuities, edge linking and boundary detection, Thresholding, region oriented segmentation, segmentation of morphological watersheds, the use of motion in segmentation.	8
5.	**COLOR IMAGE PROCESSING** : Color Fundamentals, Color Models, Pseudo color Image Processing, processing basics of full color image processing	7

Note: (1) Five assignments are evaluated for 5 marks: Assignment – 1 from units 1 , Assignment 2 from Unit 2, Assignment - 3 from units 3, Assignment 4 from Unit 4 and Assignment – 5 from unit 5.

(2) Unit 4 is identified for Blended learning

Course Outcomes : After the completion of the course, the student will be able to

1. Explain the representation of a digital image.
2. Understand the effect of applying various enhancement techniques in spatial domain.
3. Analyze the impact of frequency domain techniques on images.
4. Analyze computer-vision applications with various segmentation techniques.
5. Know the applicability of various color-models.

Cos	Mapping with Pos
CO1	PO1, PO3, PO9,PO10
CO2	PO2, PO3, PO9
CO3	PO3, PO9,PO10
CO4	PO3, PO9,PO10
CO5	PO3, PO9,PO10

TEXT BOOKS

1. Rafel C Gonzalez and Richard E. Woods, "Digital Image Processing", PHI 4th Edition, 2017.
2. S.Jayaraman, S.Esakkirajan, T.Veerakumar," Digital Image Processing, TMH Publication, 2nd edition, 2017

REFERENCE BOOKS / WEBLINKS:

1. Anil K.Jain, "Fundamentals of Digital Image Processing", PHI Learning , 3rd Edition,
2. Madhuri A Joshi "Digital Image Processing –an alogorithm approach", PHI Learning, 2006
3. http://eeweb.poly.edu/~onur/lectures/lecture8.pdf

Sub Title : INTERNET OF THINGS		
Sub Code:18TE743	**No. of Credits : 3 = 3 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hours	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 39**

Objectives:

1. To study the basics framework and architecture of Internet of Things (IoT).
2. To gain knowledge of IoT design principles.
3. To understand the Internet connectivity principles in IoT.
4. To study sensor & RFID technology for IoT.
5. To gain knowledge on IoT Design Methodology

Unit No.	Syllabus	No. of Teaching Hours
1	**Internet of things: An overview-** Internet of things, IoT Conceptual Framework, IoT Architectural view, Technology behind IoT, Sources of IoT, M2M Communication. (Text Book 1)	8
2	**Design Principles Of Connected Devices:** Introduction, IoT/M2Msystems layers and design standardization, Communication Technologies, Data enrichment, data consolidation and device management at gateway. (Text Book 1)	7
3	**Internet Connectivity Principles:** Introduction, Internet connectivity, Internet based communication, IP addressing in the IoT, Media Access control, Application Layer protocols.	9
4	**Sensors, Participatory sensing, RFIDs, and Wireless Sensor Networks:** Introduction, Sensor Technology, Participatory sensing, Industrial IoT, Automotive IoT, Actuator, Sensor data communication protocols, Radio Frequency Identification Technology, Wireless Sensor Network Technology.(Text Book 1)	9
5	**IoT Platforms Design Methodology:** Introduction, IoT Design Methodology, Case Study on IoT System for Weather Monitoring.(Text Book 2)	6

Note: (1) Five assignments are evaluated for 5 marks: Assignment – 1 from units 1 , Assignment 2 from Unit 2, Assignment - 3 from units 3, Assignment 4 from Unit 4 and Assignment – 5 from unit 5.

(2) Unit 3 is identified for Blended learning

Course Outcomes:

1. Illustrate the knowledge of framework and architecture of IoT.
2. Apply IoT Design principles.
3. Describe the Internet connectivity principles in IoT.
4. Apply sensor and RFID technology for IoT.
5. Demonstrate the Design Methodology of IoT and Illustrate the case study.

TEXT BOOKS:

1."**Internet of Things – Architecture and Design Principles",** Raj Kamal, 2017 McGraw Hill publications.

