List of Revised Courses

Department : *Electronics and Communication Engineering*

Program Name : *B.Tech.*

Academic Year : 2021-22

List of Revised Courses

Sr. No.	Course Code	Name of the Course
01.	EC203TPC01	Electronic Devices
02.	EC203TPC02	Digital Logic Design
03.	EC203TPC03	Network Theory
04.	EC203TPC04	Signals & Systems
05	EC204TPC05	Analog Circuits
06	EC204TPC06	Analog Communication
07	EC205TPC10	Digital Signal Processing
08	EC07TPC14	Fiber Optics Communication
09	EC07TPC15	Embedded Systems
10		
11		

विभागाध्यक्ष (इलें. एवं संचार अभियांत्रिकी)
H.O.D. (Elect. & Comm. Engineering)
प्रौद्योगिकी संस्थान
Institute of Technology
गु. घा. वि., बिलासपुर (छ.ग.)
G. G. V. Bilaspur (C.G.)

Minutes of Meetings (MoM) of Board of Studies (BoS)

Academic Year: 2021-22

School : *School of Studies of Engineering and Technology*

Department : *Electronics and Communication Engineering*

Date and Time : *September 30, 2021 – 11:00 AM*

Venue : *Online Platform*

The scheduled meeting of member of Board of Studies (BoS) of Department of Electronics and Communication Engineering, School of Studies of Engineering and Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur was held to design and discuss the B. Tech. Second year (III and IV semesters) scheme and syllabi.

The following members were present in the meeting:

1. Prof. Shrish Verma (External Expert Member BoS, Dept. of ECE, NIT Raipur)
2. Mr. Vikas Patel, (External Expert Member BoS, Senior SDE, BSNL Bilaspur)
3. Mrs. Anita Khanna (HOD, Assistant Prof., Dept. of ECE-cum Chairman, BOS)
4. Dr. Soma Das (Invited Member, Associate Professor, Dept. of ECE)
5. Mr. Shrawan K. Patel (Member BoS, Assistant Professor, Dept. of ECE)
6. Mrs. Bhawna Shukla (Member BoS, Assistant Professor, Dept. of ECE)
7. Dr. P.S. Shrivastava (Invited Member, Assistant Professor, Dept. of ECE)
8. Mrs. Beaulah Nath (Invited Member, Assistant Professor, Dept. of ECE)
9. Mrs Pragati Patharia (Invited Member, Assistant Professor, Dept. of ECE)
10. Mr. Deepak Rathore (Invited Member, Assistant Professor, Dept. of ECE)
11. Mr. Nipun Kumar Mishra(Invited Member, Assistant Professor, Dept. of ECE)
12. Mr. Sumit Kumar Gupta (Invited Member, Assistant Professor, Dept. of ECE)
13. Mr. Jitendra Bhardwaj (Invited Member, Assistant Professor, Dept. of ECE)
14. Dr. Anil Kumar Soni (Invited Member, Assistant Professor, Dept. of ECE)
15. Mr. Chandan Tamrakar (Invited Member, Assistant Professor, Dept. of ECE)
16. Mrs. Praveena Rajput (Invited Member, Assistant Professor, Dept. of ECE)

Following points were discussed during the meeting

1. New CBCS based evaluation scheme of B. Tech. Second year (III and IV semesters) was discussed and finalized.
2. Courses of B. Tech. Second year (III and IV semesters) are discussed one by one and the changes have been incorporated as per the valuable suggestions of Expert member.

The committee discussed and approved the scheme and syllabi. The following courses were revised in the of B. Tech. Second year (III and IV semesters):

- Electronics Devices (EC203TPC01)
- Digital Logic Design (EC203TPC02)
- Network Theory (EC203TPC03)
- Signals & Systems (EC203TPC04)
- Analog Circuits (EC204TPC05)
- Analog Communication (EC204TPC06)

विभागाध्यक्ष (इलें. एवं संचार अभियांत्रिकी)
H.O.D. (Elect. & Comm. Engineering)
प्रौद्योगिकी संस्थान
Institute of Technology
गु. घा. वि., बिलासपुर (छ.ग.)
G. G. V. Bilaspur (C.G.)

Signature & Seal of HoD

Minutes of Meetings (MoM) of Board of Studies (BoS)

Academic Year: 2022-23

School : *School of Studies of Engineering and Technology*

Department : *Electronics and Communication Engineering*

Date and Time : *June 04, 2022 – 11:00 AM*

Venue : *Online Platform*

The scheduled meeting of member of Board of Studies (BoS) of Department of Electronics and Communication Engineering, School of Studies of Engineering and Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur was held to design and discuss the B. Tech. Third year (V and VI semesters) scheme and syllabi.

The following members were present in the meeting:

1. Prof. Kavita Thakur (External Expert Member BoS, Professor, Pt. Ravi Shankar Shukla University, Raipur)
2. Mr. Deepak Sanyal (External Industry Expert Member BoS, AGM, NTPC, Sipat Bilaspur)
3. Dr. Soma Das (HOD, Associate Professor, Dept. of Electronics and Communication Engineering,- cum Chairman, BOS)
4. Mrs. Anita Khanna (Member BoS, Assistant Professor, Dept. of Electronics and Communication Engineering, SoS (E&T), GGV Bilaspur)
5. Mrs. Bhawna Shukla (Invited Member, Assistant Professor, Dept. of ECE)
6. Dr. P. S. Shrivastava (Invited Member, Assistant Professor, Dept. of ECE)
7. Mrs. Pragati Patharia (Invited Member, Assistant Professor, Dept. of ECE)
8. Mr. Deepak Kumar Rathore (Invited Member, Assistant Professor, Dept. of ECE)
9. Mr. Shrawan Kumar Patel (Invited Member, Assistant Professor, Dept. of ECE)
10. Dr. Nipun Kumar Mishra (Invited Member, Assistant Professor, Dept. of ECE)
11. Mr. Sumit Kumar Gupta (Invited Member, Assistant Professor, Dept. of ECE)
12. Mr. Jitendra Bhardwaj (Invited Member, Assistant Professor, Dept. of ECE)
13. Mrs. Praveena Rajput (Invited Member, Assistant Professor, Dept. of ECE)
14. Dr. Nikita Kashyap (Invited Member, Assistant Professor, Dept. of ECE)
15. Dr. Anil Kumar Soni (Invited Member, Assistant Professor, Dept. of ECE)
16. Mr. Chandan Tamrakar (Invited Member, Assistant Professor, Dept. of ECE)

