List of New Course(s) Introduced

Department : *Electronics and Communication Engineering*

Programme Name : *B.Tech.*

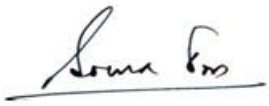
Academic Year : 2021-22

List of New Course(s) Introduced

Sr. No.	Course Code	Name of the Course
1	EC205TPC09	Digital Communication
2	EC206TPC11	CMOS Digital VLSI Design
3	EC206TPC12	Data Communication & Computer Networks
4	EC206TPC13	Microprocessor & Microcontroller
5	EC206TES07	Electronic Measurements and Sensors
6	EC206TPE02	Advance Signal Processing
7	EC206TPE03	Renewable Energy Sources
8	EC07TPE09	Digital Image Processing
9	EC07TPE10	Analog & Digital VLSI
10	EC07TPE11	Estimation and Detection Theory
11	EC07TPE12	Advanced Power Electronics
12	EC07TPE15	Machine Learning
13	EC08TPE16	Millimeter Wave Technology
14	EC08TPE17	Video Processing
15	EC08TPE18	Biomedical Electronics
16	EC08TPE19	Next Gen. Comm. Technology
17	EC08TOE05	Intellectual Property Rights
18	EC08TOE07	Introduction to IOT
19	ECPATT1	Linear Algebra
20	ECPATT2	Wireless Communication & Network
21	ECPATT3	Optoelectronic Devices
22	ECPATP1	Introduction to Signal Processing
23	ECPATP2	Introduction to Embedded & IOT System
24	ECPATP3	Microstrip Antenna
25	ECPATP4	Estimation & Detection Theory
26	ECPATP5	Digital Image Processing
27	ECPATP6	Network Security & Cryptography

28	ECPATP7	Modern Digital Communication
29	ECPATP8	Antenna for Modern wireless Communication
30	IPPATC1	Research Methodology & IPR
31	ECPALT1	Optoelectronic Device Laboratory
32	ECPBTT1	Advanced VLSI Fabrication
33	ECPBTT2	Millimeter Wave Technology
34	ECPBTP1	Machine Learning
35	ECPBTP2	Optical Communication System
36	ECPBTP3	Next Generation Communication Technologies
37	ECPBTP4	Advanced Digital Signal Processing
38	ECPBTP5	Computer Vision
39	ECPBTP6	Digital Communication Receiver
40	ECPBTP7	Optical Instrumentation
41	ECPBTP8	Satellite Communication
42	MSPBTO1	Business Analysis
43	IPPBTO2	Industrial Safety
44	IPPBTO3	Operations Research
45	CEPBTO4	Cost Management of Engineering Projects
46	MEPBTO5	Composite Materials
47	CHPBTO6	Waste to Energy
48	ECPBTO7	Internet of Things
49	ELPBTX1	English for Research Paper Writing
50	PEPBTX2	Stress Management by Yoga
51	CEPBTX3	Disaster Management
52	LAPBTX4	Constitution of India
53	ECPBLT1	Wireless Communication laboratory
54	ECPBLT2	RF & Microwave Component Design Laboratory
55	ECPCPT1	Dissertation Stage–I
56	ECPDPT1	Dissertation Stage–II
57	ECDATP8	Introduction to Signal Processing
58	ECDATP9	Introduction to Embedded & IOT System
59	ECDATP10	Microstrip Antenna
60	ECDATP11	Estimation & Detection Theory
61	ECDATP12	Digital Image Processing
62	ECDATP13	Network Security & Cryptography

63	ECDATP14	Modern Digital Communication
64	ECDATP15	Machine Learning
65	ECDATP16	Optical Communication System
66	ECDATP17	Next Generation Network
67	ECDATP18	Advanced Digital Signal Processing
68	ECDATP19	Computer Vision
69	ECDATP20	Digital Communication Receiver
70	ECDATP21	Optical Instrumentation
71	ECDATP22	Satellite Communication



विभागाध्यक्ष (इले. 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: 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

1. Scheme of 5th and 6th semester courses are discussed and finalized based on the various core area of ECE programme
2. Program elective introduced based on current demand of society and industries
3. Open elective courses are finalized for other B.Tech department Program excluding ECE department
4. Open elective course for ECE department students will take from the list of Open elective courses introduced by other department.
5. 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)
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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)
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G. G. V. Bilaspur (C.G.)

Signature & Seal of HoD

Implementation of CBCS / ECS

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 : *November 02, 2021 – 11:00 AM*

Venue : *Online Mode*

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 M.Tech. 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. Mrs. Anita Khanna (HOD, Assistant Prof., Dept. of ECE-cum Chairman, BOS)
3. Dr. Soma Das (Member BoS, Associate Professor, Dept. of ECE)
4. Mr. Shrawan K. Patel (Member BoS, Assistant Professor, Dept. of ECE)
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. Beaulah Nath (Invited Member, Assistant Professor, Dept. of ECE)
8. Mrs Pragati Patharia (Invited Member, Assistant Professor, Dept. of ECE)
9. Mr. Deepak Rathore (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. Mr. Anil Kumar Soni (Invited Member, Assistant Professor, Dept. of ECE)
14. Mr. Chandan Tamrakar (Invited Member, Assistant Professor, Dept. of ECE)
15. Mrs. Praveena Rajput (Invited Member, Assistant Professor, Dept. of ECE)

Following points were discussed during the meeting

1. CBCS based evaluation scheme of M.Tech. was discussed and finalized.
2. Courses of M.Tech. 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 introduced in the of M.Tech.:

- Linear Algebra (ECPATT1)
- Wireless Communication & Network (ECPATT2)
- Optoelectronic Devices (ECPATT3)
- Introduction to Signal Processing (ECPATP1)
- Introduction to Embedded & IOT System (ECPATP2)
- Microstrip Antenna (ECPATP3)
- Estimation & Detection Theory (ECPATP4)
- Digital Image Processing (ECPATP5)

- Network Security & Cryptography (ECPATP6)
- Modern Digital Communication (ECPATP7)
- Antenna for Modern wireless Communication (ECPATP8)
- Research Methodology & IPR (IPPATC1)
- Advanced VLSI Fabrication (ECPBTT1)
- Millimeter Wave Technology (ECPBTT2)
- Machine Learning (ECPBTP1)
- Optical Communication (ECPBTP2)
- Next Generation Communication Technologies (ECPBTP3)
- Advanced Digital Signal Processing (ECPBTP4)
- Computer Vision (ECPBTP5)
- Digital Communication Receiver (ECPBTP6)
- Optical Instrumentation (ECPBTP7)
- Satellite Communication (ECPBTP8)
- Business Analysis (MSPBTO1)
- Industrial Safety (IPPBTO2)
- Operations Research (IPPBTO3)
- Cost Management of Engineering Projects (CEPBTO4)
- Composite Materials (MEPBTO5)
- Waste to Energy (CHPBTO6)
- Internet of Things (ECPBTO7)
- English for Research Paper Writing (ELPBTX1)
- Stress Management by Yoga (PEPBTX2)
- Disaster Management (CEPBTX3)
- Constitution of India (LAPBTX4)

विभागाध्यक्ष (इलें. एवं संचार अभियांत्रिकी)
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G. G. V. Bilaspur (C.G.)