2.Vijay Madisetti and Arshdeep Bahga, **"Internet of Things (A Hands-on-Approach)",** 1st Edition, VPT, 2014.(**ISBN-13:** 978-8173719547)

REFERENCE MATERIALS:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, **"From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence",** 1st Edition, Academic Press, 2014.(**ISBN-13:** 978-0124076846)

Cos	Mapping with Pos
CO1	PO1, PO2,PO3, PO4,PO5,PO6,PO8
CO2	PO2,PO3, PO4,PO5,PO8,PO10
CO3	PO2, PO3
CO4	PO2, PO3
CO5	PO6,PO10

Open Elective -C

Subject Title : Wireless Sensor Networks		
Sub Code : 18TE751	**No. of credits : 3=3:0:0(L-T-P)**	**No. of hrs/week : 3**
Exam duration : 3hrs	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 39**

Course Objectives:

1. To learn the technologies and challenges of Wireless Sensor Networks.
2. To study the architecture of node and networks.
3. To understand various protocols of Wireless Sensor Networks.
4. To learn the topology control and positioning of nodes.
   To get familiarized with different platforms and tools needed for Wireless Sensor Networks.

Unit No.	**Syllabus**	**No. of Teaching hours**
1	**OVERVIEW OF WIRELESS SENSOR NETWORKS** Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks, Mobile Ad-Hoc Networks, 4G LTE and applications.	09
2	**ARCHITECTURES** Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.	09
3	**NETWORKING SENSORS** Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC, B- MAC, IEEE 802.15.4 standard and Zigbee, Dissemination protocol for large sensor network. The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic	09

	Routing.	
4	**INFRASTRUCTURE ESTABLISHMENT** Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.	06
5	**SENSOR NETWORK PLATFORMS AND TOOLS** Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.	06

Note: (1) Five assignments are evaluated for 5 marks: Assignment – 1 from units 1 , Assignment 2 from Unit 2, Assignment - 3 from units 3, Assignment 4 from Unit 4 and Assignment – 5 from unit 5.

(2) Unit 3 is identified for Blended learning

Course Outcomes :

CO1. Learnt the technologies and challenges of Wireless Sensor Networks.
CO2. Understood the architecture of sensor node and networks.
CO3. Understood various protocols of Wireless Sensor Networks.
CO4. Learnt the topology control and positioning of nodes.
CO5. Studied the different platforms and tools for Wireless Sensor Networks.

COs	**Mapping with Pos**
CO1	PO1, PO2, PO5
CO2	PO1, PO2, PO4
CO3	PO1, PO2, PO5
CO4	PO1, PO2
CO5	PO1, PO2, PO6, PO7, PO8

TEXT BOOKS:

1. Holger Karl and Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks” John Wiley, 2005.
2. Feng Zhao and Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
3. Raghavendra, Cauligi S, Sivalingam, Krishna M, Zanti Taiev. “Wireless Sensor Networks”, Spinger 1st Edition 2004.

REFERENCE BOOKS:

1. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.
2. Kazem Sohraby, Daniel Minoli, and Taieb Znati, “Wireless Sensor Networks Technology, Protocols and applications”, Wiley Publications, 2013.
3. K Akkaya and M. Younis, “A survey of routing protocols in wireless sensor networks”, Elsevier Ad Hoc Network Journal, Vol. 3, no. 3, pp. 325—349.
4. N P Mahalik, “Sensor Networks and Configuration- Fundamentals , standards , platforms and applications”, Spinger verlag, 2007.

Sub Title :MULTIMEDIA COMMUNICATION		
Sub Code: 18TE752	No. of Credits : 3=3:0:0 (L-T-P)	No. of lecture hours/week : 3
Exam Duration : 3 hours	CIE + SEE = 50 + 50 =100	Total No. of Contact Hours : 39

Course Objectives :

1. To study the different types of Media and their representation in different forms.
2. To explain the different compression techniques for Text with examples.
3. To understand the different compression techniques for Image with examples.
4. To analyze the different compression techniques for Audio.
5. To study the different compression techniques for video.

UNIT No	Syllabus	No of Teaching hours
1	**MULTIMEDIA COMMUNICATIONS:** Introduction, multimedia information representation, multimedia networks, multimedia applications, media types, communication modes, network types, multipoint conferencing, network QoS, Application QoS.	07
2	**TEXT AND IMAGE COMPRESSION**: Introduction, compression principles, text compression – Arithmetic coding, Lempel-ziv and Welsh coding, Image compression- GIFF, TIFF, Digitized documents and Pictures, JPEG.	07
3	**AUDIO COMPRESSION:** Introduction, audio compression, LPC, Code excited LPC, Perceptual coding, MPEG Audio coders, Dolby Audio coders. **VIDEO COMPRESSION** : Video compression principles, H.261, H.263, MPEG, MPEG-1, MPEG-2, and MPEG-4.	07
4	**THE INTERNET**: IP addresses, ARP, RARP, Routing Algorithms-Flooding, Distance vector Routing, Link State & Hierarchical Routing, ICMP, Broadcast Routing, Multicast Routing.	09

5	**BROADBAND ATM NETWORKS:** Cell format and Switching principles, Switching architectures, Protocol architectures. **TRANSPORT PROTOCOLS**: TCP, UDP, RTP and RTCP.	09

Note:

1. Unit 5 Broadband ATM Networks is identified for blended learning.
2. Students submit three assignments covering five units with higher level questions upto level 4.