Following points were discussed during the meeting

3. Scheme of 5th and 6th semester courses are discussed and finalized based on the various core area of ECE programme
4. Program elective introduced based on current demand of society and industries
5. Open elective courses are finalized for other B.Tech department Program excluding ECE department
6. Open elective course for ECE department students will take from the list of Open elective courses introduced by other department.
7. For all 5th and 6th Semester courses, course objective, course outcome and mapping with programme outcome are added

The committee discussed and approved the scheme and syllabi. The following courses were revised in the of B. Tech. Third year (V and VI semesters):

- Digital Signal Processing (EC205TPC10)

The following new courses were introduced in the of B. Tech. Third year (V and VI semesters):

- Digital Communication (EC205TPC09)
- CMOS Digital VLSI Design (EC206TPC11)
- Data Communication & Computer Network (EC206TPC12)
- Microprocessor & Microcontroller (EC206TPC13)
- Electronics Measurements and Sensors (EC206TES07)
- Advance Signal Processing (EC206TPE02)
- Renewable Energy Sources (EC206TPE03)

विभागाध्यक्ष (इलें. एवं संचार अभियांत्रिकी)
H.O.D. (Elect. & Comm. Engineering)
प्रौद्योगिकी संस्थान
Institute of Technology
गु. घा. वि., बिलासपुर (छ.ग.)
G. G. V. Bilaspur (C.G.)

Signature & Seal of HoD

Minutes of Meetings (MoM) of Board of Studies (BoS)

Academic Year: 2021-22

School : *School of Studies of Engineering and Technology*

Department : *Electronics and Communication Engineering*

Date and Time : *July 19, 2021 – 11:00 AM*

Venue : *Online Platform*

The scheduled meeting of member of Board of Studies (BoS) of Department of Electronics and Communication Engineering, School of Studies of Engineering and Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur was held to design and discuss the B. Tech. Final year (VII and VIII semesters) scheme and syllabi.

The following members were present in the meeting:

1. Prof. Shrish Verma (External Expert Member BoS, Dept. of ECE, NIT Raipur)
2. Mr. Vikas Patel, (External Expert Member BoS, Senior SDE, BSNL Bilaspur)
3. Mrs. Anita Khanna (HOD, Assistant Prof., Dept. of ECE-cum Chairman, BOS)
4. Dr. Soma Das (Member BoS, Associate Professor, Dept. of ECE)
5. Mr. Shrawan K. Patel (Member BoS, Assistant Professor, Dept. of ECE)
6. Dr. Meenakshi Sood (Curriculum Development Expert, Associate Professor, NITTTR Chandigarh
7. Mrs. Bhawna Shukla (Invited Member, Assistant Professor, Dept. of ECE)
8. Dr. P.S. Shrivastava (Invited Member, Assistant Professor, Dept. of ECE)
9. Mrs. Beaulah Nath (Invited Member, Assistant Professor, Dept. of ECE)
10. Mrs Pragati Patharia (Invited Member, Assistant Professor, Dept. of ECE)
11. Mr. Deepak Rathore (Invited Member, Assistant Professor, Dept. of ECE)
12. Mr. Nipun Kumar Mishra(Invited Member, Assistant Professor, Dept. of ECE)
13. Mr. Sumit Kumar Gupta (Invited Member, Assistant Professor, Dept. of ECE)
14. Mr. Jitendra Bhardwaj (Invited Member, Assistant Professor, Dept. of ECE)
15. Mrs. Nikita Kashyap (Invited Member, Assistant Professor, Dept. of ECE)
16. Dr. Anil Kumar Soni (Invited Member, Assistant Professor, Dept. of ECE)
17. Mr. Chandan Tamrakar (Invited Member, Assistant Professor, Dept. of ECE)
18. Mrs. Praveena Rajput (Invited Member, Assistant Professor, Dept. of ECE)

Following points were discussed during the meeting

1. New CBCS based evaluation scheme of B. Tech. Final year (VII and VIII semesters) was discussed and finalized.
2. Courses of B. Tech. Final year (VII and VIII semesters) are discussed one by one and the changes have been incorporated as per the valuable suggestions of Expert member.

The committee discussed and approved the scheme and syllabi. The following courses were revised in the of B. Tech. Final year (VII and VIII semesters):

- Fiber Optics Communication (EC07TPC14)
- Embedded Systems (EC07TPC15)

The following new courses were introduced in the of B. Tech. Final year (VII and VIII semesters):

- Digital Image Processing (EC07TPE09)
- Analog & Digital VLSI (EC07TPE10)
- Estimation and Detection Theory (EC07TPE11)
- Advanced Power Electronics (EC07TPE12)
- Machine Learning (EC07TPE15)
- Millimeter Wave Technology (EC08TPE16)
- Video Processing (EC08TPE17)
- Biomedical Electronics (EC08TPE18)
- Next Gen. Comm. Technology (EC08TPE19)
- Intellectual Property Rights (EC08TOE05)
- Introduction to IOT (EC08TOE07)

विभागाध्यक्ष (इले. एवं संचार अभियाँत्रिकी)
H.O.D. (Elect. & Comm. Engineering)
प्रौद्योगिकी संस्थान
Institute of Technology
गु. घा. वि., बिलासपुर (छ.ग.)
G. G. V. Bilaspur (C.G.)