Signature & Seal of HoD

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

Academic Year: 2020-21

School : *School of Studies of Engineering and Technology*

Department : *Electronics and Communication Engineering*

Date and Time : *July 14, 2020 – 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 Pre PhD 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. Dr. Soma Das (HOD, Associate Prof., Dept. of ECE-cum Chairman, BOS)
4. Mr. Shrawan K. Patel (Member BoS, Assistant Professor, Dept. of ECE)
5. Dr. J.K. Rai (External Expert as Employer of Research Scholar, Scientist E, CGCOST Raipur)
6. Mrs. Bhawna Shukla (Invited Member, Assistant Professor, Dept. of ECE)
7. Mrs. Anita Khanna (Invited Member, Assistant Professor, Dept. of ECE)
8. Mrs. Pragati Patharia (Invited Member, Assistant Professor, Dept. of ECE)
9. Mr. Nipun Kumar Mishra(Invited Member, Assistant Professor, Dept. of ECE)
10. Mr. Sumit Kumar Gupta (Invited Member, Assistant Professor, Dept. of ECE)
11. Mr. Jitendra Bhardwaj (Invited Member, Assistant Professor, Dept. of ECE)
12. Dr. Anil Kumar Soni (Invited Member, Assistant Professor, Dept. of ECE)
13. Mr. Chandan Tamrakar (Invited Member, Assistant Professor, Dept. of ECE)
14. Mrs. Praveena Rajput (Invited Member, Assistant Professor, Dept. of ECE)
15. Dr. Robert Mark (PhD Alumni of Dept. of ECE, Post doctoral Fellow DRDO)
16. Mr. Laxmikant Dewangan (Present Students, Dept. of ECE)
17. Ms. Surabhi Vaishnav (Present Students, Dept. of ECE)

Following points were discussed during the meeting

1. Evaluation scheme of Pre PhD was discussed and finalized.
2. Courses of Pre PhD 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 Pre PhD:

- Antenna For Modern Wireless Communication (ECDATP5)

The following new courses were introduced in the of Pre PhD:

- Introduction to Signal Processing (ECDATP8)
- Introduction to Embedded & IOT System (ECDATP9)
- Microstrip Antenna (ECDATP10)
- Estimation & Detection Theory (ECDATP11)
- Digital Image Processing (ECDATP12)

- Network Security & Cryptography (ECDATP13)
- Modern Digital Communication (ECDATP14)
- Machine Learning (ECDATP15)
- Optical Communication System (ECDATP16)
- Next Generation Network (ECDATP17)
- Advanced Digital Signal Processing (ECDATP18)
- Computer Vision (ECDATP19)
- Digital Communication Receiver (ECDATP20)
- Optical Instrumentation (ECDATP21)
- Satellite Communication (ECDATP22)

विभागाध्यक्ष (इले. एवं संचार अभियांत्रिकी)
H.O.D. (Elect. & Comm. Engineering)
प्रौद्योगिकी संस्थान
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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 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.

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. THIRDYEAR (SEMESTER- VI)

(Electronics and Communication Engineering)

S. No.	COURSE No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	SUB-TOTAL	
THEORY									
1.	EC206TPC11	CMOS Digital VLSI Design	3	1	-	30	70	100	4
2.	EC206TPC12	Data Communication & Computer Networks	3	-	-	30	70	100	3
3.	EC206TPC13	Microprocessor & Microcontroller	3	-	-	30	70	100	3
4.	EC206TES07	Electronic Measurements and Sensors	3	-	-	30	70	100	3
5.	EC206TPE0X	**Program Elective-1**	3	-	-	30	70	100	3
6.		**Open Elective-1**	1	1	-	-	-	-	-
		TOTAL	**16**	**2**	**-**	**150**	**350**	**500**	**16**
PRACTICALS									
1.	EC206PPC09	CMOS Digital VLSI Design Lab	-	-	2	30	20	50	1
2.	EC206PPC10	Data Communication & Computer Networks Lab	-	-	2	30	20	50	1
3.	EC206PES06	Electronic Measurement and Sensors Lab	-	-	2	30	20	50	1
		TOTAL	**-**	**-**	**6**	**90**	**60**	**150**	**3**
		GRAND TOTAL	**16**	**2**	**6**	**240**	**410**	**650**	**19**

Total Credits: **19** Total Contact Hours: **24** 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.

Program Elective - 1	
EC206TPE01	Information Theory & Coding
EC206TPE02	Advance Signal Processing
EC206TPE03	Renewable Energy Sources
EC206TPE04	Introduction to MEMS
Open Elective – 1 (for other branches)	
EC206TOE01	Introduction to Electronic Devices & Circuits

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

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
SCHOOL OF ENGINEERING & TECHNOLOGY, GGV, BILASPUR, C.G. (INDIA)

SCHEME OF EXAMINATION

M.TECH.ELECTRONICS & COMMUNICATION ENGINEERING

MTech. I-Semester

Sl.	Course Type/Code	Subjects	Periods/Week			Evaluation			Credits
			L	T	P	IA	ESE	Total	
1.	ECPATT1	Linear Algebra	3	0	0	40	60	100	3
2.	ECPATT2	Wireless Communication & Network	3	0	0	40	60	100	3
3.	ECPATT3	Optoelectronic Devices	3	0	0	40	60	100	3
4.	ECPATP1 to ECPATP4	Elective-I	3	0	0	40	60	100	3
5	ECPATP5to ECPATP8	Elective-II	3	0	0	40	60	100	3
6.	IPPATC1	Research Methodology & IPR	3	0	0	40	60	100	3
7.	ECPALT1	Optoelectronic Device Laboratory	0	0	4	30	20	50	2
Total			18	0	4	270	380	650	20

List of Electives approved for Semester – I

Elective-I	Elective-II
ECPATP1: Introduction to Signal Processing	**ECPATP5:** Digital Image Processing
ECPATP2: Introduction to Embedded & IOT System	**ECPATP6:** Network Security & Cryptography
ECPATP3: Microstrip Antenna	**ECPATP7:**Modern Digital Communication
ECPATP4: Estimation & Detection Theory	**ECPATP8:** Antenna for Modern wireless Communication

M.Tech. II-Semester

Sl.	Course Type/Code	Subjects	Periods/Week			Evaluation			Credits
			L	T	P	IA	ESE	Total	
1.	ECPBTT1	Advanced VLSI Fabrication	3	0	0	40	60	100	3
2.	ECPBTT2	Millimeter Wave Technology	3	0	0	40	60	100	3
3.	ECPBTP1 to ECPBTP4	Elective-III	3	0	0	40	60	100	3
4.	ECPBTP5 to ECPBTP8	Elective-IV	3	0	0	40	60	100	3
5	MSPBTO1, IPPBTO2, IPPBTO3, CEPBTO4, MEPBTO5, CHPBTO6, ECPBTO7, MCPBTO8	Open Elective	3	0	0	40	60	100	3
6.	ELPBTX1, PEPBTX2, CEPBTX3, LAPBTX4	Audit Course/ Value Added Course	2	0	0	40	60	100	2
7.	ECPBLT1	Wireless Communication laboratory	0	0	4	30	20	50	2
8.	ECPBLT2	RF & Microwave Component Design Laboratory	0	0	4	30	20	50	2
Total			17	0	08	300	400	700	21

List of Electives approved for the semester –II

Elective-III	Elective-IV	Open Elective	Audit Course
ECPBTP1: Machine Learning	**ECPBTP5:** Computer Vision	**MSPBTO1:** Business Analysis	**ELPBTX1:** English for Research Paper Writing
ECPBTP2: Optical Communication System	**ECPBTP6:**Digital Communication Receiver	**IPPBTO2:** Industrial Safety	**PEPBTX2:** Stress Management by Yoga
ECPBTP3: Next Generation Communication Technologies	**ECPBTP7:**Optical Instrumentation	**IPPBTO3:** Operations Research	**CEPBTX3:** Disaster Management
ECPBTP4: Advanced Digital Signal Processing	**ECPBTP8:**Satellite Communication	**CEPBTO4:** Cost Management of Engineering Projects	**LAPBTX4:** Constitution of India
		MEPBTO5: Composite Materials	
		CHPBTO6: Waste to Energy	
		ECPBTO7: Internet of Things	
		MCPBTO8: MOOCs	