Course Outcomes : Students will be able to:

1. Acquire the knowledge of types of Multimedia networks and applications.
2. Illustrate representation of the information of text, images, audio and video.
3. Analyze the text and image, Audio and Video compression using different techniques and Standards.
4. Analyze the various Routing algorithms.
5. Acquire the knowledge different Architectures and Protocols.

Cos	Mapping with Pos
CO1	PO1,PO5
CO2	PO1,PO2,PO5
CO3	PO2, PO6,PO8
CO4	PO2,PO10
CO5	PO1,PO2,PO10

TEXT BOOK:

1. **Multimedia Communications: Applications, Networks, Protocols, and Standards** – Fred Halsall, Pearson Education, Asia, Second Indian reprint 2002.

REFERENCE BOOKS:

1. **Multimedia Information Networking** –, Nalin K. Sharda, PHI, 2003.
2. **Multimedia Fundamentals: Vol 1-Media Coding and Content Processing** – RalfSteinmetz, KlaraNarstedt, Pearson Education, 2004.
3. **Multimedia Systems Design** – Prabhat K. Andleigh, KiranThakrar, PHI, 2004

Subject Title : Microwave Lab		
Sub Code : 18TEL76	**No of credits : 1= 0:0:1 (L-T-P)**	**No of hrs/week : 3**
Exam duration : 3hrs	**CIE+SEE = 50 + 50 =100**	

Course Objectives:

1. To study characteristics of microwave source.
2. To study and calculate various parameters of a KPS.
3. To study characteristics of various passive elements used in microwaves.
4. To estimate the scattering matrix parameters of passive microwave components.
5. To study and plot radiation pattern of microwave antennas.

LIST OF EXPERIMENTS

1. Working of Gunn Diode source and characteristics
2. Working of Klystron source with Mode curves
3. Measurement of impedance using slotted line Assembly.
4. Calibration of crystal detector.
5. Calibration of Variable waveguide attenuator.
6. Finding Isolation and Insertion loss of Circulator/Isolator.
7. Finding the parameters of Directional coupler. Extraction of S-parameter.
8. Finding the parameters of E-plane H-plane & Magic tee. Extraction of S- parameter.
9. Measurement of phase shift for a ferrite phase shifter.
10. Field intensity measurement of a Horn antenna.
11. Field intensity measurement of a Parabolic dish
12. Demonstration and study of various microstrip antennas.

Course Outcome :

After going through this course the student will be able to :

1. To understand and realize practically the working of microwave sources.
2. To practically plot mode curves of KPS and calculate various parameters
3. To determine parameters of various microwave passive devices
4. To compare practical and theoretical scattering matrices for various passive devices.
5. To realize practical BW and Directivity of microwave antennas

Cos	Mapping with Pos
CO1	PO3,PO5,PO6,PO8
CO2	PO3,PO5,PO6,PO8
CO3	PO3,PO5,PO6,PO8
CO4	PO3,PO4,PO5,PO6,PO8
CO5	PO3,PO4,PO5,PO6,PO8

Subject Title : Wireless and Mobile Communication Networks Lab		
Sub Code : 18TEL77	**No of credits : 1= 0:0:1 (L-T-P)**	**No of hrs/week : 3**
Exam duration : 3hrs	**CIE+SEE = 50 + 50 =100**	

Course Objectives :.

1. To familiarize students with the Generation of DPSK & QPSK Schemes using Matlab.
2. Implementation of GSM & CDMA, using NS2/NS3.
3. Simulation of Outdoor & Indoor Propagation model.
4. Configuration of a WiMAX, UTMS, GSM, WSN, VoIP Networks and to analyse the Packet drop probability & Throughput using Qualnet.
5. Implementation of PN sequence using Matlab

List of Experiments

1. Generation of DPSK and QPSK schemes using Matlab

2. Implementation and Study of GSM & CDMA using NS2/NS3

3. Simulation of Okumura/Hata Path Loss for Outdoor propagation Model

a. MATLAB program to calculate the path loss for Okumura outdoor propagation model.

b. To simulate the Okumura path loss model using MATLAB.

c. To obtain graphical representation by varying various parameters and by considering various terrains.