Signature & Seal of HoD

Scheme and Syllabus

SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)
(A CENTRAL UNIVERSITY)

CBCS-NEW, EVALUATION SCHEME

PROPOSED (W.E.F. SESSION 2020-21)

B. TECH. SECOND YEAR (SEMESTER- III)

(Electronics and Communication Engineering)

S.No.	COURSE No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	SUB-TOTAL	
THEORY									
1.	EC203TPC01	Electronic Devices	3	-	-	30	70	100	3
2.	EC203TPC02	Digital Logic Design	3	-	-	30	70	100	3
3.	EC203TPC03	Network Theory	3	1	-	30	70	100	4
4.	EC203TPC04	Signals & Systems	3	1	-	30	70	100	4
5.	EC203TBS05	Mathematics - III	3	1	-	30	70	100	4
6.	EC203THS02	Engineering Economics	3	-	-	30	70	100	3
		TOTAL	**18**	**3**	**-**	**180**	**420**	**600**	**21**
PRACTICALS									
1.	EC203PPC01	Electronics Devices Lab	-	-	2	30	20	50	1
2.	EC203PPC02	Digital Logic Design Lab	-	-	2	30	20	50	1
		TOTAL	**-**	**-**	**4**	**60**	**40**	**100**	**2**
		GRAND TOTAL	**18**	**3**	**4**	**240**	**460**	**700**	**23**

Total Credits: **23** Total Contact Hours: **25** Total Marks: **700**

L: LECTURE, T: TUTORIAL, P: PRACTICAL, IA: INTERNAL ASSESSMENT, ESE: END SEMESTER EXAMINATION
*INTERNAL ASSESSMENT- Two Class Test of 15 Marks each will be conducted.

SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)
(A CENTRAL UNIVERSITY)

CBCS-NEW, EVALUATION SCHEME

PROPOSED (W.E.F. SESSION 2020-21)

B. TECH. SECOND YEAR (SEMESTER- IV)

(Electronics and Communication Engineering)

S. No.	COURSE No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	SUB-TOTAL	
THEORY									
1.	EC204TPC05	Analog Circuits	3	1	-	30	70	100	4
2.	EC204TPC06	Analog Communication	3	1	-	30	70	100	4
3.	EC204TPC07	Control System	3	1	-	30	70	100	4
4.	EC204TES05	Data Structure with C++	3	-	-	30	70	100	3
5.	EC204TBS06	Numerical Methods	3	1	-	30	70	100	4
6.	EC204TMC02	Enviromental Sciences	2	-	-	-	-	-	-
		TOTAL	**17**	**4**	**-**	**150**	**350**	**500**	**19**
PRACTICALS									
1.	EC204PPC05	Analog Circuits Lab	-	-	2	30	20	50	1
2.	EC204PES05	Data Structure with C++ Lab	-	-	2	30	20	50	1
		TOTAL	**-**	**-**	**4**	**60**	**40**	**100**	**2**
		GRAND TOTAL	**17**	**4**	**4**	**210**	**390**	**600**	**21**

Total Credits: **21** Total Contact Hours: **25** Total Marks: **600**

L: LECTURE, T: TUTORIAL, P: PRACTICAL, IA: INTERNAL ASSESSMENT, ESE: END SEMESTER EXAMINATION
*INTERNAL ASSESSMENT- Two Class Test of 15 Marks each will be conducted.

SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)
(A CENTRAL UNIVERSITY)

CBCS-NEW, EVALUATION SCHEME

PROPOSED (W.E.F. SESSION 2022-23)

B. TECH. THIRD YEAR (SEMESTER- V)

(Electronics and Communication Engineering)

S.No.	COURSE No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	SUB-TOTAL	
THEORY									
1.	EC205TPC08	LIC & its Application	3	1	-	30	70	100	4
2.	EC205TPC09	Digital Communication	3	1	-	30	70	100	4
3.	EC205TPC10	Digital Signal Processing	3	1	-	30	70	100	4
4.	EC205TES06	Electromagnetic Waves	3	-	-	30	70	100	3
5.	EC205THS03	Probability Theory & Random Process	3	-	-	30	70	100	3
6.	EC205THS04	Effective Technical Communication	2	-	-	-	-	-	-
		TOTAL	**17**	**3**	**-**	**150**	**350**	**500**	**18**
PRACTICALS									
1	EC205PPC06	LIC Lab	-	-	2	30	20	50	1
2.	EC205PPC07	Analog and Digital Communication Lab	-	-	2	30	20	50	1
3.	EC205PPC08	Digital Signal Processing Lab	-	-	2	30	20	50	1
		TOTAL	**-**	**-**	**6**	**90**	**60**	**150**	**3**
		GRAND TOTAL	**17**	**3**	**6**	**240**	**410**	**650**	**21**

Total Credits: **21** Total Contact Hours: **26** Total Marks: **650**

L:LECTURE, T:TUTORIAL, P:PRACTICAL, IA: INTERNAL ASSESSMENT, ESE:END SEMESTER EXAMINATION
*INTERNAL ASSESSMENT- Two Class Test of 15 Marks each will be conducted.

SCHEME OF EXAMINATION
B.TECH. (FOUR YEAR) DEGREE COURSE
FINAL YEAR, ELECTRONICS & COMMUNICATION ENGINEERING
SCHOOL OF STUDIES IN ENGINEERING & TECHNOLOGY, GGVV BILASPUR (CG)
EFFECTIVE FROM SESSION 2021-22
SEMESTER VII (FINAL YEAR)

Sr. No.	Course Code	Course Title	L	T	P	Periods/ week	Evaluation Scheme			Credit
							IA	ESE	Total	
Theory										
1	EC07TPC14	Fiber Optics Communication	3	1	0	4	30	70	100	3
2	EC07TPC15	Embedded Systems	3	1	0	4	30	70	100	3
3	EC07TPC16	Mobile Communication & Network	3	1	0	4	30	70	100	3
4	EC07TPE09 EC07TPE10 EC07TPE11 EC07TPE12	**Program Elective - 3** • Digital Image Processing • Analog & Digital VLSI Design • Estimation and Detection Theory • Advanced Power Electronics	3	1	0	4	30	70	100	3
5	EC07TPE13 EC07TPE14 EC07TPE15	**Program Elective - 4** • Microwave Theory & Techniques • Radar & Satellite Comm. • Machine Learning	3	1	0	4	30	70	100	3
Practical										
1	EC07PPC12	Fiber Optics Communication Lab	0	0	2	2	30	20	50	1
2	EC07PPC13	Design and Simulation Lab	0	0	2	2	30	20	50	1
3	EC07PPS01	Seminar on Industrial Training	0	0	0	0	30	20	50	1
4	EC07PPS02	Project - I	0	0	10	10	60	40	100	5
									Total Credits	23