Note: Under MOOCs, the students have to opt any subject other than ELECTRONICS & COMMUNICATION ENGINEERING from NPTEL/UGC SWAYAM

M.Tech. III-Semester

Sl.	Course Type/ Code	Subjects	Periods/Week			Evaluation			Credits
			L	T	P	IA	ESE	Total	
1.	ECPCPT1	Dissertation Stage–I	0	0	28	100	100	200	14
Total			0	0	28	100	100	200	14

M.Tech. IV-Semester

Sl.	Course Type/ Code	Subjects	Periods/Week			Evaluation			Credits
			L	T	P	IA	ESE	Total	
1.	ECPDPT1	Dissertation Stage–II	0	0	32	100	200	300	16
Total			0	0	32	100	200	300	16

Total Credits for the Program = 20 + 21 +14 +16 = 71

ANNEXURE -II

**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING,
SCHOOL OF STUDIES IN ENGINEERING AND TECHNOLOGY,
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)**

**SCHEME OF Pre-PhD, COURSE WORK
EFFECTIVE FROM 2021-22**

S.N.	NAME OF SUBJECT	SUBJECT CODE	PERIODS / WEEK L - T - P	ESE DURATION	ESE MARKS		CREDIT
					MAX	MIN	
1.	Research Methodology in Engineering	ECDATT1	3 - 1 - 0	3 Hrs	100	40	4
2.	Elective-I		3 - 1 - 0	3 Hrs	100	40	4
3.	Elective-II		3 - 1 - 0	3 Hrs	100	40	4
4.	Seminar	ECDASC1	-	-	Qualified/Not qualified		-
Total			9 - 3 - 0	9 Hrs	300	165*	12

LIST OF ELECTIVES

S.N.	NAME OF SUBJECT	SUBJECT CODE	S.N.	NAME OF SUBJECT	SUBJECT CODE
1.	Vacuum Technology	ECDATP1	12.	Digital Image Processing	ECDATP12
2.	Sensors Measurement Science & Technology	ECDATP2	13.	Network Security & Cryptography	ECDATP13
3.	Artificial Intelligence	ECDATP3	14	Modern Digital Communication	ECDATP14
4.	Optimization Techniques	ECDATP4	15.	Machine Learning	ECDATP15
5.	Antenna For Modern Wireless Communication	ECDATP5	16.	Optical Communication System	ECDATP16
6.	Wireless Communication & Network	ECDATP6	17.	Next Generation Network	ECDATP17
7.	Finite Element Method	ECDATP7	18.	Advanced Digital Signal Processing	ECDATP18
8.	Introduction to Signal Processing	ECDATP8	19.	Computer Vision	ECDATP19
9.	Introduction to Embedded & IOT System	ECDATP9	20.	Digital Communication Receiver	ECDATP20
10.	Microstrip Antenna	ECDATP10	21.	Optical Instrumentation	ECDATP21
11.	Estimation & Detection Theory	ECDATP11	22.	Satellite Communication	ECDATP22

ESE: End Semester Examination, **L**: Lecture, **T**: Theory, **P**: Practical
Max: Maximum Marks in ESE
Min: Minimum Pass Marks in each subject as 40%

- Duration of the semester will be 6 months.
- *Candidate has to score minimum 55% of aggregate marks to qualify in ESE.
- Two subjects as Electives (4 credits each) can be taken from the list of Electives

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC205TPC09	3	1	-	4 hours	30	70	100	4

DIGITAL COMMUNICATION

Course Objectives:

1. To study process of sampling, quantization that are fundamental to the digital transmission of analog signals.
2. To study baseband and band pass signal transmission and reception techniques.
3. To Study concept of signaling
4. To study digital modulation methods and optimum receiver.
5. To study the noise in digital communication, optimum filter and matched filter.
6. To Study the Error control and channel coding concept.

Syllabus Content:

UNIT-I: Digital transmission of analog signal: Sampling Theorem, Quantization, Companding, PAM, PWM, PPM, PCM, Differential PCM (DPCM), Delta Modulation, Adaptive Delta Modulation, Delta Sigma Modulation, channel bandwidths of PCM, TDM, noises in PCM PWM, PPM, DM.

Noise in PCM and DM. PCM transmission: Calculation of SNR in PCM. Delta modulation transmission: signals to quantization noise ratio Calculation.

UNIT-II: Principle of digital data transmission: Line coding: PSD of various line codes, Polar signalling, On-Off signalling, Bipolar signalling, Pulse shaping: Nyquist criterion for zero ISI, Scrambling, Regenerative repeater: Eye diagram, Detection error probability for polar signal, ON-Off and bipolar signals.

UNIT-III: Digital modulation techniques: Fundamentals of BASK, BPSK and BFSK, Generation, detection, spectrum and geometrical representation of BPSK and BFSK, Fundamentals of DPSK, DEPSK and QPSK, Generation and detection of DPSK, DEPSK and QPSK, Signal space representation of QPSK. M-ary PSK. MSK Signalling Scheme.

UNIT-IV: Optimal Reception of Digital Signal: A baseband signal Receiver, Probability of Error, Optimal Receiver design, Signal Space representation and probability of Error calculation.

UNIT-V: Information Theory and Coding: Introduction, unit of information, rate of information, joint and conditional entropy, mutual information, channel capacity: Noise free channel, symmetrical channel, binary symmetrical channel, cascaded channel, Shannon's theorem, capacity of Gaussian channel, Shannon's Hartley theorem, bandwidth S/N tradeoff, coding efficiency, source coding, channel coding.

Text/Reference Books:

1. Principles of communication system by Taub & Schilling, 3 rd Ed., McGraw-Hill Education
2. Modern Digital and Analog Communication Systems by B.P. Lathi,3 rd Ed., Oxford university press.
3. Digital communications by Simon Haykin, Wiley India Private Limited,2006

SubCode	L	T	P	Duration	IA	ESE	Credits
EC206TPC11	3	1	0	4hours	30	70	4

CMOS DIGITAL VLSI DESIGN

Course Objectives:

1. Impart knowledge of MOS transistor theory
2. To learn basic CMOS Circuits
3. Impart knowledge on architectural choices and performance trade offs involved in designing and realizing the circuits in CMOS technology.
4. To understand various aspects of memory
5. To impart knowledge of VHDL language

Unit I: FUNDAMENTALS OF MOSFETS:

Introduction to MOS transistor, basic operation, threshold voltage ,V-I characteristic ,Depletion MOSFET ,trans conductance, PMOS and its V-I characteristic, aspect ratio and its implication, channel length modulation, substrate bias effect, electrical parameters of MOSFETS.P - Mos and N -Mos Inverters

Unit II: CMOS INVERTER:

Introduction, ideal inverter, Logic level standards, VTC of inverter, Noise margin, Basic NMOS inverter, CMOS inverter, design technique, inverter switching characteristic, delay times, transient effects, power dissipation, introduction to bi-CMOS inverter

Unit III: STATIC AND DYNAMIC LOGIC CIRCUITS:

Introduction, Various Static CMOS logic gate design ,Pseudo-nMOS gates ,pass transistor logic, transmission gates, tristate buffer, dynamic logic, Evaluate logic, Domino CMOS logic, Non ideal effects of dynamic logic circuits

Unit IV: SEQUENTIAL AND COMBINATIONAL CIRCUITS:

Types of regenerative circuits, bi-stability principle, basics S-R flip flop, JK flip-flop, Master slave Flip Flop, D latch, Static Vs Dynamic latch ,memory system, types of semiconductor memory, Dynamic RAM, Static RAM.