4. Simulation of Log-distance Path Loss for Indoor Propagation Model

a. MATLAB program to calculate the path loss for Okumura outdoor propagation model.

b. To simulate the Okumura path loss model using MATLAB.

c. To obtain graphical representation by varying various parameters and by considering various terrains.

5. Configuration of a Wi-MAX N/W using Qualnet

a. To find the delay in MAC layer,

b. To analyse the Packet drop probability & Throughput

6. **Configuration of a UMTS N/W using Qualnet**

a. To find out the delay in call establishment, call drop probability and call disconnection during handoff.

b. To analyse the Packet drop probability & Throughput

7. Configuration of a GSM N/W using Qualnet

a. To find out the delay in call establishment, call drop probability and call disconnection during handoff.

b. To analyse the Packet drop probability & Throughput

8. Configuration of a WSN using Qualnet

a. Increase the number of co-ordinators and nodes in the same area and observe the performance at physical and MAC layers.

b. To analyse the Packet drop probability & Throughput

9. Configuration of a WSN for different energy models using Qualnet

a. To analyse the Packet drop probability & Throughput & Observe the performance at application and physical layers

b. To analyse the energy required for sending & receiving packets.

10. Configuration of VoIP N/W using Qualnet

a. To find out the delay in call establishment, call drop probability and call disconnection during handoff.

b. To analyse the Packet drop probability & Throughput

11. Implementation and study on PN Sequence Generation using Matlab.

Course Outcome :

After going through this course the student will be able to :

1. Generate DPSK & QPSK Schemes using Matlab.
2. Implement GSM & CDMA, using NS2/NS3.
3. Simulate the Outdoor & Indoor Propagation model.
4. Configure a WiMAX, UTMS, GSM, WSN, VoIP Networks and analyse the Packet drop probability & Throughput using Qualnet.
5. Implementation of PN sequence using Matlab.

Sub. Title : PROJECT WORK PHASE-I		
Sub. Code: 18TEP78	**No. of Credits : 0=0:0:0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hours	**CIE+SEE=50+50=100**	

1. Project group should comprise of 3 or 4 students and should not exceed 4 students.
2. Project proposal(synopsis) submitted by the student must be related to the field of telecommunication.
3. Project should be based on recent technology.
4. Evaluation will be done on the basis literature survey, learning the prerequisite tool, documentation and presentation

Sub. Title : INTERNSHIP		
Sub. Code: 18TEI79	**No. of Credits : - =- :-:- (L-T-P)**	**No. of lecture hours/week : -**
Exam Duration : 3 hours	**CIE+SEE= -**	

1. Internship is conducted for individual student or groups, enhances practical knowledge regarding technical and social aspects.
2. Student document their internship period as a report and submit it to the department.
3. Evaluation will be done on the basis of relevance of the topic, presentation skills, depth of knowledge and documentation.

Sub. Title : Project Work Phase-II		
Sub. Code: TEP82	**No. of Credits : 12=0:0:12 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hours	**CIE+SEE=50+50=100**	

Process of Conduction and Evaluation :

1. Project group should comprise of 3 or 4 students and should not exceed 4 students.
2. Project proposal(synopsis) submitted by the student must be related to the field of telecommunication.
3. Project should be based on recent technology.
4. Evaluation will be done on the basis of implementation, results, documentation and presentation

Sub. Title : SUBJECT SEMINAR		
Sub. Code: TES83	**No. of Credits : 2**	**No. of lecture hours/week : -**
Exam Duration : 3 hours	**CIE+SEE=50+00=50**	

Process of Conduction and Evaluation :

1. Subject seminar is conducted for individual student.
2. Student should submit a recent topic to the coordinator which needs to be approved by a panel comprising of HOD and coordinator.
3. Evaluation will be done on the basis of relevance of the topic, presentation skills, depth of knowledge and documentation

Sub. Title : INTERNSHIP		
 **Sub. Code: 18TEI84**	**No. of Credits : - 2=-0 :0-:2 (L-T-P)**	**No. of lecture hours/week : -**
Exam Duration : 3 hours	**CIE+SEE=50+50=100**	

Process of Conduction and Evaluation :

1. Internship is conducted for individual student or groups, enhances practical knowledge regarding technical and social aspects.
2. Student document their internship period as a report and submit it to the department.
3. Evaluation will be done on the basis of relevance of the topic, presentation skills, depth of knowledge and documentation.