SEMESTER VIII (FINAL YEAR)

Sr. No.	Course Code	Course Title	L	T	P	Periods/ week	Evaluation Scheme			Credit
							IA	ESE	Total	
Theory										
1	EC08TPC17	VLSI Fabrication Technology	3	1	0	4	30	70	100	3
2	EC08TPE16 EC08TPE17 EC08TPE18	**Program Elective - 5** • Millimeter Wave Technology • Video Processing • Biomedical Electronics	3	1	0	4	30	70	100	3
3	EC08TPE19 EC08TPE20 EC08TPE21	**Program Elective - 6** • Neural Network & Fuzzy logic • Next Gen. Comm. Technology • Wireless Sensor Networks	3	1	0	4	30	70	100	3
4	EC08TOE05 EC08TOE06 EC08TOE07	**Open Elective - 3** • Intellectual Property Rights • Principles of Management • Introduction to IOT	3	1	0	4	30	70	100	3
Practical										
1	EC08PPS03	Project - II	0	0	18	18	120	80	200	9
2	EC08PPS04	Comprehensive viva	0	0	0	0	30	20	50	1
									Total Credits	22

L: LECTURE T: TUTORIAL P: PRACTICALIA: INTERNAL ASSESSMENT ESE: END SEMESTER EXAM

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC203TPC01	3	0	-	3 hours	30	70	100	3

ELECTRONIC DEVICES

Course Objectives:

1. To develop basic concept of semiconductor materials and physics.
2. To introduce different methods of DC analysis and AC models of semiconductor devices.
3. To develop the concept and analysis of transistor characteristics, biasing and thermal stabilization.
4. To help students develop various designs of Amplifiers and its applications
5. To Analyze and perform the theoretical concepts through laboratory and simulation experiments.

Syllabus Content:

UNIT-I: **Semiconductor concept:** Metals, Insulators and Semiconductors, Electrical properties of Ge and Si, Conductivity Equation, Mobility and Conductivity, Electron and holes in intrinsic and extrinsic semiconductors, Donor and Acceptor Impurities,

Electrons in periodic Lattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon, Transport Phenomena of semiconductor, Generation and recombination of carriers, Charge density in Semiconductor, Hall Effect, Injected minority charge carriers, Potential variation within graded semiconductor.

Junction Diode Characteristics: Properties of P-N junction, Open circuited P-N junction, V-I characteristics, Temperature dependence of V-I characteristics, Diode resistance, Current component of PN diode: Space charge capacitance, Charge control description of a diode, Diffusion capacitance, Junction diode switching times, Breakdown mechanism.

UNIT-II: **Diode Circuits:** Load line concepts, Graphical analysis, Clipper circuit, Clamper, Comparator, Rectifier, Full wave circuits, Filter circuits: Inductor filter, Capacitor filter, LC filter, Multiple LC filter, CLC or □ filter, Zener diode regulator circuit.

Other Diodes: Negative conductance in semiconductors- Tunnel diode, Photo diode - Photo voltaic effect, Solar cells, Schottky Diode, Varactor Diode, Avalanche diode, PIN diode, LED, LASER.

UNIT-III: **Transistor Characteristics:** Junction Transistor, Transistor current components, Transistor as an amplifier, Transistor construction, Transistor circuit configuration (CB, CE, CC)- Analytical Expression for transistor characteristics and Operation, Early Effect, Ebers-Moll Model, □-re model, Transistor as a switch.

Transistor Biasing and Thermal Stabilization: The operating point, Bias stability, Stability factor- Stabilization against variation in I_{CO}, V_{BE} and □, Emitter bias, Collector – to – base bias, Voltage divider bias with emitter bias, Emitter bypass capacitor. Bias compensation.

UNIT-IV: **Field Effect Transistor (FET):** JFET Construction, Operation, V-I characteristics, Transfer characteristics, Drain characteristics. Metal Oxide Semiconductor Field Effect Transistor (MOSFET)- Construction, Operation and characteristics, Depletion MOSFET, Enhancement MOSFET,

complementary MOSFET.MOS capacitor, C-V characteristics, MOSFET, small signal models of MOS transistor, LED, photodiode and solar cell;

UNIT-V: **Pnpn and other devices** – Silicon controlled rectifier- Basic rectifier operation, V-I characteristics, gate triggering characteristics, Application, Silicon-controlled switch. Shockley Diode, DIAC, TRIAC, Unijunction transistors - Construction, Operation, V-I characteristics, Application.

Text/Reference Books:

1. Integrated Electronics: Analog & Digital Circuit Systems- Jacob Millman & Halkias, TMH
2. Electronic Devices & Circuits- Allen Mottershead, PHI
3. Electronic Devices & Circuit Theory- Boylestad & Nashelsky, PHI
4. G. Streetman, and S. K. Banerjee, "Solid State Electronic Devices," 7th edition, Pearson,2014
5. D. Neamen, D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education
6. S. M. Sze and K. N. Kwok, "Physics of Semiconductor Devices," 3rd edition, John Wiley &Sons, 2006.

Course Outcome:

Students will try to learn:

1. To Analyze operation of semiconductor physics and pn junction device.
2. To Analyze and identify DC analysis and AC models of semiconductor devices.
3. To apply and investigate the various designs of Amplifiers and its applications
4. Analyze and perform the theoretical concepts through laboratory and simulation experiments.
5. Perform mini projects based on electronics circuit concepts.

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1							3	3	3	
CO2	3	2	3	2	1							3	3	3	
CO3	3	3	3	3	2							3	3	3	
CO4	3	3	3	3	3							3	3	3	
CO5	3	3	3	3	3							3	3	3	

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC203TPC02	3	0	-	3 hours	30	70	100	3

DIGITAL LOGIC DESIGN

Course Objectives:

1. To understand number representation and conversion between different representation in digital electronic circuits.
2. To analyze logic processes and implement logical operations using combinational logic circuits.
3. To understand characteristics of memory and their classification.
4. To understand concepts of sequential circuits and to analyze sequential systems in terms of state machines.
5. To understand concept of Programmable Devices, PLA, PAL.