Unit V: INTRODUCTION TO VHDL:

Introduction and use of VHDL, Entity and Architecture Declaration, Types of Models of Architecture, Data objects, Data types, Operators ,concurrent and sequential statements, process statements, case ,if, when statements ,Design of sequential and combinational circuits.

Text/Reference Book:

1. Basic VLSI Design- Douglas A. Pucknell & Kamran Eshraghian, PHI 3rd Edition (original Edition – 1994).
2. CMOS VLSI Design- A Circuits and Systems Perspective- Neil H.E. Weste, David Harris, Ayan Banerjee, 3rd Edition, Pearson Education.
3. J Bhaskar A VHDL Primer,PearsonPub

Sub Code	L	T	P		IA	ESE	Credits
EC206TPC12	3	0	0	3 hours	30	70	3

DATA COMMUNICATION & COMPUTER NETWORK

Course Objectives:

Student will try to learn to:

1. Build an understanding of the fundamental concepts of data communication in computer networking.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
3. Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
4. Develop an understanding of modern network architectures from a design and performance perspective.

Unit I: Model of a digital communication system, OSI reference model , TCP/IP, Analog and digital transmission ,parallel and serial transmission , Asynchronous and synchronous transmission. Introduction to computer networks and the Internet: Application layer: Principles of network applications, The Web and Hyper Text Transfer Protocol, File transfer, Electronic mail, Domain name system, Peer-to-Peer file sharing, Layering concepts. Review of different types of encoding.

Unit II: Switching in networks: Classification and requirements of switches, a generic switch, Circuit Switching, Time-division switching, Space-division switching, Crossbar switch and evaluation of blocking probability, 2-stage, 3-stage and n-stage networks, Packet switching, Blocking in packet switches, Three generations of packet switches, Buffering, Multicasting.

Unit III: Multiplexing. Transport layer: Connectionless transport - User Datagram Protocol, Connection oriented transport – Transmission Control Protocol. Transport layer: Connectionless transport - User Datagram Protocol, Connection-oriented transport – Transmission Control Protocol. Congestion Control and Resource Allocation: Issues in Resource Allocation, Queuing Disciplines, TCP congestion Control, Congestion Avoidance Mechanisms and Quality of Service.

Unit IV: Network layer: Virtual circuit and Datagram networks, Router, Internet Protocol, Routing algorithms, Broadcast and Multicast routing

Unit V: Link layer: ALOHA, Multiple access protocols, IEEE 802 standards, Local Area Networks, addressing, Ethernet, Hubs, Switches.

Text Reference books:

1. William Stallings, "Data and computer communications", Prentice Hall
2. B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, 4th Edition
3. J.F. Kurose and K. W. Ross, "Computer Networking – A top down approach featuring the Internet", Pearson Education, 5th Edition

Sub Code	L	T	P		IA	ESE	Credits
EC206TPC13	3	0	0	3 hours	30	70	3

MICROPROCESSOR AND MICROCONTROLLER

Course Objectives: Students will learn:

1. To develop basic concept of microprocessor and learn assembly language programming.
2. To learn about the memory interfacing and concept of advance microprocessor.
3. To learn the basic concept of various programmable interfacing devices.
4. To get the basic knowledge of concept of microcontroller and its programming tools.
5. To learn the interfacing of various devices with microcontroller and also learn the introductory part of embedded system.

UNIT-I: History and evolution of microprocessor and microcontroller, Microprocessor based system, Architecture and pin diagram of 8085 microprocessor, Register organization, Timing and control module. Multiplexing concept of buses, Instruction set and Assembly language program.

Unit-II Addressing modes, Memory interfacing, I/O interfacing, Address decoding, Interrupts, Instruction execution cycle, Subroutine instructions , Stack, Stack related instructions.

Advanced microprocessor, Intel 8086 Architecture, Register organization, Memory organization, Pipeline structure, Instructions set, 8086 interrupt.

Unit III 8255 PPI, various modes of operation, 8254 timer/ counter, Serial communication standards, serial data transfer schemes, 8251 USART architecture and Interfacing, DMA controller and its operation, Interrupt controller.

LCD & Keyboard Interfacing — ADC, DAC & Sensor Interfacing — External Memory Interface-Stepper Motor and Waveform generation.

Unit IV Microcontroller- Introduction to microcontroller, Embedded Vs external memory devices, CISC and RISC processor, Harvard and von Neumann architecture, 8051 microcontroller, Architecture, Register and memory organization, 8051 Assembly language programming tools.

Unit- V PIC microcontrollers: Introduction to PIC 16C6X/7X, family microcontroller, architectures, registers, register file structure, addressing mode, instruction set, interrupt structure, timers, counters, I/O port concepts, peripheral interfacing and application.

Basic of ARM Architecture: Introduction to Arm, microprocessor and its features, Architecture, programming model.

CISC and RISC architectures comparison, advantages of RISC

Introduction to embedded system, characteristics of embedded system, Designing issues and challenges in embedded system, various designing methods of embedded system.

Course outcome:

At the end of the semester, student will be able to

1. Make Assembly language program and project based on it.

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC206TES07	3	0	0	3 hours	30	70	3

ELECTRONIC MEASUREMENTS AND SENSORS

Course Objectives:

Students will try to learn:

1. To explain basic concepts and definitions in measurement.
2. To describe the bridge configurations and their applications.
3. To elaborate discussion about the importance of signal generators and analyzers in Measurement.

UNIT – I: Measurements and Measurement system: Measurements, Significance of measurement, Methods of measurement- Direct and Indirect Method. Instruments and measurement system: Mechanical, Electrical, Electronic instruments; Classification of Instruments: Deflection and null type instruments. Analog and Digital mode of Operation, Application of measurement system, Characteristics of instrument and measurement system: static & dynamic; Elements of a Generalized Measurement System: Primary Sensing Element, Variable Conversion Element, Data presentation Element. Accuracy and precision, Significant figure, types of error, gross error, systematic error- Instrumental, Environmental, Observational Errors, Random error, Probability of error, Probable Error- of a finite number of readings, for combination of components, Limiting error.

UNIT –II: Electromechanical Indicating Instruments: Operating forces, Constructional Details, Types of Support, Torque/Weight Ratio, Control system, Damping- Air friction and Eddy current damping.

D´Arsonaval Galvanometer- construction, Torque Equation, Dynamic Behavior, Undamped, Damped, Over damped Motion, Response of Galvanometer. Ballistic Galvanometer. PMMC- Construction, Torque Equation, Voltage/Current Measurement: Ammeter, Voltmeter, Ohmmeter, Multimeter (V.O.M.), Ratiometer, Megger. High frequency Measurement: Q-meter

UNIT – III: AC Bridge: Introduction, Sources and Detectors, General equation for bridge balance,General form of AC Bridge. Maxwell´s Bridge, Hay´s bridge, Anderson´s bridge, De-Sauty´s bridge, Schering bridge, Wien´sbridge. **Electronic Instruments:** Introduction, Advantage of Electronic voltmeter, VTVM, Differential voltmeter, Electronic voltmeter using rectifier, True RMS reading voltmeter, Calorimeter, power meter, energy meter.

UNIT – IV: Sensor & Transducers: Classification of transducer, Primary & Secondary, Passive & Active, Analog & Digital, Potentiometer, loading effect, Strain Gauge, Thermistor, Construction of thermistor, Thermocouple, LVDT, Advantage & Disadvantage of LVDT, RVDT, Capacitive Transducer, Piezo-electric transducer, Hall-effect Transducer, Capacitive Transducer, Pressure Transducer, Mechanical) sensors, fiber-optic sensors, nano-sensors, magnetic field, microwave and radiation sensors, vision and imaging sensors, chemical sensor, comparisons and selection.

UNIT – V: Display devices: Digital display method, Segmental display- 7segment & 14 segment display,dot matrix, LED, LCD, TFT, Plasma display, DLP. **Digital voltmeter (DVM):** Types of DVM, Ramp type DVM, Integrating type DVM,

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC206TPE02	3	-	-	3 hours	30	70	100	3

ADVANCE SIGNAL PROCESSING

Course Objectives:

The objectives of the course are to make the students:

1. To develop basic idea of multi rate filter bank design
2. To develop the understanding the concept of prediction of future signals
3. To introduce the fundamental concepts for adaptive filter designs.
4. To analyze the concept of estimation theory for signal analysis
5. To explore the concept of multi-resolution transformation.

Unit-1 Multirate Digital Signal Processing:

Decimation and Interpolation, Multistage implementation of sampling rate conversion, Applications of multirate signal processing, Digital filter banks, two channel quadrature mirror filter banks, .

Unit-2 Linear prediction and Optimum Linear Filters:

Random signals, Correlation Functions and Power Spectra, Innovations Representation of a Stationary Random Process. Forward and Backward Linear Prediction. Solution of the Normal Equations. The Levinson-Durbin Algorithm. Properties of the Linear Prediction-Error Filters..

Unit-3 Adaptive filters:

Applications of Adaptive Filters-Adaptive Channel Equalization, Adaptive noise cancellation, Linear Predictive coding of Speech Signals, Adaptive direct form FIR filters-The LMS algorithm, Properties of LMS algorithm. Adaptive direct form filters- RLS algorithm..

Unit-4 Power Spectrum Estimation:

Parametric and Non parametric Methods for Power Spectrum Estimation, Methods for the AR Model Parameters, ARMA Model for Power Spectrum Estimation.

Unit-5 Wavelet Transform

Origin of Wavelets, Wavelets and other reality transforms History and future of wavelets, Short Time Fourier Transform, Continuous Wavelet, and Discrete Wavelet Transform

Text/Reference Books:

1. John G. Proakis, Dimitris G. Manolakis, "Digital Signal Processing, Principles, Algorithms and Applications", Pearson, Fourth edition, 2007.
2. S. Haykin, "Adaptive Filter Theory" Prentice Hall, Englewood Cliffs, NJ, 1991.
3. K P Soman, Ramachandran, Resmi, "Insight into Wavelets- from Theory to Practice", PHI, Third Edition, 2010.
4. P.P.Vaidyanathan, "Multi rate systems and filter banks", Prentice Hall, 1993.
5. S.Mallet,"A Wavelet tour of Signal Processing", Academic Press, 1998.

MOOCs:

1. https://nptel.ac.in/courses/117/105/117105075/

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC206TPE03	3	-	-	3 hours	30	70	100	3

RENEWABLE ENERGY SOURCES

COURSE OBJECTIVE:

To impart knowledge on the following

1. Awareness about renewable Energy Sources and technologies.
2. Adequate inputs on wind power plants
3. To learn basics of solar energy and its extraction
4. To learn power generation process using biomass and hydroelectric system
5. To know details of other renewable energy sources and their storage.

UNIT I RENEWABLE ENERGY (RE) SOURCES: Environmental consequences of fossil fuel use, Importance of renewable sources of energy, Sustainable Design and development, Types of RE sources, Limitations of RE sources, Present Indian and international energy scenario of conventional and RE sources

UNIT II WIND ENERGY: Power in the Wind – Types of Wind Power Plants(WPPs)–Components of WPPs-Working of WPPs- Siting of WPPs-Grid integration issues of WPPs

UNIT III SOLAR PV AND THERMAL SYSTEMS: Solar Radiation, Radiation Measurement, Solar Thermal Power Plant, Central Receiver Power Plants, Solar Ponds.- Thermal Energy storage system with PCM- Solar Photovoltaic systems : Basic Principle of SPV conversion – Types of PV Systems- Types of Solar Cells, Photovoltaic cell concepts: Cell, module, array ,PV Module I-V Characteristics, Efficiency & Quality of the Cell, series and parallel connections, maximum power point tracking, Applications.

UNIT IV BIOMASS ENERGY: Introduction-Bio mass resources –Energy from Bio mass: conversion processes-Biomass Cogeneration-Environmental Benefits. Geothermal Energy: Basics, Direct Use, Geothermal Electricity. Mini/micro hydro power: Classification of hydropower schemes, Classification of water turbine, Turbine theory, Essential components of hydroelectric system.

UNIT 5: OTHER ENERGY SOURCES: Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal power systems. Wave Energy: Energy from waves, wave power devices. Ocean Thermal Energy Conversion (OTEC)- Hydrogen Production and Storage- Fuel cell : Principle of working- various types - construction and applications. Energy Storage System- Hybrid Energy Systems.

TEXT/ REFERENCE BOOKS:

1. Joshua Earnest, Tore Wizeliu, 'Wind Power Plants and Project Development', PHI Learning Pvt.Ltd, New Delhi, 2011.
2. D.P.Kothari, K.C Singal, Rakesh Ranjan "Renewable Energy Sources and Emerging Technologies", PHI Learning Pvt.Ltd, New Delhi, 2013.
3. Scott Grinnell, "Renewable Energy & Sustainable Design", CENGAGE Learning, USA, 2016.
4. Bradley A. Striebig,Adebayo A.Ogundipe and Maria Papadakis," Engineering Applications in Sustainable Design and Development", Cengage Learning India Private Limited, Delhi, 2016.
5. Shobh Nath Singh, 'Non-conventional Energy resources' Pearson Education, 2015

Sub Code	L	T	P	Duration	IA	ESE	Credit
EC07TPE09	3	1	0	4	30	70	3

DIGITAL IMAGE PROCESSING

Course Objectives:

- To provide the fundamental knowledge on digital image processing.
- To develop the ability to understand and implement various digital image processing algorithms.
- To facilitate the students for analyze and implement various real time digital image processing applications.

Unit I: Image Representation and Image Processing Paradigm

Image, Elements of Image perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels

Image Enhancements: Point operations, Arithmetic operations, Logical operation, Gray level transformations, histogram equalization, histogram specifications, pixel-domain smoothing filters, pixel-domain sharpening filters, two-dimensional DFT and its inverse, Cosine transform, Time-frequency localization, Wavelet transforms

Unit II: Image Filtering and restoration

Noise models, Restoration in the Presence of Noise only using Spatial Filtering and Frequency Domain Filtering, Linear Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering.

Unit III: Color Image Processing

Color models, Color transformations, Color image smoothing and sharpening; Color Segmentation.

Unit IV: Image Compression

Redundancy–inter-pixel and psycho-visual, Lossless compression – predictive, entropy, Lossy compression- predictive and transform coding; Still image compression standards – JPEG and JPEG-2000.

Sub Code	L	T	P	Duration	IA	ESE	Credit
EC07TPE10	3	1	0	4	30	70	3

ANALOG AND DIGITAL VLSI DESIGN

Course Objective:

- Concepts and understanding of Importance of VLSI design in the field of Electronics and Telecommunication.
- Underlying methodologies for fundamental CMOS Analog and Digit signal Circuits.
- To study analog circuit and its limitations issues in the context of VLSI technology.
- To understand scaling technology
- To design and verify digital circuits by means of computer aided tools.
- To understand issues and tools related to ASIC

Unit I: Introduction to MOS and CMOS

General considerations, C-V characteristics, Short channel effect, Scaling of MOSFET, Constant field scaling and its effects, Constant Voltage Scaling and its effect, second order effect for calculation.