Syllabus Content:

UNIT – I **CODES: Binary codes:** Introduction & usefulness, Weighted & non-weighted codes, Sequential codes, Self complementing codes, Cyclic codes, 8-4-2-1 BCD code, Excess-3 code, Grey code: Binary to Grey and Grey to Binary code conversion, Error detecting code, Error correcting code, 7-bit Hamming code, ASCII code, EBCDIC code.

Realization of Boolean Expressions: Reduction of Boolean Expressions using Laws, Theorems and Axioms of Boolean Algebra, Boolean expressions and logic diagram, Converting AND/OR/Invert logic to NAND/NOR logic, SOP and POS Forms and their Realization.

UNIT – II **MINIMIZATION TECHNIQUES: Binary codes:** Expansion of a Boolean expression to SOP form, Expansion of a Boolean expression to POS form, 2,3 & 4 variable K-map: Mapping and minimization of SOP and POS expressions. Completely and Incompletely Specified Function-Concept of Don´t Care Terms.

UNIT – III **COMBINATIONAL CIRCUITS:** Adder & Subtractor: Half-adder, Full-adder, Half-subtractor, Full subtractor, Parallel binary adder, Look Ahead carry adder, Serial adder, BCD adder, Code converter, Parity bit generator/checker, Comparator. Decoder: 3-line to 8-line decoder, 8-4-2-1 BCD to Decimal decoder, BCD to 7 segment decoder. Encoder: Octal to Binary and Decimal to BCD encoder. Multiplexer: 2-input multiplexer, 4-input multiplexer, 16-input multiplexer. Demultiplexer: 1-line to 4-line & 1-line to 8-line demultiplexer, Multiplexer as Universal Logic Function Generator, Programmed Array Logic (PAL), PLA and PLD.

UNIT – IV **SEQUENTIAL CIRCUITS:** Flip-Flop & Timing Circuits: S-R Latch, Gated S-R Latch, D Latch, J-K Flip-Flop, T Flip-Flop, Edge-triggered S-R, D, J-K, T Flip-Flops, Master-Slave Flip-Flop, Direct Preset and Clear Inputs, Shift Registers: PIPO, SIPO, PISO, SISO, Bi-directional Shift Registers, Universal Shift Registers, Counter: Asynchronous Counter: Ripple Counter, Design of Asynchronous Counter, Effect of propagation delay in Ripple Counter, Synchronous Counter: 4-bit Synchronous Up Counter, 4-bit Synchronous Down Counter, Design of Synchronous Counter, Ring Counter, Jhonson Counter, Pulse Train generators using Counter, Design of Sequence generator.

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC203TPC03	3	1	0	4 hours	30	70	100	4

NETWORK THEORY

Course Objectives:

The objectives of the course are to make the students:

1. Capable for analyzing any given electrical network.
2. Identify the behaviour of the electrical network.
3. Understand the significance and practical aspect of two port network.
4. Understand the use of network graphs and Synthesize passive filter circuits.
5. Familiarize an electrical network from a given impedance/admittance function.

Syllabus Content:

Unit-I **Circuit concept:** R, L, C parameter, Relationship of field & circuit concepts, Dot Convention to coupled circuits. Nodal and mesh analysis, Duality, **Network theorems:** Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem as applied for dependent and independent sources, Wye-Delta transformation. **Resonance:** Series resonance and Parallel resonance, frequency- response of series and Parallel circuits, quality factor Q, bandwidth, Conditions for maximum impedance.

Unit-II **Time and Frequency domain analysis:** Network equation, Initial conditions in networks, Step and Impulse response, Transient analysis of DC & AC circuits, Solution of network equations.
First order differential euations; General & Particular solutions, time constant, integrating factor, Initial conditions in networks: Why study Initial conditions, Procedure for evaluating initial conditions, Initial state of a network. **Second order differential equations;** Internal Excitation, Network excited by external energy sources, General solutions in terms of S,Q, and Wn. Laplace transforms and properties: Partial fractions expansions, Initial and final value theorem.

Unit-III **Two port networks:** Relationship of two port variables, short circuit admittance parameters, open circuit impedance parameters, transmission parameters, hybrid parameters, relationship between parameter sets, interconnection of two port networks, T and π section representation in parameter forms.

Unit-IV **Network Graph Theory:** Introduction of Graph theory, Concept of network graph, Properties of Tree in a graph, Formation of Incidence Matrix, Properties of Incidence Matrix, Number of Tree in a graph, Cut Set Matrix, Loop Matrix.
Passive filters: Characteristic impedance of symmetrical networks, the propagation constant, filter fundamentals; pass and stop bands.

Unit-V **Network Synthesis:** Concept of network synthesis, Procedure of synthesis, reactive network, Foster's canonic first and second form, Ladder network, Cauer canonic first and second form, Applicability of Foster's and Cauer form.

Text/Reference Books:

1. M.E. Van Valkenburg, "Network Analysis", Third Edition, 2010, Prentice-Hall India.
2. Franklin F. Kuo., "Network Analysis and Synthesis", Second Edition, 2008, Wiley India.
3. W. H. Hayt and J E Kemmerly, "Engineering Circuit Analysis", Eighth Edition, 2008, Tata McGraw-Hill.
4. Sudhakar, A. Shyammohan, "Circuits and Network", Third Edition, 2006, Tata McGraw Hill.
5. C. L. Wadhwa, "Network analysis and synthesis", Second Edition, 2006, New Age International.

Course Outcomes:

Upon successful completion of the course, students will be able to

CO1: analyze various electrical networks using advanced theorems and techniques.
CO2: obtain the transient and steady-state response of electrical networks.
CO3: apply two-port network formulation for analyzing electrical networks.
CO4: apply network graph in real-world scenario and design different types of passive filters.
CO5: synthesize electrical network using Foster and Cauer Forms.

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	1	1	1					2	2		
CO2	3	3	3	1		1	2					2			
CO3	3	3	2	1	1							1			
CO4	3	3	3	3		2	2					2	2	2	
CO5	3	2	2	3								1			

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC203TPC04	3	1	0	4 hours	30	70	100	4

SIGNALS & SYSTEMS

Course Objectives:

- **To make the students familiarize with the fundamental** continuous and discrete signals and systems.
- To develop basic idea of operations performed on LTI systems in time and frequency domain.
- To introduce different transformation methods used in time and frequency domains.
- **To help students develop an understanding the concept of r**epresentation of various time and frequency domains systems.
- To explore the concept of continuous to discrete conversion technique needed in communication

Syllabus Content:

UNIT-I: **Signals and systems:** Definition of signal, test signals, operations on signals, Classification of Signals, definition of system and system classification, System properties: additivity and homogeneity, causality, stability, invertibility.

UNIT-II: **Linear Time Invariant (LTI) Systems:** Impulse response and step response, convolution, Properties of LTI systems, Eigen functions, System representation through differential and difference equations.

UNIT-III: **Continuous Time System Analysis:** The Laplace Transform, region of convergence, poles and zeros of system, Properties of Laplace transform, Inverse Laplace transform, Laplace domain analysis, Solution to differential equations and system behavior.

Discrete Time System Analysis: The z-Transform, region of convergence, Properties of z-transform, Inverse Z-transform, Z-domain analysis, solution to difference equations and system behavior.

UNIT-IV: **Fourier analysis of Continuous Time System:** Fourier series representation, Fourier Transform, Properties of Fourier transform, Magnitude and Phase response.
Continuous to Discrete conversion: Sampling, Sampling theorem and signal reconstruction. **Fourier analysis of Discrete Time System:** The Discrete-Time Fourier Transform (DTFT), properties of DTFT, LTI system representation by DTFT.

UNIT-V: Discrete Fourier Transform (DFT), Properties of DFT, Parseval's Theorem, Fast Fourier Transform (FFT): Concept of twiddle factor, DIT and DIF radix-2 algorithm.

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC204TPC05	3	1	0	4 hours	30	70	100	4

ANALOG CIRCUITS

Course Objectives:

Students will try to learn:

1. To understand the operation of the various bias circuits of low frequency transistors and Analyze and design FET based circuits.
2. To understand the operation and design of high frequency amplifier and multi stage amplifier.
3. To understand the operation and design of transformer coupled various types of power amplifier circuits.
4. To understand the effects of negative feedback on amplifier circuits.
5. To analyze the different RC and LC oscillator circuits.

Syllabus Content:

UNIT-I: **Low Frequency Transistor Amplifier:** Graphical Analysis of CE amplifier; h-parameter Models for CB, CE, CC configurations and their Interrelationship; Analysis and Comparison of the three Configurations; Linear analysis of Transistor Circuits: Miller's Theorem: Cascading: Simplified Models and Calculation of CE and CC Amplifiers; Cascade amplifiers: Darlington Pair, analysis of Single stage FET amplifier-CS and CD Configuration.

UNIT-II: **High Frequency Transistor Amplifier:** CE hybrid pi model, Validity and parameter Variation, Current gain with Resistive load: frequency response of a single stage CE amplifier: Gain-Bandwidth product: CC stage High frequencies.
Multistage Amplifier: Classification: Distortion in Amplifiers: Step response, Pass band of Cascaded Stages: Response of a two-stage RC coupled Amplifier at Low and High frequencies: sources of noise in transistor circuits, Noise figure.

UNIT-III: **Feedback Amplifiers:** Classification: Feedback concept, Ideal feedback amplifier, Properties of negative feedback amplifier topologies: Method of Analysis of feedback amplifier, Voltage series feedback: Voltage series feedback pair: Current series, current shunt, Voltage shunt feedback, Effect of feedback on amplifier bandwidth and stability.

UNIT-IV: **Oscillator:** Sinusoidal oscillator, Phase shift oscillator, Wien bridge oscillator, Resonant circuit oscillators: LC Collpit, LC Hartley, General form of oscillator configuration: Crystal oscillator.

UNIT-V: **Large Signal/ Power Amplifier:** Classification, large signal amplifier characteristics, class A amplifiers: class A amplifier with direct-coupled resistive load, transformer-coupled class A amplifier, class A push pull amplifiers,

class B amplifiers- transformer-coupled push-pull class B amplifier, complementary symmetry push-pull class B amplifier, class AB amplifier, class C amplifier, Harmonic Distortion, Push-pull Amplifiers, Cross-over Distortion.

Tuned Amplifiers: Classification of tuned Amplifier, Analysis of single and double tuned amplifiers.

Text/Reference Books:

1. Integrated Electronics, Millman & Halkias, TMH
2. Microelectronics, Millman & Grabel, TMH
3. Electronic Device & Circuits, David A Bell, PHI
4. Electronic Device & Circuit Theory, Boylestad & Nashelsky, PHI

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Design and analyze different modes of Low frequency transistors and FET amplifier.
2. Design and analyze high frequency transistor amplifier.
3. Design and analyze various Feedback amplifiers circuits.
4. Design sinusoidal and non-sinusoidal oscillators
5. Understand the functioning of large signal/ power amplifier circuits

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2											3	2	
CO2	3	2											3	2	
CO3	3	2											3	2	
CO4	3	2											3	2	
CO5	3	2											3	2	

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC204TPC06	3	1	0	4 hours	30	70	100	4

ANALOG COMMUNICATION

Course Objectives:

Students undergoing this course, are expected to

1. Understand Modulation & demodulation techniques of AM, DSB, SSB, VSB & FM
2. Understand Modulation & demodulation techniques PAM & PTM and Sampling Theorem.
3. Know Noise Figure in AM & FM receiver systems.
4. Understand Function of various stages of AM, FM transmitters
5. Know Characteristics of AM & FM receivers.

Syllabus Content:

UNIT -I: SPECTRAL ANALYSIS:
Fourier series, Response of a linear system, Normalized power in a Fourier expansion, Power spectral density. The Fourier transform, Convolution, Parseval's theorem, Power and energy spectral density, Signal transfer through a LTI network, Auto and Cross correlations.

UNIT -II: AMPLITUDE MODULATION SYSTEMS:
Frequency translation, A method of frequency Translation, Recovery of base band signal, Amplitude Modulation, Maximum Allowable Modulation. The square Law demodulator, Spectrum of AM signal, Modulators and Balanced Modulator, SSB modulation and generation, VSB, Multiplexing.