Unit II: MOSFET Models

Low frequency models and its analysis, High frequency models and its analysis, Frequency response, Basic concepts different types of amplifier.

Unit III: CMOS Fabrication Technology

VLSI design flow chart, Y-diagram, CMOS design flow, N-well, P-well, Twin-Tub, CMOS process enhancement, BI-CMOS technology and its application.

Unit IV

Hardware modeling with verilog HDL, Encapsulation, verilog models of propagation delay, net delay, path delay and simulation, Design examples in verilog.

UNIT V: Introduction to ASIC's

Programmable Logic Devices, Programmable Array Logic, concepts of FPGA, CPLD, Different design styles and its comparison.

REFERENCES:

1. Paul R. Gray, Paul. Hurst, Stephen H. Lewis, Robert G. Meyer, Analysis and Design

Sub Code	L	T	P	Duration	IA	ESE	Credit
EC07TPE11	3	1	0	4	30	70	3

ESTIMATION AND DETECTION THEORY

Course Objective:

- To teach students the basics of estimation and detection theory.
- To introduce the students to estimation bounds.
- To introduce classical and Bayesian estimators like ML, LS, and MMSE to students.
- To teach hypothesis testing and a number of detectors of signals in noise.
- To introduce the likelihood ratio test and GLRT.
- Exposing the students to applications of estimation and detection is another important goal.

Unit-I

Recap of probability and linear algebra, Introduction of estimation in signal processing, Minimum variance unbiased estimation, Unbiased estimators, Minimum variance criterion, Existence of minimum variance unbiased estimator, Cramer-Rao lower bound (CRLB), scalar parameters, Signal in white Gaussian noise.

Unit-II

Linear models, General minimum variance unbiased estimation, Sufficient statistic, finding minimum variance unbiased estimators, Best linear unbiased estimators (BLUE), Finding the BLUE, Signal processing example.

Unit-III

Maximum Likelihood Estimators(MLE), finding the MLE, Properties of the MLE,MLE for transformed parameters, Extension to a vector parameter, Introduction to Least Square (LS) Approach, Linear least square estimation, Geometrical interpretations of LS estimation, Some examples.

Unit-IV

Bayesian estimators, Priors and Posteriors probabilities, Choosing a Prior PDF, General Bayesian estimators, Minimum mean square estimators (MMSE), Maximum A Posteriori (MAP) Estimators, Linear MMSE Estimation.

Sub Code	L	T	P	Duration	IA	ESE	Credit
EC07TPE12	3	1	0	4	30	70	3

ADVANCED POWER ELECTRONICS

Course Objectives:

- To provide the students with deep insights of different rectifier configurations and their applications.
- To make the student, analyze the DC- DC converters for different mode
- To provide the students with a knowledge of resonant converters and multilevel inverters
- To make the students confident with the use of voltage source inverter and current source inverters.

Unit I: Phase Controlled Rectifiers

Principle of phase control, Single Phase Full wave controlled converters: Midpoint and bridge type, analysis of two pulse bridge converter with continuous current, single phase two pulse converters with discontinuous current

Unit II: DC to DC switch mode Regulators

Introduction, Review of linear power supply and basic dc-dc voltage regulator configurations, Buck converters, Boost converters, Buck-Boost converters and their analysis for continuous and discontinuous conduction mode, other converter configurations.

Unit III: Resonant Converters

Introduction, Need of resonant converters, Classification of resonant converters, Load resonant converters, resonant switch converters, Zero Voltage Switching DC-DC Converters, Zero Current Switching DC-DC Converters, Applications of Resonant Converters.

Unit IV: Multi-level converters

Need for multi-level inverters, Concept of multi-level, Topologies for multi-level: Diode Clamped, Cascaded H-bridge multilevel Converters configurations; Features and relative comparison of these configurations applications.

Sub Code	L	T	P	Duration	IA	ESE	Credit
EC07TPE15	3	1	0	4	30	70	3

MACHINE LEARNING

Course Objectives:

- To review and strengthen important mathematical concepts required for ML.
- Introduce the concept of learning patterns from data.
- Introduce the linear regression technique and SVM .
- Introduce the basic neural network and provide background knowledge for deep learning.
- Introduce a few standard clustering techniques.

Unit I:

Review Artificial Intelligence and Mathematical foundations: Matrix Theory and Statistics for Machine Learning.

Introduction: Basic definition, Idea of Machines learning from data, Types of Learning, Classification of problem –Regression and Classification, Supervised and Unsupervised learning.

Unit II:

Linear Regression: Model representation for single variable, Single variable Cost, Function, Gradient Descent for Linear Regression, Gradient Descent in practice.

Unit III:

Logistic Regression: Classification, Hypothesis Representation, Decision Boundary, Cost function, Advanced Optimization, Multi-classification (One vs All), Problem of Over fitting. Support Vector Machine, Kernel function and kernel SVM.

Unit IV:

Discussion on clustering algorithms and use-cases cantered around clustering and classification, K-means, Adaptive hierarchical clustering, Gaussian mixture model.

Unit V:

Neural network: Perceptron, multilayer network, back propagation, introduction to deep neural network.

Sub Code	L	T	P	Duration	IA	ESE	Credit
EC08TPE16	3	1	0	4	30	70	3

MILLIMETER WAVE TECHNOLOGY

Course objective

Students will be able:

- To understand the Characteristics and requirement of Millimeter Wave Technology
- To understand the concepts and working principles of various guiding Structures at Millimeter Wave Technology.
- To design the Antenna for Millimeter Wave Applications.
- To perform analysis of passive Components at Millimeter Wave
- To understand the basic concept of Active Devices and Link Design at Millimeter Wave.

Unit-I: Introduction to Millimeter wave Technology

Advantages and Challenges of Millimeter Wave Technology, Millimeter Wave Applications, Sources of losses at Millimeter wave; Dielectric Loss, Conduction Loss, Radiation Surface wave losses, Wave propagation, Phase and Group Velocity, Slow and Fast waves.

Unit-II: Guiding Structure

Transmission Lines, TEM, TE and TM modes, Surface Wave in Grounded Dielectric Slab, Parallel Plate Guide, Wave Guides, Rectangular Cavity Resonator, Microstrip Lines, High Frequency Limitation of Microstrip Lines, Microstrip Coupled Lines, Conductor Backed CPW, Substrate Integrated Waveguide (SIW), Design of SIW, Image Guide, Non radiative Dielectric Guide (NRD)

Unit-III: Antennas at Millimeter wave Frequency

Antenna Parameters, Printed Millimeter Wave Antennas, Dipole and Slot Antenna, Loop Antennas, Printed Millimeter Wave Array Antennas, Waveguide Slot Arrays, On Chip Antennas: Design and Challenges.

Unit-IV: Passive Components

Dielectric Resonators, Dielectric Resonators Antenna and its modes, filters, Different types of couplings, Power divider, Directional Coupler, Hybrid Coupler.

Sub Code	L	T	P	Duration	IA	ESE	Credit
EC08TPE17	3	1	0	4	30	70	3

VIDEO PROCESSING

Course Objectives:

Students will be able:

- To acquire the fundamental knowledge on digital video processing.
- To develop the ability to understand and implement various digital video processing and estimation algorithms.
- To facilitate the students for analyze and implement various real time digital video processing applications.

Unit-I: Basic Steps of Video Processing

Video capture and display, Analog video, Digital Video, Time varying Image Formation models-3D motion models, Geometric Image formation, Photometric Image formation, sampling of video signals, filtering operations

Unit-II: Video Modelling

Camera Model-Pinhole Model, CAHV Model, Camera Motions. Object Model- Shape Model, Motion Model. Scene Model, Two-Dimensional Motion Models.