UNIT-III: FREQUENCY MODULATION SYSTEM:
Phase and frequency modulation and their relationship, Frequency deviation, spectrum of FM Signal, BW of FM signal, Effect of modulation on BW, constant BW, FM phasor diagram, Spectrum of Narrow band FM and Wideband FM, Bandwidth Required for a Gaussian Modulated WBFM Signal, FM generation: Armstrong and Parameter Variation methods of FM Demodulators. Frequency Multiplication, FM Demodulators, Approximately Compatible SSB Systems, stereophonic FM Broadcasting.

UNIT-IV: NOISE IN COMMUNICATION SYSTEM:
Resistor noise, Available power, Noise temperature, Noise bandwidth, Two ports Noise bandwidth, Input Noise temperature, Noise figure, Equivalent-Noise temperature of a cascade example of receiving system, Noise Performance of Communication System, Noise in SSB and DSB system, Noise in AM System, Noise in angle modulation system, Threshold effect in Angle Modulation System, Pre-emphasis and De-emphasis.

UNIT-V: RECEIVERS AND SAMPLING THEORM:
Receivers: Introduction, tuned radio frequency receiver, super heterodyne receiver, radio frequency amplifier, mixer, local oscillator, intermediate frequency amplifier, automatic gain control; Receiver characteristics: Sensitivity, selectivity, image frequency rejection ratio, choice of intermediate frequency, fidelity; Frequency

modulation receiver, amplitude limiting, automatic frequency control, comparison with amplitude modulation receiver.

Sampling: Sampling theorem, graphical and analytical proof for band limited signals, types of sampling, reconstruction of signal from its samples.

TEXT BOOKS:

1. Simon Haykin, Communication Systems, Wiley Eastern, India.
2. Taub and schilling, Principles of Communication Systems, Tata McGraw Hill, India.
3. Sham Shanmugam, Digital and Analog Communication Systems, Wiley-India edition.

REFERENCE BOOKS:

1. Kennedy, Davis, Electronic Communication Systems, Tata McGraw Hill, New Delhi.
2. B. P. Lathi, Modern Digital and Analog Communication Systems, OXFORD university Press.
3. Tomasi, Advanced Electronic Communications Systems, Pearson.
4. Proakis and Salehi, Fundamentals of Communication System, 1/E Pearson Education.

Course Outcome:

On completion of the course, the students will be able to attain the following COs:

1. Analyze and apply the Spectral Analysis concepts.
2. Analyze various methods of Amplitude modulation and detection.
3. Analyze various methods of Angle modulation and detection.
4. Evaluate the performance of analogue communications in the presence of noise.
5. Explain the principle and working of analog transmitters and receivers.

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2			1							2	3	2	
CO2	3	2			1							2	3	2	
CO3	3	2			1							2	3	2	
CO4	3	2			1							2	3	2	
CO5	3	2			1							2	3	2	

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC205TPC10	3	1	-	4 hours	30	70	4

Digital Signal Processing

Course Objectives:

Objective of the course are to make Students will able:

1. To summarize and analyze the concepts of signals, systems in time and frequency domain with corresponding transformations
2. To introduce the diverse structures for realizing digital filters.
3. To develop the understanding the concept of design and implementation of digital filters.
4. To develop basic idea of multi rate filter bank design.
5. To utilise the appropriate tools for design and realization of signal processing modules

Unit–I: Basic elements of digital signal Processing

Introduction of discrete time signals and systems, Discrete Time Fourier Transform (DTFT), Discrete Fourier series (DFS), Discrete Fourier Transform (DFT), Fast Fourier Transform (FFT) using DIT and DIF algorithms, Inverse FFT using DIT and DIF algorithms, Circular convolution, Correlation, MATLAB programs based illustrations.

Unit-II: Realization of Systems

Realization of discrete time systems, Structures for Infinite Impulse Response (IIR) and Finite Impulse Response (FIR) systems, Basic realisation Block diagram and Signal flow graph, **Realization of IIR filter:** Direct forms structure, Transposed structure, Cascade structure, Parallel structure, Lattice structure, Ladder structure. **Realization of FIR filter:** Direct forms structure, Cascade structure, linear phase realization, Lattice structure.

Unit-III: FIR Filter Design

Linear phase response, Symmetric and Anti-symmetric, Design characteristics of FIR filters, Frequency response of FIR filters, Design FIR filter by Window functions: Rectangular, Triangular, Hanning, Hamming, Blackman & Kaiser, Design FIR filter by Frequency sampling method, MATLAB programs based illustrations for FIR filters.

Unit-IV: IIR Filter design

Transformation of Analog filter to digital filters by: Approximation of Derivatives, Impulse invariance method, bilinear transformation method, design of digital Butterworth and Chebyshev filter, Frequency Transformations in Analog and Digital domain, MATLAB programs based illustrations for IIR filters.

UNIT-V: Multi-rate Digital Signal Processing

Introduction of multi rate system, Sampling Rate Conversion, Decimation, Interpolation, Sampling rate alteration, Poly-phase Decomposition, Digital Filter Bank, Application of DSP: Speech and Image.

Text/Reference Books:

1. S. K. Mitra, " Digital Signal Processing: A computer based approach", McGraw Hill, 2011.

Sub Code	L	T	P	Duration	IA	ESE	Credit
EC07TPC14	3	1	0	4	30	70	3

FIBER OPTICS COMMUNICATION

Course Objectives:

- To introduce the concept of optical communication system.
- Recognize and classify the structures of Optical fiber and types.
- Discuss the channel impairments like losses and dispersion.
- Measurement devices of optical fiber Communication system.
- To learn the Optical detector and optical transmitter.

Unit I:

Introduction to optical communication, principle of light transmission, propagation of light into fiber, mode theory of a cylindrical waveguide, Ray model.

Unit II:

Different types of optical fibers, Modal analysis of a step index fiber. Signal degradation on optical fiber due to dispersion and attenuation, Fabrication of fibers and measurement techniques like OTDR.

Unit III:

Optical sources-LEDs and Lasers, Photo-detectors - PIN-diodes, APDs, detector responsivity, noise, optical receivers, Optical link design - BER calculation, power penalties.