Unit-III: 2-D Motion Estimation

Optical flow, general methodologies, pixel based motion estimation, Block matching algorithm, multi resolution motion estimation, Application of Motion Estimation in Video Coding.

Unit-IV: Video Coding

Waveform based coding, Block based transform coding-Unitary Transform, Discrete Cosine Transform, Bit Allocation and Transform Coding Gain, DCT-Based Image Coders and the JPEG Standard, predictive coding, Video Coding Using Temporal Prediction and Transform Coding.

Unit-V: Video Compression

H.261, H.263, MPEG-1, MPEG-2, and MPEG-4.

Text/Reference Books:-

1. The Essential Guide to Video Processing, Al Bovik (Alan C Bovik), Academic Press, Second Edition, 2009

Sub Code	L	T	P	Duration	IA	ESE	Credit
EC08TPE18	3	1	0	4	30	70	3

BIO-MEDICAL ELECTRONICS

Course Objectives:

Students will be able to:

- To introduce the concept of Biomedical Electronics and instrument system.
- To introduce the concept of Physiological system of human Body.
- To learn different Biomedical transducers.
- To learn the Radiology, X-Ray and Angiography.
- To learn the Biotelemetry system and their different Application in patient care.

Unit-I

Concept of Biomedical Electronics, Biomedical Engineering, Biometrics, Components of man instrument system, Data Acquisition techniques.

Unit-II

Brief introduction to human physiology, Physiological system of the Body, cells & their structure, Resting & Action, Bioelectric Potential, The heart & cardiovascular system, Physiological system & Mechanical activity of Heart, Electrocardiographic lead system, Electrocardiogram, Electrocardiography, other Physiological systems.

Unit-III

Biomedical transducers: Displacement, Velocity, Force, Acceleration, Flow, Temperature, Potential, dissolved ions and gases. Bio-electrodes and bio-potential amplifiers for ECG, EMG, EEG, etc.

Unit-IV

Radiology Introduction, Generation of ionizing Radiation, X-Ray System, Radiography, X-Ray Diagnostic, Special techniques in X-Ray, Angiography

Unit-V

Biotelemetry-Introduction, Physiological parameters, Biotelemetry system, Radio telemetry system, Problems in implant telemetry, Application of telemetry in patient care, EEG measurements, EMG measurement, Working Principle of PACE MAKERS.

Sub Code	L	T	P	Duration	IA	ESE	Credit
EC08TPE20	3	1	0	4	30	70	3

NEXT GENERATION COMMUNICATION TECHNOLOGY

Course Objective:

- To learn the new communication technologies such as OFDM, MIMO, and massive
- MIMO used in Next Generation communication systems.
- To analysis the performance such as capacity/spectral efficiency and energy
- efficiency of the MIMO and massive MIMO system

Unit-I : Introduction and Preliminaries

Introduction to point-to-point Multi-input Multi-output (MIMO), multiuser MIMO, massive MIMO, Coherence Time, Coherence Bandwidth, Coherence Interval.TDD Coherence Interval structure, Coherence Interval in the context of OFDM modulation, Small-scale and Large-scale fading, Normalized signal model, and SNR.

Unit-II : OFDM

Principle of Orthogonal Frequency Division Multiplexing (OFDM), Multiple access – OFDMA, Implementation of transceivers, Frequency-selective channels, Cyclic Prefix (CP), Performance in the frequency-selective channel, Pilot based channel estimation, Peak-to-average power ratio, Inter-carrier-interference, Parameter adaptation

Unit-III : MIMO Systems

Introduction to MIMO systems, Diversity in wireless channel, Introduction to fading distributions, Analytical MIMO channel models, Independent and identically distributed (uncorrelated) MIMO fading model, Fully correlated MIMO channel model, MIMO channel parallel decomposition.

Unit-IV : MIMO Channel Capacity and Power Allocation

Power allocation in MIMO systems, Uniform power allocation, Adaptive power allocation, MIMO channel capacity, Capacity of i.i.d. Rayleigh fading MIMO channels, Capacity of separately correlated Rayleigh fading MIMO channel

Unit-V : Massive MIMO Systems

Definition of Massive MIMO, Correlated Rayleigh fading, Uplink, and downlink system model, Impact of Spatial channel correlation, Channel hardening and favorable propagation,

Sub Code	L	T	P	Duration	IA	ESE	Credit
EC08TOE05	3	1	0	4	30	70	3

INTELLECTUAL PROPERTY RIGHTS

Course Objective:

Students will be able to:

- Introduce fundamental aspects of Intellectual property Rights.
- Understand rationale behind Patent System.
- Understand WTO, TRIPS and WIPO.
- To get insight about an overview of the IPR regime.

Unit-I: Overview on IPR and its classification

Introduction to IPRs, Basic concepts and need for Intellectual Property – Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR

Unit-II: Patents

Patents - Elements of Patentability: Novelty , Non Obviousness (Inventive Steps), Industrial Application , Non Patentable Subject Matter ,Registration Procedure, Rights and Duties of Patentee, Assignment and licence , Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties - Patent office and Appellate Board

Unit-III: Registration of IPRs

Meaning and practical aspects of registration of Copy Rights, Trademarks, Geographical Indications, Trade Secrets, Plant Variety Protection and Industrial Design registration in India and Abroad.

Unit-IV: Agreement and legislation

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, intellectual Property - History of GATT & TRIPS Agreement , Berne convention, Madrid agreement Hague agreement concerning the International Deposit of Industrial Designs ,Lisbon Agreement Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

Sub Code	L	T	P	Duration	IA	ESE	Credit
EC08TOE07	3	1	0	4	30	70	3

INTRODUCTION TO IOT

Course Objective:

- It will enable student to understand the basics of Internet of things and protocols.
- It introduces some of the application areas where Internet of Things can be applied.
- Students will learn about the middleware for Internet of Things.
- It will enable to understand the concepts of Web of Things.

Unit I : Introduction to Internet of Things

Review of computer communication concepts (OSI layers, components, packet communication, Networks, TCP-IP, subnetting, IPV4 addressing and challenges). IPV6 addressing. IoT architecture reference layer. Characteristics IoT sensor nodes, Edge computer, cloud and peripheral cloud, single board computers, open source hardware, Examples of IoT infrastructure.

Unit II: IoT and M2M

Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER.

Unit III : IOT protocols and Communication Technologies

MQTT, UDP, MQTT brokers, publish subscribe modes, HTTP, COAP,XMPP and gateway protocols, IoT Communication Pattern, IoT Protocol Architecture, Selection of Wireless technologies (6LoWPAN, Zigbee, WIFI, BT, BLE,SIG,NFC, LORA, Lifi, Widi).

Unit IV : Data and Analytics for IoT

An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of IOT Security, Common Challenges in IOT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment.

MTECH SYLLABUS
SEMESTER: I

LINEAR ALGEBRA

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ECPATT1	3	0	0	3 hours	40	60	100	3

Course Objective:

The objectives of the course are to make the students:

1. Formulate, solve, apply, and interpret systems of linear equations in several variables
2. Compute with and classify matrices
3. Master the fundamental concepts of abstract vector spaces
4. Decompose linear transformations and analyze their spectra (eigenvectors and eigenvalues)
5. Utilize length and orthogonality in each of the above contexts
6. Apply orthogonal projection to optimization (least-squares) problems

UNIT-I

Introduction to Vectors: Vectors and Linear Combinations, Dot Products.

Solving linear Equations: Matrices and Linear Equations, Gaussian Elimination, Rules for Matrix Operations, Row-Reduced Echelon Form (RREF), Rank of a Matrix, Solution set of a Linear System, Inverse Matrices, Factorization: A=LUs.