Unit IV:

Optical switches - coupled mode analysis of directional couplers, electro-optics switches, Optical amplifiers - EDFA, Raman amplifier, WDM and DWDM systems and Principles of WDM networks.

Unit V:

Nonlinear effects in fiber optic links, Concept of self-phase modulation, group velocity dispersion and Soliton based communication.

Text/Reference Books

1. J. Keiser, Fibre Optic communication, McGraw-Hill, 5thEd. 2013 (IndianEdition).
2. T. Tamir, Integrated optics, (Topics in Applied Physics Vol.7), Springer-Verlag, 1975.

Sub Code	L	T	P	Duration	IA	ESE	Credit
EC07TPC15	3	1	0	4	30	70	3

EMBEDDED SYSTEMS

Course Objective:

Students will be able to:

- To introduce the Building Blocks of Embedded System
- To Educate in Various Embedded Development Strategies
- To Introduce Bus Communication in processors, Input/output interfacing.
- To impart knowledge in various processor scheduling algorithms
- To introduce Basics of Real time operating system.

Unit-I: Embedded system Introduction

Overview of microcomputer systems and their building blocks, Review of 8051 Microcontroller, Basic idea of system, Introduction of Embedded system, characteristic of Embedded system.

Unit-II: Components of Embedded system

Functional building blocks of Embedded systems, processor and controller, Interfacing of memory between analog and digital blocks, interfacing with external systems, user interfacing.

Unit-III: Layers of an Embedded system

Introduction, Need for Layering, The Middleware Layer, The Application Layer. Introduction to Real Time Operating Systems, Design tradeoffs due to process compatibility, thermal considerations.

Unit-IV: Networks for Embedded Systems

Serial Communication RS 232 model, I square Model, CAN and CAN Open, SPI and SCI, USB, HDLC, Parallel Communication Basics PCI interface and PCI X- interface, Device Driver Serial Port and Parallel Port.

Unit-V: Methodologies, Life cycle and Modeling

Software Life cycle, Embedded Life cycle Water Fall Model, Spiral Model, RAD Model and Modeling of Embedded system, Simulation and Emulation. Software aspects of embedded systems: real time programming languages and operating systems for embedded systems.

Text/Reference books:

1. J. W. Valvano, "Embedded Microcomputer System: Real Time Interfacing", Brooks/Cole, 2000.
2. Jack Ganssle, "The Art of Designing Embedded Systems", Newness, 1999.

Sub Code	L	T	P	Duration	IA	ESE	Credit
EC07TPE13	3	1	0	4	30	70	3

MICROWAVE THEORY AND TECHNIQUES

Course Objective:

- To understand the concepts of waveguides and various modes.
- To understand the basic concept of various types of Guiding Structure and Passive Components at Microwave.
- To understand the concepts and working principles of Microwave Active Components.
- To understand the concepts and working principles of Microwave System Design and Antenna
- To understand the applications and effect of microwave in various system

Unit I:

Introduction to Microwaves-History of Microwaves, Microwave Frequency bands; Applications of Microwaves, Mathematical Model of Microwave Transmission-Concept of Mode, Features of TEM, TE and TM Modes in Rectangular and Circular waveguide, Losses associated with microwave transmission, Concept of Impedance in Microwave transmission. Introduction of Microwave Systems.

Unit II:

Analysis of RF and Microwave Transmission Lines- Coaxial line, Strip line, Micro strip line. Microwave Network Analysis- Equivalent voltages and currents for non-TEM lines, Network parameters for microwave circuits, Scattering Parameters. Passive Microwave Devices- Microwave passive components: Directional Coupler, Power Divider, Magic Tee, Resonator.

Unit III:

Microwave active components: Microwave Semiconductor Devices: Gunn Diodes, IMPATT diodes, Schottky Barrier diodes, PIN diodes. Microwave Tubes: Klystron, Travelling Wave Tube Amplifier, Magnetron.

Unit IV:

Microwave Design Principles-Impedance transformation, Impedance Matching, Introduction of Microwave Filter Design, RF and Microwave Amplifier Design, Microwave Antennas

Antenna parameters, Introduction of Antennas for ground based systems, airborne and satellite systems, Introduction of Planar Antennas for Microwave frequency.

Unit V:

Microwave Measurements- Power, Frequency and impedance measurement at microwave frequency, Noise at microwave frequency and measurement of noise figure. Electromagnetic interference and Electromagnetic Compatibility (EMI & EMC), Modern Trends in Microwaves Engineering- Effect of Microwaves on human body.

Text/Reference Books:

1. R.E. Collins, Microwave Circuits, McGraw Hill
2. K.C. Gupta and I.J. Bahl, Microwave Circuits, Artech house
3. S.Y. Liao, Microwave Devices and circuits, Pearson Education
4. David M. Pozar, Microwave Engineering, John Wiley & Sons
5. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill, 2005

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

- Understand the need of various microwave system components and their properties.
- Understand the working of various Guiding structures and passive components along with their properties.
- Appreciate that during analysis/ synthesis of microwave active systems, the different mathematical treatment is required compared to general circuit analysis.
- Will able to design the Microwave Devices
- Will able to do the Measurement of Microwave Properties and will learn latest development in Microwave Technology.

Sub Code	L	T	P	Duration	IA	ESE	Credit
EC08TPE21	3	1	0	4	30	70	3

WIRELESS SENSOR NETWORKS

Course Objectives:

- To introduce and understand the concept of Wireless Sensor Network and its applications.
- To identify various network technologies and its challenges.
- To know about various protocols used in Wireless Sensor Networks
- To understand the networking concept in Wireless Sensor Networks
- To introduce operating system in field of Sensor Networks

Unit I:

Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks

Unit II:

Mobile Ad-hoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks

Unit III: MAC protocols and Routing Protocols for Wireless Sensor Networks

Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee, Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion, Quality of a sensor network; Real-time traffic support and security protocols.

Unit IV:

Design Principles for WSNs, Gateway Concepts Need for gateway, and WSN to Internet Communication, and Internet to WSN Communication. Single-node architecture, Hardware components & design constraints

Unit V:

Operating systems and execution environments, Introduction to TinyOS and nesC.