UNIT-II

Vector Spaces and Subspaces: Properties, Rank, Nullspace, Solving $Ax = 0$, The Complete Solution $Ax = b$, Independence, Basis of a Vector Space, Dimension, Linear Span and Linear Independence, Dimensions of the Four Subspaces, Sums and Direct Sums.

Orthogonality: Orthogonality of the Four Subspaces, Projections and Least Square, Orthogonal Bases and Gram-Schmidt Process, QR Decomposition, The Fast Fourier Transform.

UNIT-III

Eigenvalues and Eigenvectors: The Characteristic Polynomial, Eigenvalues of a Square Matrices, Invariant Subspaces, Diagonalization, Applications to Differential Equations, Upper-Triangular Matrices, Symmetric Matrices, Spectrum of a Matrix. **Positive Definite Matrices:** Tests for Positive Definiteness, Similar Matrices, Singular Value Decomposition (SVD).

Complex Vector Spaces: Complex Vectors and Matrices: Hermitian and Unitary Matrices, Generalized Eigenvectors, Decomposition, Square Roots, The Minimal Polynomial, Jordan Form.

WIRELESS COMMUNICATION & NETWORK

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ECPATT1	3	0	0	3 hours	40	60	100	3

Course Objective:

1. To know the evolution of wireless communication, its types and concept.
2. To know basics of recent wireless technologies.
3. To know the different multiple access techniques in wireless communication.
4. To know the details of Ad-hoc wireless network.
5. To know the basics and details of wireless personal local area network.

UNIT-I

Overview of wireless communication, cellular communication, different generations of Cellular communication system, satellite communication including wireless local loop cordless phone.

UNIT-II

Recent wireless technologies; multicarrier modulation, OFDM, MIMO system, diversity-multiplexing trade off; MIMO OFDM system; smart antenna; beam forming and MIMO, cognitive radio.

UNIT-III

Multiple access techniques in wireless communication: contention free multiple access Schemes {FDMA TDMA, CDMA, SDMA and Hybrid}, contention-based multiple access schemes (ALOHA and CSMA).

UNIT-IV

Wireless personal local area networks {Bluetooth, UWB and ZigBee), wireless local area network, IEEE 802.11, network architecture, medium access methods, WLAN standards

UNIT-V

Ad-Hoc wireless network: Design Challenges in Ad-hoc wireless networks, concept of cross layer design, security in wireless networks MANET and WSN, Wireless system protocols.

Text Books

1. Andrea Goldsmith, "Wireless Communications Cambridge University press, 2005.
2. Sanjay Kumar, "wireless communication the fundamental and advanced concepts, River publisher, Denmark ,2015 {Indian reprint}

OPTOELECTRONIC DEVICES

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ECPATT3	3	0	0	3 hours	40	60	100	3

Course Objective:

1. To develop the basic concept of solid state physics and characteristics of light.
2. To develop the concept of luminescence, display devices, laser and their applications.
3. To learn the principle of optical detection mechanism in detection devices.
4. To learn different light modulation techniques and applications of optical switching
5. To develop the concept of opto electronic integrated circuits in transmitters and receivers.

UNIT I

WAVE NATURE OF LIGHT AND SOLID STATE PHYSICS

Wave nature of light, Polarization, Interference, Diffraction, Review of Semiconductor Physics and Junction Device.

UNIT II

DISPLAY DEVICES AND LASERS

Introduction, Photo Luminescence, LED, Plasma Display, Liquid Crystal Displays, Laser Emission, Absorption, Radiation, Optical Feedback, Threshold condition, Laser Modes, laser applications.

UNIT III

OPTICAL DETECTION DEVICES

Photon devices Photo emissive detectors, Photo conductive detectors, Photomultipliers (PMT), Photo diodes PIN & APD, photo transistors, Solar cells.

UNIT IV

OPTOELECTRONICS MODULATOR

Opto Electronic Modulators, Polarization, birefringence's, Electro optic effect, EO materials. Magneto Optic Modulators Faraday effect, Accusto Optic Modulators.

UNIT V

OPTOELECTRONICS INTEGRATED CIRCUITS

Introduction, hybrid and Monolithic Integration, Application of Opto Electronic Integrated Circuits, Integrated transmitters and Receivers, Guided wave devices.

Text Books

INTRODUCTION TO SIGNAL PROCESSING

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ECPATP1	3	0	0	3 hours	40	60	100	3

Course Objective:

The objectives of the course are to make the students:

1. Review of signal and system, Fourier transforms, the Z-transform
2. To impart knowledge of mathematical concept involved in signal processing.
3. To introduce mathematical modeling for Statistical Signals processing.
4. To apply optimization techniques for signal processing applications.

Unit-I

Discrete and Continuous time signals and systems, LTI systems, Convolution, Difference equations, z-transforms, Fourier transform and its properties.

Unit -II

Sampling and reconstruction, Review of vector spaces, Eigenvectors and Eigen-values. Hilbert transforms, matched filtering, equalization. Coherent and Non-coherent detection.

Unit-III

Probability theory review, Random variables, statistical averages, Random processes, Transmission of random process through an LTI system.

Unit-IV

Statistical Signal Processing: Power Spectrum Estimation Parametric and Maximum Entropy Methods, Wiener, Kalman Filtering, and the Poisson process, Levinson Durbin Algorithms Least Square Method.

Unit -V

Optimization techniques for linear and nonlinear problems, Applications in various areas of signal processing.

Text/Reference Books:

1. Proakis, John G. - Digital signal processing: principles algorithms and applications, PHI.
2. Oppenheim, Alan V - Discrete-time signal processing, Pearson Education India.
3. Vaidyanathan, Parishwad P - Multirate systems and filter banks, Pearson Education India.
4. Monson H. Hayes, "Statistical Digital Signal Processing And Modeling", 1st Edition, Wiley India Pvt Ltd, 2008.
5. Vaidyanathan, Palghat P- The theory of linear prediction, Morgan and Claypool Publishers.
6. Haykin, Simon S. - Adaptive filter theory, Pearson Education India.
7. Henry Stark and John W. Woods, "Probability and Random Processes with Applications to Signal Processing", Prentice Hall, 3rd Edition 2001

INTRODUCTION TO EMBEDDED & IOT SYSTEM

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
ECPATP2	3	0	0	3 hours	40	60	100	3

Course Objective:

This course will enable student to:

1. To introduce the Building Blocks of Embedded System
2. To understand the life cycle and applications of embedded system.
3. To understand the fundamentals about IoT, IoT Access technologies and IOT case studies.
4. To understand the design methodology and different IoT hardware platforms.
5. To study the basics of IoT Data Analytics and supporting services.

UNIT-I

Introduction and functioning: Review of Microcontroller concept. Functional block diagram of 8051 microcontroller. Introduction to Embedded system, characteristic of Embedded system. Functional building blocks of embedded systems, processor and controller.

UNIT-II

Life cycles and Applications: Interfacing of memory between analog and digital blocks, interfacing with external systems, Temperature control, stepper motor and keyboard interface. user interfacing, Embedded Life cycle, Water Fall Model , Spiral Model, RAD Model.

UNIT-III:

Introduction to IOT: Definition and characteristics of IOT, Physical design of IOT, Logical design of IOT, IoT Protocols, IoT communication models, IoT Communication APIs, IOT enabling technologies: Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture,Industry, and health and life style.

UNIT IV:

IoT and M2M- Software defined networks, network function virtualization, difference between SDNand NFV for IoT, Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER.

Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks IoT Platform overview: Overview of IoT supported Hardware platforms such as: Raspberry pi, Arduino Board details.

UNIT V: